JIMMA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF ACCOUNTING AND FINANCE

DETERMINANTS OF COST OVERRUN: THE CASE OF CONDOMINIUM HOUSING PROJECTS IN BOLE SUB-CITY.

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ART IN PROJECT MANAGEMENT AND FINANCE.

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DECLARATION

The candidate herewith adjudges that the work presented in this Dissertation on "DETERMINANT FACTORS OF COST OVERRUN: THE CASE OF CONDOMINIUM HOUSING PROJECTS IN BOLE SUB-CITY" for the Degree of Master of Art in Project Management and Finance(Honors) degree presented to the Department of Accounting in the Faculty of Business and Economics at Jimma University School of Commerce, is that of the candidate alone and has not previously been submitted, in whole or part, in respect of any other academic award and has not been published in any form by any person except where due reference is given.

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ABSTRACT

Cost overrun in building construction projects is a ubiquitous problem which affects project completion and general performance with regards to quality, time and cost and known to result to project failures, increased time spent, and loss of productivity and revenue which in turn affects the economy of the nation. Several determinant factors are responsible for the undesirable increased cost of a condominium housing project. The aim of this study is to highlight the determinant factors of condominium housing projects cost overrun; the case of 20/80 condominium housing projects in Bole sub-city, Addis Ababa. Based on a comprehensive literature review, forty factors which were believed to cause condominium housing projects cost overrun were shortlisted and were categorized into four major groups namely, contractor related, consultant related, client related and external/other factors. The survey was done in order to have the stakeholder's opinion on identifying and ranking the most common factors causing project cost overruns and their effects on housing projects in the sub-city. In conducting the study, both exploratory and descriptive research design with quantitative and qualitative research approaches were adopted. A total of 77 questionnaires were distributed to contractors, consultants and clients which are considered as the target population of the study and 72 were collected for analysis and interviews were made with most concerned stakeholders. The selection of respondents was made by using purposive sampling technique. Some mitigation strategies were proposed. The data obtained was analyzed statistically. Both descriptive and inferential statistics were used to see the determinants of cost overrun. Relative importance index and mean score methods were used to find out the most significant factors affecting cost overrun. The overall results of the finding show that the most significant factor of cost overrun based on RII was market inflation with a RII value of 0.781. Similarly, regression model indicates from the overall factors of cost overrun, external/ other factors affect cost overrun of condominium housing projects significantly. Finally, the necessary conclusions and recommendations were made.

Key words: *Bole –Sub City, Cost management, Cost overrun, condominium housing projects*

DEDICATION

I would like to dedicate this research to my fiancée Kalkidan W. for all her support and continuous encouragement.

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Table of Contents

List of Figures

List of Tables

ABBREVIATIONS AND ACRONYMS

AAHDAA—Addis Ababa Housing Development Administrative Agency

AAHDP --- Addis Ababa Housing Development Project

AAHDPO --- Addis Ababa Housing Development Project Office

AARH---Agency for the Administrative of Rental Houses

AASHDE-- -Addis Ababa Savings Houses development Enterprise

ACWP--- Actual Cost of Work Performance

BCWP---Budget Cost of Work Performance

CSA --- Central Statistics Agency

CV --- Cost Variance

EPRDF--- Ethiopian People's Revolutionary Democratic Front

ETB --- Ethiopian Birr

GDP --- Gross Domestic Product

GTZ --- Deutsche Gesellschaft fur Technische Zusammenarbeit

IHA-UDP --- Integrated Holistic Approach – Urban Development Project

IHDP --- Integrated Housing Development Program

MoFED --- Ministry of Finance and Economic Development

MWUD --- Ministry of Works and Urban Development

NBE --- National Bank of Ethiopia

NGOs --- Non- Governmental Organizations

PASDEP --- Plan for Accelerated and Sustained Development to End Poverty

WB --- World Bank

CHAPTER: ONE
1. INTRODUCTION
1.1.   BACKGROUND OF THE STUDY

For the successful completion of condominium housing projects accurate cost estimation by participants such as, contractors, consultants and clients is very important. Cost overrun is defined the difference between final project cost and the cost agreed within the project contract. It is a worldwide problem faced by both developed and developing countries. Cost overrun is a common problem in both the developed and the developing nations, making it difficult to complete many projects within budget (Shehu, Endut, & Akintoye, 2014). However, the majority of developing countries experience overruns exceeding 100% of the initial budget (Memon, Abdul-Rahman, Zainun & AbdKarim, 2013 as cited by Durdyev et al, 2017). According to Apolat, Alinaitwe &Tindiwensi, 2010: Allahaim & Liu (2012), the argument in the construction industry on how to reduce or totally remove cost overruns from projects has been ongoing among built-environment professionals, project owners, and users for the past 70 years. Various reasons for construction cost overruns in any project include design error, inadequate scope, weather, project changes.

The causes of cost overruns are critical to the success of any project (Allahaim & Liu, 2012). Hence, it is imperative to comprehend the main causes of cost overruns for different projects. Therefore, cost overruns have been attributed to a number of sources, including technical errors in design or estimation; managerial incompetence; risks and uncertainties; suspicions of foul play; deception and delusion, and even corruption (Ahiaga-Dagbui & Smith, 2014).

According to Love (2011), the Scottish Parliament Building which was over 3 years late and experienced more than a 900% cost overrun. In Australia, several large scale social infrastructure projects (i.e., hospitals, law and order, museums, schools, recreational facilities), have experienced considerable delays due to poor project governance and design errors (Love, 2011). Allahaim & Liu (2012), contend that the practical causes of cost overruns are the lack of experience among the project team; contract size/complexity, and design error. Other surveys have identified the following four major factors that cause cost overruns for a project: variations in design; insufficient project planning; inclement weather conditions, and building materials' price fluctuation (Allahaim & Liu, 2012). Love et al. (2011) opined that design error at the pre-contract stage of a project is the major cause of cost overruns for hospital and school buildings.

According to a research conducted by Memon, Abdul Rahman, and Abdul Azis (2011), poor design and delays in design was found to be the most significant factors leading to construction cost overrun in Malaysia. The following factors are also listed among the top five factors contributing to cost overrun in construction projects: unrealistic contract duration and requirements imposed; lack of experience; late delivery of materials and equipment; and relationship between management.

Based on a qualitative study conducted by Azis, Memon, Abdul Rahman, and Abd.Karim (2013) in Malaysia, the most influencing factors that contribute to cost overrun evaluated in this study are related with contractor's site management, information and communication and financial management.

According to a survey conducted by Durdyev et al. (2013), the vital factors that affect cost overrun in the residential projects in Turkey are pointed out. The most significant factors causing cost overrun are listed under five main categories, but only three of them were noted to be essential, which are improper planning, inaccurate project cost estimation, high cost of needed resources (money, men, materials and machinery), lack of skilled workforce, price of construction materials and high land prices. More conclusions are drawn regarding sub-factors, including lack of coordination, cost of the reworks, inadequate duration of contract period, lack of communication between parties and poor on-site management.

According to a mixed research conducted by Cheng (2014), sixteen factors under four categories are found to be the most influencing to the cost of Taiwanese construction projects. The factors with the strongest influence are found to be as clearly defined the scope of project in the contract, cost control and contract dispute. This study further recommends that pre-construction stage communication will help to understand what the client does really need, as well as clear understanding of the contract scope will avoid pricing disputes.

Construction industry plays a major role in development and achievement the goals of society. Construction is one of the largest industries and contributes to about 10% of the Gross National product (GDP) in industrialized countries (Umble & Umble, 2010). In Ethiopia, construction industry accounted for 71.4% of industrial output and expanded by 15.7% signifying the leading role of the construction sector in terms of roads, railways, dams and residential house expansion (NBE, 2017/18). Construction industry has complexity in its nature because it contains large

number of parties as clients, contractors, consultants, stakeholders, shareholders and regulators. Construction industry is known to be a costly and material depleting industry, due to its complexity and volatility occasioned by varied needs, wants and preferences. No investor would invest in a project that seems last forever, with indefinite cost and budget (Nicholas, 2011).

Housing is one of the basic necessities for human survival. Nevertheless, it remains for a long period as a critical problem of most of the cities of developing countries. The stagnant nature of economic development and rapid population growth of most of the developing countries makes effective and efficient service delivery difficult for governments to satisfy the need of their residents. This is the main feature of Addis Ababa, which is the capital city of Ethiopia. Housing supply of the last 30-40 years could not cope to the fast raising need. In addition, the government tenure system drives more than 40% of the housing stock to non-reparable and inhabitable state. The availability of basic infrastructural facilities and amenities is also very limited (Azeb, 2006).

According to Azeb (2008), the majority of houses in Ethiopia are by far inadequate in quality and quantity terms. The extent of provision for water supply, electricity, and drainage is very minimal. The lives and health of people living in houses of such poor quality and with such inadequate provision for water, sanitation, and drainage are under continuous threat. However, in the developing world in general and in least developed countries like Ethiopia in particular the number of people living in such conditions is increasing every year. Studies have shown that without major improvements in housing markets and in the expansion and improved provision of infrastructure and service, it is inevitable that the population living in such environmental expand very rapidly (Lovert, 1997).

Ethiopia, the second-most populous country in Africa, has an estimated population of 90 million (Central Statistics Agency [CSA], 2014). According to the CSA's (2014) annual statistical abstract, the majority of Ethiopians reside in rural areas. However, Ethiopia's urban population more than doubled from 4.87 to 11.86 million between 1984 and 2007 and, growing at a rate of 3.8% annually, is expected to triple by 2037 (World Bank[WB], 2015). According to the WB (2015), the level of urbanization in Ethiopia currently stands at 19%, low even by sub-Saharan African standards. However, the rate of urbanization is expected to accelerate at about 5% annually. In this research determinants of cost overrun, their effects and the mitigation measures that can be taken to reduce cost overrun in condominium housing projects were assessed.

1.2. Statement of the problem

Poor cost performance in construction projects has become a major concern for both contractors and clients (Saleh, 2008). According to Akintola(2010), Alah (2012) &Thanushan (2012) a clear understanding of the cost determinants is vital to achieve the desired level of accuracy of anticipated labor costs, material costs, plant and equipment's in total cost estimation. The estimator needs to be able to examine these factors and subsequently estimate, plan for, and mitigate the advance effects of these project costs. Further accuracy of cost estimate according to Hawang, Zhao & Ng (2013) will greatly affect the ability to deliver on time and within the budget. Further, it has been observed that most accurate estimate leads to highest value for money to the construction client. However, according to Hammed, Ismail, and Mohd (2011), cost overrun is observed as one of the most frequently occurring issues in construction projects worldwide and that is more severe in developing countries which needs to be studied more to alleviate this issue in the future.

In Ethiopia, studies carried out by Melaku and Beza (2017) show that the main causes of cost overrun on public housing program and factors affecting time and cost overrun in housing construction respectively. Similarly, Moges (2018) conducted a research on cost overrun in Addis Ababa Saving House construction projects. However, in this study the most significant factors causing cost overrun in condominium housing projects will be examined and prioritized based on their relative importance so as to understand the degree of severity by key stakeholders (clients, consultants and contractors).

In addition, the effects of cost overrun on key stakeholders (clients, consultants and contractors) will be assessed in this study. The Addis Ababa Housing Development Administrative Agency (AAHDAA) which administers 20/80 condominiums and the Addis Ababa Savings Houses Development Enterprise (AASHDE) which constructs the 40/60 condominiums are revising prices by considering the increasing cost of labour, materials and the inflation which have an impact on saving tenants (end-users).

The recurrent problems of delay and cost overruns are widely prevalent in the public sector construction projects. Assaf (2009) found out that only 30% of construction projects were completed within the scheduled completion dates and that the average time and cost overrun was between 10% and 30%. The presence of cost overruns can be a reason for project failure. This call

for research on innovative, adaptive and dynamic project management approaches to construction projects from inception to successful completion (Askew, 2011).

According to Knight and Fayek (2000); Mahamid (2014), the construction cost overrun can be caused by several factors, such as project location (remote vs. local), weather, access to site, labor productivity, price fluctuation of materials, political situation, economic instability, fluctuation in currency exchange rate, government policy, and accuracy of planning. In Ethiopia, condominium housing construction projects are not completed within their actual budget which requires additional budgets and have an impact on the client (government), consultant and contractor. In addition, in this study gaps in research methodology such as gaps in data collection, gaps in data analysis etc. were assessed. It is on this basis that the researcher now seeks to examine the most significant factors of cost overrun in condominium housing construction projects.

1.3.   Research Questions

In this study, research questions were proposed to achieve research problem stated above. Based on these understanding, basic questions are: -

1. What are the factors related to clients, contractors, consultants and external/other factors that cause cost overrun in condominium housing projects (20/80)?
2. What is the overall effect of cost overrun on clients, contractors and consultants that participates on condominium housing projects (20/80)?
3. What strategic measures have to be taken to improve successful condominium housing project delivery (20/80)?
4. How much is the extent/ magnitude of factors related to clients, contractors, consultants & external/other factors that determine cost overrun in condominium housing projects (20/80)?

1.4. Objectives of the study

1.4.1. General Objective

The main objective of this study is to identify factors that determine cost overrun in condominium housing projects in the case of Bole sub city.

1.4.2. Specific Objectives

Based on the statement of the general objective of the study above, the study has tried to meet the following specific objectives:

- To identify factors related with clients, contractors, consultants and external/other factors that causes cost overrun in condominium housing projects (20/80 housing project).

- To highlight the overall effect of cost overrun on clients, contractors& consultants which are considered as stakeholders in condominium housing projects (20/80 housing project).

- To suggest strategic measures that can be taken for successful 20/80 condominium housing project delivery.

- To prioritize factors related with clients, contractors, consultants & external/other factors that cause cost overrun in condominium housing projects (20/80 housing project) based on their relative importance.

1.5. Significance of the Study

Carrying out a research on the cause and effects of condominium housing project cost overrun in Addis Ababa is useful since many housing projects were experiencing cost overrun. The outcome of the research will then be a guide line to the parties that were involved in condominium housing so as to minimize or get rid of construction cost overruns. Moreover, the outcomes of the research would help the project team to suggest on several strategies that can be adopted to minimize cost overruns on construction projects. The project team would be benefited from the outcomes of this research in sense that they would have ideas of the causes of construction cost overrun and their effects on housing projects. Knowing these would alert them to avoid risks of construction cost overrun and enhance successful project delivery in terms of budget.

Generally, this study believed to be relevant for: First, it would stimulate all involved parties or practitioners to look for more effective solutions for the identified factors which determine cost overrun in condominium housing projects in the case of Bole sub city. Second, the concrete suggestions of the study would be used by the concerned body at least to minimize cost variance and negative impacts of cost overrun on clients, contractors and consultants which involves on condominium housing projects. Finally, the study would have valuable importance for further study and add new idea to the existing knowledge of condominium housing projects.

1.6.   Scope of the Study

There are various factors that determine cost overrun in condominium housing projects. Through this study, the various factors that determine cost overrun in condominium housing projects have been discussed. Each factors of cost overrun has various degrees of importance in condominium housing projects. Therefore, it is important to identify the most significant factors that determine cost overrun based on their level of importance and their impact on clients, contractors' and consultants which participates in condominium housing projects intended to execute or to be implemented in Bole sub city, Addis Ababa, Ethiopia.

Generally, the scope of this study was limited to: first, identifying factors that determine cost overrun on condominium housing projects, other factors such as time and performance are not examined in this research. Second, this research focuses only on housing construction projects, which does not give attention to other sectors. Third, the study is geographically limited on condominium housing projects in Addis Ababa, Particularly in Bole sub-city. Fourth; due to time and budget constraints it was not possible to address all the sites and workforces. Fifth; the study also has methodological limitations. The research methodology which was adopted in this study was that the researcher believes more appropriate and can increase the validity and reliability of the study. Finally, the study has limitation on concepts. The concepts included in this study are the one which the researcher considers more relevant to the study.

CHAPTER: TWO
2. LITERATURE REVIEW

2.1. INTRODUCTION

Cost estimating is an essential task for budgeting and bid preparation for any construction project. To adequately define the project scope and to ensure sufficient construction funds are available, cost estimates are required during the various stages of project development. As the project progresses, the estimates are refined to ensure the project is still cost effective, sufficient funds are available for construction, and the contractors bid price is reasonable. A key factor for a successful project is the preparation of an accurate estimate, which can be influenced by many factors that affect this accuracy (Shabniya, 2017).

According to Eman (2014), it is expected that the accuracy of cost estimating has a significant effect on construction industry. For instance, it may have a serious effect on contractor ability to compete successfully with other contractors. It also has an important effect on contractor's profit. Therefore, this research is an attempt to identify the most determinant factors causing and affecting cost overrun in public condominium housing projects in Bole sub-city, Addis Ababa, Ethiopia. Such factors should be taken into consideration when preparing cost estimating for any future project. This chapter represents some cost overrun definitions. It also gives some details about factors causing cost overrun and their effects on stakeholders that involves on condominium housing construction projects and finally it mentions previous work in order to get a predetermined list of factors that may cause and affect condominium housing construction projects cost overrun.

2.2. Building Construction Projects Cost management

Cook-Davies (2010) states the cost of building construction projects generally can be defined as the cost of any activities carried out to preserve an element or restore it to an acceptable standard and condition but excludes any enhancements other than those demanded by failure to substitute obsolete materials and components. According to Bellah (2015), financial accounting is very important in building maintenance management. As a general principle the objective of a maintenance management organization is to ensure the continuous provision of the required standards and level of service provided by the buildings at a minimum cost. The maintenance cost is viewed as an overhead on the operations of the building users.

CMAA (2001) define Cost management as the act of managing all or part of the cost of planning, design and construction projects process so as remain within the owner's budget; from this definition one can simply understand that; Project Cost Management should consider the owners requirements for managing costs. Different stakeholders will measure project costs in different ways and at different times.

2.2.1. Possible project cost management processes

According to PMBOK (2013), project Cost management includes the processes required to ensure that the project is completed within the approved budget. It includes activities such as resource planning, cost estimating, cost budgeting, and cost control so that the project can be completed within time and the approved budget and the project performance could be improved in time.

Cost management covers the full life cycle of a project from the initial planning phase towards measuring the actual cost performance and project completion.

Project cost Management

Resource Planning

1. **Inputs**
    1. Work breakdown structure
    2. Historical information
    3. Scope statement
    4. Resource pool description
    5. Organizational Policies
    6. Activity duration estimates
2. **Tools and Techniques**
    1. Expert judgment
    2. Alternatives identification
    3. Project management software
3. **Outputs**
    1. Resource requirements

Cost Estimating

1. **Inputs**
    1. Work breakdown structure
    2. Resource requirements
    3. Resource rates
    4. Activity duration estimates
    5. Estimating publications
    6. Historical information
    7. Chart of accounts
    8. Risks
2. **Tools and Techniques**
    1. Analogous estimating
    2. Parametric modeling
    3. Bottom-up estimating
    4. Computerized tools
    5. Other cost estimating methods
3. **Outputs**
    1. Cost estimates
    2. Supporting detail
    3. Cost management plan

Cost Budgeting

1. **Inputs**
    1. Cost estimates
    2. Work breakdown structure
    3. Project schedule
    4. Risk management plan
2. **Tools and techniques**
    1. Cost budgeting tools and techniques
3. **Outputs**
    1. Cost baseline

Cost Control

1. **Inputs**
    1. Cost baseline
    2. Performance reports
    3. Change requests
    4. Cost management plan
2. **Tools and techniques**
    1. Cost change control system
    2. Performance measurement
    3. Earned value management (EVM)
    4. Additional planning
    5. Computerized tools
3. **Outputs**
    1. Revised cost estimates
    2. Budget updates
    3. Corrective action
    4. Estimate at completion
    5. Project closeout
    6. Lessons learned

Figure 2.1 Project Cost management Overview

2.2.1.1. Resource planning

Resource planning involves determining what physical resources (people, equipment, materials) and what quantities of each should be used and when they would be needed to perform project activities. It must be closely coordinated with cost estimating (PMBOK, 2013)

Input: what you need to do the job?

- Work breakdown structure
- Historical information
- Scope Statement
- Resource pool description
- Organizational policies
- Activity duration statement

Activity: How is it done? [Tools & Techniques]

- Expert judgment
- Alternative identification
- Project management software

Output: What you get by doing It?

- Resource requirements

Figure 2.2 . Resource Planning: input, activity and output

2.2.1.2. Cost estimating

According to PMBOK (2013), cost estimating involves developing an approximation (estimate) of the costs of the resources needed to complete project activities. In approximating cost, the estimator considers the causes of variation of the final estimate for purposes of better managing the project.

When the project is performed under contract, care should be taken to distinguish cost estimating from pricing. Cost estimating involves developing an assessment of the likely quantitative results – how much will it cost the performing organization to provide the product or service involved? Pricing is a business decision – how much will the performing organization charge for the product or service – that uses the cost estimate as but one consideration of many (PMBOK, 2013).

According to PMBOK (2013), cost estimating includes identifying and considering various costing alternatives. For example, in most application areas, additional work during a design phase is widely held to have the potential for reducing the cost of the production phase. The cost-

estimating process must consider whether the cost of the additional design work will be offset by the expected savings.

Input: what you need to do the job?

- Work breakdown structure
- Resource requirements
- Resource rates
- Activity duration statements
- Estimating publications
- Historical information
- Chart of Accounts
- Risk

Activity: How is it done? [Tools & Techniques]

- Analogous estimating
- Parametric modeling
- Bottom-up estimating
- Computerized tools
- Other cost estimating methods

Output: What you get by doing It?

- Cost estimates
- Supporting details
- Cost management plans

Figure 2.3. Cost estimating: input, activity and output

2.2.1.2.1. Types of Cost Estimates

Type of Estimate	When Done?	Why Done	How Accurate
Rough Order of Magnitude (ROM)	Very early in the project life cycle, often 3–5 years before project completion	Provides rough ballpark of cost for selection decisions	$-25\%, +75\%$
Budgetary	Early, 1–2 years out	Puts dollars in the budget plans	$-10\%, +25\%$
Definitive	Later in the project, < 1 year out	Provides details for purchases, estimate actual costs	$-5\%, +10\%$

Table 2.1 Types of Cost estimates

2.2.1.2.2. Elements of cost Estimating

Elements of cost estimating consist of:

1. Direct cost

2. Indirect cost

3. Markup

1. Direct Cost

Costs of completing work those are directly attributable to its performance and are necessary for its completion. In construction, the cost of installed equipment, material, labor and supervision directly or immediately involved in the physical construction of the permanent facility (AACE, 2013)

2. Indirect Cost

Costs not directly attributable to the completion of an activity which are typically allocated or spread across all activities on a predetermined basis. In construction it is costs which do not become a final part of the installation, but which required for the orderly completion of the installation and may include, but are not limited to, field administration, direct supervision, capital tools, startup tools, contractor's fees, insurance, taxes, etc. (AACE, 2013).

3. Markup

As variously used in construction estimating, includes such percentage applications as general overhead, profit, and other indirect costs (AACE, 2013).

2.2.1.3. Cost budgeting

Cost budgeting involves allocating the overall cost estimates to individual activities or work packages to establish a cost baseline for measuring project performance. Reality may dictate that estimates are done after budgetary approval is provided, but estimates should be done prior to budget to budget request whenever possible (PMBOK,2013).

Input: what you need to do the job?

- Cost estimates
- Work Breakdown structure
- Project schedule
- Risk management plan

Activity: How is it done? [Tools & Techniques]

- Cost budgeting tools and techniques

Output: What you get by doing It?

- Cost baseline

Figure 2.4 Cost budgeting: input, activity and output

2.2.1.4. Cost control

According to PMBOK (2013), cost control is concerned with; influencing the factors that create changes to the cost baseline to ensure that changes are agreed upon; determining that the cost baseline has changed and managing the actual changes when and as they occur. Cost control includes: Monitoring cost performance to detect and understand variances from plan; ensuring that all appropriate changes are recorded accurately in the cost baseline; preventing incorrect, inappropriate, or unauthorized changes from being included in the cost baseline; informing appropriate stakeholders of authorized changes; acting to bring expected costs within acceptable limits.

According to PMBOK (2013), Cost control includes searching out the "why" of both positive and negative variances. It must be thoroughly integrated with the other control processes (scope change control, schedule control, quality control and others).

Input: what you need to do the job?

- Cost baseline
- Performance reports
- Change requests
- Cost management plan

Activity: How is it done? [Tools & Techniques]

- Cost change control system
- Performance measurement Earned value management (EVM)
- Additional planning
- Computerized tools

Output: What you get by doing It?

- Revised cost estimates
- Budget updates
- Corrective actions
- Estimate at completion
- Project closeout
- Lessons learned

Figure 2.5 Cost control: input, activity and output

2.3. Definitions

2.3.1. Definitions of Cost Overrun

Cost overrun is referred to as "cost increase" or "budget overrun". It involves unanticipated costs incurred in excess of the budgeted amounts (Shanmugapriya& Subramanian, 2013) &Shakantu (2016) view **cost overrun** as simply an occurrence, where the final or actual cost of a project surpasses the original or initial estimates.

Cost overrun is defined as a percentage difference between the final completion cost and the contract-bid cost (Shanmugapriya & Subramanian, 2013: Shrestha, Burns & Shields, 2013: Saidu & Shakantu, 2016).

Cost overrun has also been referred to as the percentage of actual or final costs above the estimated or tender cost of a project (Ubani et al., 2011).

Cost overrun can be defined as an occurrence in which the delivery of contracted goods/services is claimed to require more financial resources than was originally agreed upon between a project sponsor and a contractor (Nega, 2008),**.**

Cost overrun is defined as the difference between final project cost and the cost agreed within the project contract (Shehu, Endut, & Akintoye, 2014).

Cost overrun is the difference between the original cost estimate of project and actual construction cost on completion of works of a commercial sector construction projects (Choudhry, 2004).

A probabilistic approach was proposed by Morris (2009) to compute the expected value, variance, and semi variance of the NPV of an investment.

$$\text{cost overrun} = \frac{FinalContractAmount - OriginalContractAmount}{OriginalConrtactAmount}$$

2.3.2. Cost Variance
Cost Variance (CV) = budgeted cost of work performed (BCWP) – actual cost of work performed (ACWP). A negative cost variance indicates that the activity is running over budget (AACE, 2013 as cited in Eman, 2014).

2.4. Cost overruns worldwide
According to Memon (2013), the history of the construction industry worldwide abounds in projects that were completed with a significant amount of cost overrun, despite the use of modern technologies and software packages. In the United States of America, only 16% of the 8,000 surveyed projects in 1994 could satisfy the following requirements: timely completion within the budget, and maintaining a high standard of quality (Ameh et al., 2010 as cited by Saidu & shakantu, 2017).

According to Odeck (2014), in Canada 50 road- construction projects were investigated, and the results revealed a cost overrun of up to 82% in 2006. Cost overruns were slightly lower in Europe

compared to North America and other geographical areas (Brunes & Lind, 2014 as cited by Saidu & shakantu, 2017). In the United Kingdom, Barrick revealed, in 1995, that almost one-third of the clients complained that their construction projects generally overrun budget (Memon, 2013).

As noted by Cantarelli, VanWee, Molin & Flyvbjerg (2012), the Dutch construction projects were reported to have an average cost overrun of 10.6% for railways, 18.6% for roads, and 21.7% for fixed links. In Portugal, construction projects face, on average, a minimum of 12% of cost overrun (Abdul-Rahman, Memon, Abdul-Azis & Abdullah, 2013). These results of cost overruns are not different in the developing countries.

According to the reports of Abdul-Rahman, Memon & AbdKarim (2013), in Bosnia and Herzegovina, in a study of 53 building projects, 29 new construction projects experienced a cost overrun of 6.84% on average, while the remaining 24 re-construction projects had a cost overrun of 9.23% on average. In Pakistan, the minimum amount of cost overrun was reported to be approximately 10% for small-sized firms, 40% for large construction firms, and this percentage could increase to 60% for medium-sized firms (Azhar, Farooqui & Ahmed, 2008). Based on a survey made by Aziz (2013) on 15 different projects in Kuwait and the results revealed that only one project had been completed without a cost overrun. Aziz (2013) also reported that 70% of the building projects in Oman experienced a delay and were completed with cost above the initially estimated budget. Moreover, a study conducted on 359 projects (308 public and 51 private projects) in Malaysia revealed that only 46.8% and 37.2% of public sector and private sector projects, respectively, were completed within the budget, with an average cost deviation of 2.08% (Endut, Akintoye&Kolley,2009).

Due to various factors, cost overrun is often more of a challenge in developing countries where budget problems are just one factor in often poor project performance. In Nigeria, Olawale & Sun (2010) conducted a survey on cost overrun and found that 41% of the respondents had experienced a cost overrun of less than 10% of their projects, while 59% of the respondents had experienced a cost overrun of 10% or more on their projects. In South Africa, Baloyi & Bekker (2011) reported that the construction of FIFA 2010 World Cup stadia in different cities was completed with cost overruns ranging from 5% to a maximum of 94%. In Uganda, Apolot, Alinaitwe &Tindiwensi (2011) reviewed 30 projects of the Civil Aviation Authority of Uganda and found that 535 of the projects, although not fully completed, experienced cost overruns; 40% of these projects were within the budgeted cost, and 7% of the projects were still below the

budget. A total of 84% of the cost overruns were occasioned by changes in the scope of the work, while the remainders were largely attributed to material-price inflation. In Zambia, Kaliba, Muya & Mumba (2009) revealed that road projects also faced over 50% of cost overruns as a result of delay and other factors.

In Ethiopia, from researches conducted on the causes and effects of cost and time overrun Taye (2016) has studied to see the effect of Time and Cost Overruns on Ethiopian Construction Projects that are performed by Defense Construction Enterprise. They found that cost overrun ranges from a minimum of 1% to the maximum of 47% of the contract amount. Similarly, Belachew (2017) conducted a research to identify the causes of cost overrun in Federal Road Projects of Ethiopia. According to the research, the degree of cost overrun among selected project lengthened from 4.16% to 83.2%. and the average magnitude of cost overrun was nearly 21.52% based on the three major construction parties (client, consultant, and contractor) and the principal factors that affect project cost performance were investigated. Lack of training, benefit realization and production supports were the primary reason for cost overrun at the execution processes of the projects as per clients' perception while lack of training, implementation process or bureaucrat and benefits realization were the primary reason for cost overrun at the execution processes as per contractors' perception.

2.5. Causes of cost overruns

The causes of cost overruns are critical to the success of any project (Allahaim & Liu, 2012). Hence, it is imperative to comprehend the main causes of cost overruns for different projects. Therefore, cost overruns have been attributed to a number of sources, including technical errors in design or estimation; managerial incompetence; risks and uncertainties; suspicions of foul play; deception and delusion, and even corruption (Ahiaga-Dagbui & Smith, 2014). According to Yu &Chan (2010), factors analysis of various significant variables from the said survey, revealed eight underlying factors namely, contractor inabilities, improper project preparation, resource planning, interpretation of requirements, works definition, timeliness, government bureaucracy, and risk allocation as having been significant contributors to overruns.

Allahaim & Liu (2012) contend that the practical causes of cost overruns are the lack of experience among the project team; contract size/complexity, and design error. Other surveys have identified the following four major factors that cause cost overruns for a project: variations

in design; insufficient project planning; inclement weather conditions, and building materials' price fluctuation. Love et al. (2011) opined that design error at the pre-contract stage of a project is the major cause of cost overruns for hospital and school buildings. In India, Subramani, Sruthi & Kavitha (2014) surveyed the causes of cost overruns, and the results indicated that the major causes of cost overruns are slow decision-making at the planning stage of a project; poor project schedules and management; increases in the prices of materials and machines; poor contract management; poor design/delay in producing design; rework due to mistakes or wrong work; land-acquisition problems; poor estimation or estimation techniques, and the long time taken between the design and the time of bidding/tendering.

In Egypt, Aziz (2013) examined the factors causing cost overruns in waste-water projects and concluded that the major causes of cost overruns are lowest tendering procurement method; additional works that are not included in the original work; bureaucracy in tendering or offering methods; wrong cost-estimation methods, and funding problems by client.

 In Nigeria, Ameh et al. (2010) concluded that the significant factors causing cost overruns in the telecommunication projects include the contractor's lack of experience; the high cost of importing materials, and the materials' price fluctuation. Kasimu (2012) found that "fluctuations in materials prices", "insufficient time", "lack of experience in contracts works and "incomplete drawings" were the major causes of cost overruns in building-construction projects in Nigeria. Malumfashi & Shuaibu (2012) conducted a study on the causes of cost overruns in the infrastructural projects in Nigeria. The results revealed that the major causes include "improper planning"; "material-price fluctuations", and "inadequate finance from the project's inception".

In South Africa, Baloyi & Bekker (2011) conducted a study on the causes of cost overruns for the 2010 FIFA World Cup stadia. The results revealed that the main causes of cost overruns are project complexity; increases in labour costs; inaccurate quantity estimations; differences between the selected bid and the consultants' estimates; variation orders by clients during construction, and manpower shortage.

In Zambia, Kaliba et al. (2009) concluded that the problem of cost overruns was caused by inclement weather conditions; changes in the size of projects; the cost of environmental sustainability; delays in the work programme; civil unrest; technical constraints, and increases in material prices. Other studies have identified a variety of causes of cost overruns, including

technical factors such as the lack of experience; the project size; errors in design; price fluctuations; wrong estimates, and scope changes (Love et al., 2011; Memon et al., 2011).

Most of the studies carried out show the contractor as the sole cause of cost overruns in project managerial mishaps as well as tainting the environment. This has been done with the hope that the contractors reap massive proceeds from the project (Vedabrata, 2012). This could be true to some extent, but cannot be substantiated as parties privy to contract have specified and clearly spelt out roles to play for successful implementation of projects (Bellah, 2015).It is the responsibility of the client to pay for all costs of the project. Consultants are tasked with duty to plan, design and ensure proper implementation and supervision of the project. The contractors are tasked with actualizing the client's desire to tangible product that meets set criterion and within certain set out parameters (The Quantity Surveyor, 2011).

2.6.   Effects of Cost overrun

Effects are the consequences that will be encountered when cost overruns occur on construction project. According to Nega (2008), 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.

Based on a study conducted by Nega (2008), he 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. However, Eshofonie (2008) 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.

By reviewing detailed literatures M.J (2014), identified the following basic effects of cost overrun: extension of project, additional cost, budget short fall, adversarial relationship between participants of the project, delayed payments to contractors, poor quality workmanship and dissatisfaction by project owners and consequently by end users as the major effects of cost overruns. Furthermore, it was observed that time overrun, cost overrun, arbitration, litigation, disputes and total abandonment of projects were the effects of construction projects schedule overruns.

As indicated by Turkey (2013), the major effects identified in his research on Federal road constructions are: reduction in planned increase of road network, damaged professional relations, inability to secure project finance/securing it at higher costs, loss of clients' confidence in consultants, for professionals -inability to deliver value to clients and decreased rate of national growth.

More over the most common effects of cost overrun identified by Abubeker (2015) are delay, supplementary agreement, adversarial relations among stakeholders, and budget shortfall of project owners.

Cost overruns in construction projects affect both stakeholders and business environment (Amoa-Abban and Allotey, 2014). These effects are not limited to the project level, but they can spread to the industry level. The effects of cost overrun in industrial level include; time overrun, disputes, arbitration, total abandonment and litigation (Kikwasi, 2012). According to Haseeb, et al. (2011), the effects of cost overrun can lead to slowing down the growth of the construction sector. The implication of these effects is to slow down other development sectors. Therefore, identifying the causes of cost overrun is the primary stage on mitigating the challenges (Tebeje, 2015).

2.7. Mitigation measures for cost overruns

Building construction project delays and cost overruns have been a major setback in the last decades, especially in developing countries. This is due to the fact that; keeping building construction projects within estimated costs and schedules, requires sound strategies, good practices, and careful judgment (Jango etal.,2019).

According to Abedi et al, 2011as cited in shiri (2015), the success of construction projects is critically significant for all project participants especially for clients as well as the country economy and in bigger picture it affects contributing to country development. Furthermore, they postulated that a construction project is commonly acknowledged as successful when the aim of the project is achieved in terms of predetermined objectives that are mainly completed the project on time, within budget and specified quality in accordance with the specifications and to stakeholders" satisfaction.

According to Doloi 2013 as cited by Saidu & Shakatu (2017), project cost overrun is minimized and mitigated when maximum attention is paid to well-developed technical skills in modern projects. As noted by Olawale & Sun (2010), a critical investigation into cost overrun mitigation measures would result in their categorization according to the broad function they perform. Thus, Olawale & Sun (2010) identified the top five leading causes of cost overrun for a project and recommend a total of 90 mitigation measures for them. These mitigation measures were further categorized into four major classes, namely preventive, predictive, corrective, and organizational. Some of these measures (categories) are fluid and can sometimes appear as though they could be classified into more than one category, depending on their actual usage during the project. They include corrective-preventive and corrective-predictive measures.

Similarly, Abdul-Azis, Memon, Abdul Rahmann & AbdKarim (2013) as cited by Saidu & shakatu identified and categorized cost overrun mitigation strategies into three major classes, namely proactive, reactive and organizational strategies. According to Olawale & Sun (2010), the proactive and organizational approaches are similar or almost the same as the preventive and organizational measures recommended by. The reactive strategies, however, are adopted to mitigate the effect of the factor that actively contributes to cost overruns, while the organizational strategies are the normal measures put in place by an organization, which must not be specific to one project, but would normally affect all projects. Some of these measures are classified in more than one strategy. For instance, proactive and organizational; reactive and organizational; pro-active and reactive, as well as pro-active, reactive, and organizational-control measures.

Two main concepts were suggested by Flyvbjerg (2008), for minimizing the cost overruns on construction projects, namely reference-class forecasting and increased public sector accountability through more involvement by the private parties. As quoted by Brunes & Lind (2014), three key areas on how cost overruns could be reduced in a project were suggested:

decentralization of budgets, where cost overruns in one project in a region lead to less cost overruns in other projects in the specific region … It should be easy to see when and where cost overruns occur, and who was primarily responsible … ensuring a systematic use of external reviewers at the different stages of a project.

According to Peeters & Madauss (2008), a five-step approach were recommended to mitigating the effects of cost overruns in a project: realistic cost estimation; considering the project's life-cycle cost; appropriate contractual framework; cost control and risk management during the project phase, and a communication-managed insurance approach. According to a conclusion made by Memon et al. (2013), site- management factors are the important factors causing cost overrun. They thus suggest that improved site management and supervision of contractors could result in better control of cost overruns. In conclusion, the magnitude of the cost overrun was reduced after a mandatory quality assurance process was introduced in Norway (Magnussen & Olsson, 2006).

2.8.   Conceptual Framework

It is necessary to develop a conceptual frame work in order to depict how the relation is correlated and the direction between the pairs. The conceptual framework outlined below shows the factors that determines cost overrun on condominium housing projects. A general conceptualization diagram shown below illustrates that cost overrun of housing projects is a dependent variable which mean it is the variable whose value depends on client related factors, contractor related factors, consultants related factors and other/external factors as independent variables which means they are variables whose variation does not depend on that of another as illustrated in figure 2.6.

The following figure depicts that the dependent variable (i.e. building construction cost overrun) is highly determined by various factors (independent variables) such as market inflation, Improper project management, insufficient project planning and scheduling, financial difficulties faced by contractors, extension of time, late delivery of materials and equipment, underestimate project duration, poor financial control on site, poor contract management and improper construction methods.

Independent Variables

Basic determinant factors of cost overrun

- o Market inflation
- o Improper project management
- o Insufficient project planning and scheduling
- o Financial difficulties faced by contractors
- o Extension of time
- o Late delivery of materials and equipment
- o Underestimate project duration
- o Poor financial control on site
- o Poor contract management
- o Improper construction methods

Dependent variable

Building construction projects cost overrun

- Number of condominium housing projects done within budget
- Number of condominium housing projects done above the estimated cost

Government policies

Moderating Variable

Figure 2.6. Conceptual framework

2.9. Contextual Framework Related with Condominium Housing Projects
2.9.1. Condominium housing; a broad definition of a housing Typology

Condominium housing is a name given to the form of housing tenure where each resident household owns their individual unit, but equally shares ownership and responsibility for the communal areas and facilities of the building, such as hallways, heating systems and elevators. There is no individual ownership over plots of land. All of the land on a condominium site is owned by all homeowner (UN-HABITAT, 2011).

As cited by UN-HABITAT (2011), usually, the external maintenance of the roof and walls are undertaken by a condominium Association that jointly represents ownership of the whole complex, employing strict management to ensure funding from each homeowner. This association consists of representatives of all condominium residents who manages the site through a Board of Directors, elected by association members.

According to UN-HABITAT (2011), a register of condominium units and common areas on site and any restrictions on their use is commonly established in a Master Deed which authorizes the Board of Directors to administer condominium affairs and assess owners on their performance of adequate maintenance. Rules of governance are usually covered in a separate set of Bylaws which generally govern the internal affairs of the condominium blocks.

Bylaws usually establish the responsibilities of the condominium Association the voting procedure to be used at Association meetings; and the obligations of the owners with regards to assessments, maintenance, and use of their unit and common areas (UN-HABITAT, 2011).

A set of Rules and Regulations, providing specific details of restrictions and conduct, are established by the Board and are more readily amendable than the declaration or Bylaws. Typically rules include mandatory maintenance fees (often a monthly, pet and livestock restrictions, and colour/design choices visible from the common areas of the buildings (UN-HABITAT, 2011).

According to UN-HABITAT (2011), the upkeep of walls and features inside a condominium unit is the sole responsibility of homeowners themselves. This area is defined as the area bounded by walls of the building allowing the homeowner to make some interior modifications without creating an impact on the common areas. These boundaries are by a legal declaration, field with the local governing authority. Anything outside this boundary is held in an undivided ownership interest by a corporation established at the time of the condominium's creation.

Condominium unit owners can be permitted to rent out their home to tenants, although leasing rights may be subject to conditions or restrictions set forth in the original declaration, such as a rental cap on the total number of units a community can lease at any one time, or otherwise as permitted by local law (UN-HABITAT, 2011).

The programme recognizes the opportunity for housing to stimulate the economy, create employment, and improve the capacity of the construction and financial sector (UN-HABITAT, 2011).

2.9.2. Land and Housing Policy in Addis Ababa during Different Regimes
2.9.2.1. Land and Housing Policy during the Imperial Regime

Housing delivery during the Imperial Regime was directly related to landholding policy. The land tenure system of the Feudal regime allowed private land ownership. Each land holder was required to be in possession of a title deed showing the land size, boundaries and the number of buildings on the property (Giorghis& Gérard, 2007 as cited in UN-Habitat, 2017). Groups and individuals with strong connections to the monarchy controlled most of the land in Addis Ababa.

Thus, during the Imperial era, some 60% of the housing stock in Addis Ababa consisted of rental units, suggesting that housing supply was predominantly controlled by the elites who had the monopoly on land ownership. This created a situation under which low income populations had the sole option of rental housing rather than owning their dwelling (UN-Habitat, 2017).

According to UN-Habitat (2017), although private real estate developers were involved in housing supply during the Imperial period, their contribution towards alleviating the housing problem of low-income populations was negligible.

2.9.2.2. Land and housing policy during the Dergue Period

The Dergue Regime introduced new housing delivery systems and abolished private sector rental or real estate development throughout the country. The nationalization of land and private property resulted in a significant loss of income to former landlords (Ejigu, 2013 as cited in UN-Habitat, 2017). Moreover, house owners were never compensated for their loss of land or housing. This situation was further exacerbated as the Dergue froze wages and salaries in 1974 despite rising inflation. As a result, the purchasing power of households steadily declined (Kebbede & Jacob, 1985 as cited in UN-Habitat, 2017).

The Dergue Regime, in line with its socialist ideology, took the decision to distribute urban land and housing equitably to the city's inhabitants. To achieve this objective it introduced two types of housing associations. The first was the Agency for the Administration of Rental Houses (AARH) responsible for the administration of government-owned rental housing with a monthly rental fee above ETB 100. The second housing delivery system was the Kebele Rental Housing, administered by Kebele Administration (urban dwellers association) and fetching a monthly rent of less than ETB 100 (Yitbarek, 2008). According to Tesfaye 2007 as cited by UN-Habitat (2017) the kebeles controlled 93.87% (142,095 units) of the total government owned housing stock of 151,372 in Addis Ababa.

According to UN-Habitat (2017), the Dergue Regime offered incentives to encourage development of housing cooperatives to expand the housing supply. Firstly, land was allocated without charge for the construction of owner-occupied dwelling units. The maximum plot size for cooperative housing was 500 square meters during the 1975-1986 periods. However, with the adoption of Proclamation 292/1986, that ceiling has been reduced to 250 square meters. Secondly, building materials were subsidized. Cooperatives were given priority access to construction materials from government retail enterprises at a cost which, on the average, was less than 65% of the market value. Thirdly, mortgage loans from the Construction and Business Bank were made to cooperatives with households earning at least ETB 250 per month substantially below market interest rates. As a result of these state interventions, a significant increase in housing supply was recorded (Tesfaye, 2007 as cited in UN-Habitat, 2017). From 1986 to 1992, in Addis Ababa alone, nearly 60,000 households were organized in cooperatives to build their own homes and between 1975 and 1992 produced 40,539 housing units (UN-Habitat, 2011).

2.9.2.3. Land and Housing policy during EPRDF

Since the overthrow of the 'Derg' by the Ethiopian People's Revolutionary Democratic Force (EPRDF) in 1991, Ethiopia has been undergoing market-orientated reforms, structural adjustment policies, decentralization of governing structures, and a program of agricultural development led industrialization. (UN-HABITAT, 2011)

Following the new constitution and federal system of government, in 1994 a rural development policy, named the Land Reform Program, was introduced. This sought to decentralize urban planning responsibilities and to encourage secondary cities to attract rural migrants to ease

pressure on the already limited housing available for urban dwellers living in Addis Ababa and other major urban areas. Addis Ababa's first housing policy, incorporating the Government's practice of maintaining public ownership, was also implemented at this time but it assumed that the housing market alone would meet the demand for affordable housing of the low-income population. Despite large subsidies and land provided at highly subsidized rates, the private sector has failed to deliver affordable housing at the large scale required. During this time house prices significantly rose making it extremely difficult for even professionals such as doctors and lawyers to access affordable housing (UN-HABITAT, 2017).

The post-1991 housing sector can therefore be typified by the following four characteristics: the private housing sector has not been sufficiently engaged and therefore has not met the immense housing demand, the practice of low-cost government owned rental housing continues to be the dominant low-income housing strategy, the housing stock is of a very low quality, is poorly maintained, and needs either replacement or significant upgrading, and informal unplanned housing has proliferated as a result of high urbanization, limited housing supply, and the limited affordability of formal housing (UN-HABITAT, 2017).

2.9.2.3.1. The Integrated Housing Development Program
According to UN-HABITAT (2010), the prominent current government approach to solving the low-income housing challenge is the Integrated Housing Development Programme (IHDP), initiated by the Ministry of Works and Urban Development (MWUD) in 2005. The Programme is a continuation of the 'Addis Ababa Grand Housing Programme' which supported the endeavours of the Ethiopian Government in their implementation of the 'Plan for Accelerated and Sustained Development to End Poverty' (PASDEP).

According to UN-HABITAT (2010), the aim of IHDP was: to increase housing supply for the low-income population; to recognize existing urban slum areas and mitigate their expansion in the future; to increase job opportunities for micro and small enterprises and unskilled laborers, which will in turn provide income for their families to afford their own housing; and to improve wealth creation and wealth distribution for the nation.

As quoted by UN-HABITAT (2010);

> "The IHDP envisages…the utilization of housing as an instrument to promote urban development, create jobs, revitalize the local urban economy through MSE

development, encourage saving and empower urban residents through property ownership, and develop the capacity of the domestic construction industry''.

2.9.3. Key players in housing

The dominant player in housing is the state, manifested through its various arms such as regional governments, districts, and kebeles. The state controls the majority of the rental accommodation and influences the supply of new housing through active involvement in material production and importation, land supply, and housing finance (UN-HABITAT, 2010)

According to UN-HABITAT (2011), very few private housing developers exist. The private construction industry is very small and it is complicated and time consuming to start a company, register it, and conduct business. Those that do exist operate only for high-income groups as there is little incentive to construct low-income housing.

Involvement in the housing market by Non- Governmental Organisations (NGOs), both national and international, has been of small scale. While many NGOs operate in Ethiopia, few deal with housing and land issues. The three most visible NGOs dealing with housing are the Integrated Holistic Approach - Urban Development Project (IHA-UDP), CARE and CONCERN, who have been involved in upgrading of sanitation and infrastructure and facilitating community participation in upgrading projects. They work mainly at the city and kebele level. The German Technical Corporation (GTZ) has been operating in Ethiopia for many decades, primarily in providing technical support and building capacity in building construction (UN-HABITAT, 2011).

2.9.4. Project Management Office

According to PMBOK (2013), a project management office (PMO) is a management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques. The responsibilities of a PMO can range from providing project management support functions to actually being responsible for the direct management of one or more projects. According to PMBOK (2013), there are several types of PMO structures in organizations, each varying in the degree of control and influence they have on projects within the organization, such as:

S*upportive*: Provide a consultative role to projects by supplying templates, best practices, training, access to information and lessons learned from other projects. This type of PMO serves as a project repository. The degree of control provided by the PMO is low.

Controlling: Provide support and require compliance through various means. Compliance may involve adopting project management frameworks or methodologies, using specific templates, forms and tools, or conformance to governance. The degree of control provided by the PMO is moderate.

Directive: Directive PMOs take control of the projects by directly managing the projects. The degree of control provided by the PMO is high.

2.9.5. Addis Ababa Housing Development Project Office Overview/ AAHDP

Addis Ababa condominium housing construction project started its activities in 2004 by constructing 750 model houses around Gerji. Until the end of 2016; 184,562 condominium houses were constructed and 94,072 were constructed under 10/90 and 20/80 programme. The categorization of the programme is based on the percentage of user's contribution at the initial stage 10 and 20 percent of the project cost. According to AAHDPO, more than 26 billion birr were invested for the construction of these houses for the past years. As it is clear for anyone these amount is a big investment and that is why it should be considered as mega project. This trigger many research has to be done how these construction projects were managed and what should be done to enhance the performances to be more efficient on similar projects.

CHAPTER: THREE
3. RESEARCH METHODOLOGY

3.1. INTRODUCTION

This chapter outlines the choice of appropriate research method used in the research study. It describes the type of research design that was used, target population, sample size and sampling procedure, research instruments, a description of tools used in collecting the data, the measurement of variables and the techniques used in analyzing the collected data validity and reliability of data collection instrument, and data analysis techniques.

3.2. Research Design and Approach

The research design used in this study were exploratory and descriptive survey design aimed at identifying factors that causes cost overrun in condominium housing construction projects in Addis Ababa, Bole sub city. These methods were preferred because it allows for prudent comparison of the research findings. Descriptive survey attempts to describe or define a subject often by creating a profile of a group of problems, people or events through the collection of data and tabulation of the frequencies on research variables or their interaction.

The research problem along with the philosophy of research methodology would guide the choice of the appropriate research method. In this study, the researcher adopts mixed type of research approach in collecting and analyzing data in order to better understand the research problem. Mixed approach implemented sequentially, in which the researcher starts with gathering qualitative data and then gather quantitative data.

3.3. Target population

Target population refers to the group of individuals or objects to which the researcher in this study is interested in generalizing the conclusions. In this study the target populations were clients, different contractors and consultants which involve in condominium housing construction projects in Bole sub-city, Addis Ababa, Ethiopia.

In Bole Sub-city, there is one consultant namely, Image which consults thirty-two contractors that are involved in the main governmental public housing construction projects (20/80 housing project).

3.4. Sample size and Sampling procedure

Cooper & Schindler (2006), define Sampling as a process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of the characteristic found in the entire group.

For the purpose of this dissertation non probability sampling methods have been used. According to O'Leary (2004) non probability sampling methods are used when there is need to address something about a discrete phenomenon (people, places, objects, etc.).

The researcher makes use of purposive sampling methods. Purposive sampling is a theoretical method of getting information from a sample of population that one thinks knows most about the subject matter (walliman, 2005). The rationale for the selection of purposive sampling is that most of condominium housing project sites are located in bole sub-city compared to other sub-cities.

3.4.1. Sample size

According to Kothari (2004), if the sample size ('n') is too small, it may not serve to achieve the objectives and if it is too large, we may incur huge cost and waste resources. As a general rule, one can say that the sample must be of an optimum i.e., it should neither be excessively large nor too small. In this research, a total of 77questionnaires were distributed for respondents. The researcher believes this sample size is relatively small to make generalizations. However, this sample size was decided based on the time and budget constraints. Not only that but the other and the main reason were all sites are almost similar and the causes also related with one to another. This had been investigated at the time of problem identification. Finally, to increase accuracy, the data is triangulated by using different data collection and analysis methods. Furthermore, according to Fowler (1986) the appropriateness of any sample design feature can be evaluated only in the context of the overall objectives. The important point for the researcher is to be aware of the potential costs and benefits of the options and weigh them in terms of the main purpose of the study.

3.5. Methods of Data Collection

To get adequate and more reliable information, methods of data collection that were employed in this study are both well-structured surveyed questionnaires and interview (i.e., triangulation). According to Orodho & Kombo (2002), a self-administered questionnaire is the only way to elicit self-report on people's opinions, attitudes, beliefs, and values. The researcher developed questionnaires that are used to obtain important information about the population.

The questionnaire was comprised of both close-ended and open-ended items. The close-ended contain questions which comprises of Likert-scaled closed-ended question and also a few open-ended questions. A questionnaire for the survey was developed based on 40 factors of cost overrun and grouped into four groups as client related, contractor related, consultant related and other/external factors. For each factor the respondents were requested to rate using a five- point scale of 1 to 5 was adopted. It was categorized as follows: 5= extremely significant; 4= very significant; 3= moderately significant; 2= slightly significant; and 1= not significant. The questionnaire was designed in such a way that it has four parts. The first part deals with general information. The second part deals with determinant factors of cost overrun on condominium housing projects. The third part deals with the effects of cost overrun on condominium housing project participants, and the fourth part deals with the strategic measures that can be taken to improve successful project delivery.

3.6. Methods of Analysis

According to Zinkmud (2010), the process of data analysis involves several stages: the completed questionnaires are edited for completeness and consistency, checked for errors and omissions and then coded to SPSS v 20.

The study was used both descriptive and inferential statistics to analyze data from the questionnaires. In this study, the Relative Importance Index (RII) and Mean scores were employed to analyze and rank factors that causes cost overrun on condominium housing projects. The procedure used in analyzing the results aimed at establishing the mean score of the various factors responsible for determining cost overruns. The score for each factor is calculated by summing up scores assigned to it by respondents. Therefore, the level of importance as indicated by the client, consultants and contractors were used to measure the mean score of each factor.

The mean score (MS) for each variable of cost overrun is computed by using the formula.

$$MS = \frac{\sum(F \times S)}{N} \text{-- } 1$$

Where;

 S= Score given to each cause of cost overrun by respondents

 F= Frequency of response to each score for each cause of cost overrun

 N= Total number of responses in the respective cause of cost overrun

To measure the importance of the factors that cause cost overrun, Relative Importance Index (RII) was measured for each factor. The relative index technique has been widely used in construction research for measuring attitudes with respect to surveyed variables. RII calculation is used to determine relative significance and for ranking of the factors causing construction cost overrun. The RII was computed using the following equation.

$$RII = \frac{\sum W}{AN} \text{-- ----------} 2$$
$$= \frac{5n5 + 4n4 + 3n3 + 2n2 + 1n1}{5 \times N}$$

Where; W is the weighting given to each factor by the respondent ranging from 1 to 5.

 i.e. $\sum W = 5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1$

n_1= number of respondents for not significant

 n_2= number of respondent for slightly significant

 n_3= number of respondents for moderately significant

 n_4= number of respondents for very significant

 n_5= number of respondents for extremely significant

A is the highest weight (i.e. 5 in the study) and N is the total number of samples

3.7. Regression Model

A regression model was used in the study in determining the level of influence the independent variables have on dependent variable. It is on this basis that correlation and multiple regression analysis were used. Multiple regression models attempt to determine whether a group of variables together predict a given dependent variable (James & Frank, 1985). A multiple regression model separates each individual variable from the rest allowing each to have its own coefficient describing its relationship to the dependent variable. This model is therefore adopted because the study had more than one variable.

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+e \text{ -- } 3$$

Where;

Y = condominium housing projects cost overrun

β_0 =constant term

$\beta_1, \beta_2, \beta_3, \beta_4$ = Beta coefficients

X_1 = Contractor related factors

X_2 = Consultant related factors

X_3 = Client related factor

X_4 =External/other related factors

e = Error term

CHAPTER: FOUR
4. RESULTS AND DISCUSSIONS

4.1. Introduction

This section provides an analysis of data collected from the field. The results have been presented in tables and graphs to highlight the major findings. They were also presented sequentially in accordance with the research questions of the study. Mean scores, Relative Importance Index were used to analyze the collected data. The raw data was coded, evaluated and tabulated to depict clearly the results of factors determining cost overrun in condominium housing projects in Bole sub-city, Addis Ababa, Ethiopia.

The responses to the questionnaires were processed by calculating their index value as a measure for identifying the factors that mostly contribute towards project cost overrun. The index was also used to determine the various factors that demand the highest attention from the three perspectives under analysis, that of the clients, contractors and consultants. These factors would therefore be considered as identifiable problems to be solved.

4.2. General Characteristics and Profiles of Respondents

The respondents were categorized mainly into three groups, namely contractors, consultants and clients which are involved in condominium housing projects. The study sought to establish the information to the respondents who participated in the study with regard to gender, age bracket, level of education and the period they have been working with the construction companies under condominium housing projects. This study made use of frequencies (absolute and relative) on single response questions.

4.2.1. Questionnaire Returns Rate

Questionnaire returns rate indicates the total number of questionnaires that were filled and returned against the total number issued. The researcher distributed 77 self-administered questionnaires to selected clients, consultants and contractors, 72 questionnaires were dully returned. According to Mugenda and Mugenda (1999), states that a response rate of 55% and above is a good response rate. Table 4.1 below indicates the response rate.

Table 4. 1 Response rate of the structured questionnaire

Group	Distributed	Returned	Returned among distributed in Percentage
Clients	23	22	95.7
Consultants	26	24	92.3
Contractors	28	26	92.9
Total	**77**	**72**	

Table 4.1 above indicates that the response rate for the questionnaire survey for clients, consultants and contractors are 95.7%, 92.3% and 92.9%, respectively. According to Sekaran (2001), a response rate of 30% is acceptable for most studies. Therefore, as the response rate of this study is more than what is referred as adequate by Sekaran (2001), the response rate was considered adequate for the study.

4.2.2. Distribution of respondents by Gender

Gender was also an important factor to be considered by the researcher. Gender constitutes other responsibilities apart from professionalism which affect the quality and commitments to public and private projects implementation.

Table 4. 2 Distribution of respondents by gender

Category	Frequency	Percentage (%)
Male	51	70.8
Female	21	29.2
Total	**72**	**100.0**

Table 4.2 above shows that out of 72(100%) respondents who participated in the study, 51(70.8%) were male while 21(29.2%) were female. This means the majority of workers in condominium housing projects in Bole sub-city, Addis Ababa, Ethiopia are male. Gender representation in the industry is biased towards male professionals. Even though the government gives an attention for affirmative action, there is still gender disparity exhibited in most activities and projects.

4.2.3. Distribution of respondents by Age

The respondents were asked to indicate their age with the aim of establishing their age brackets.

Table 4.3 represents the results of distribution of respondents by age.

Table 4. 3 Distribution of respondents by Age Group

Age Group	Frequency	Percentage (%)	Cumulative Percent
21 - 30	37	51.4	51.4
31 – 40	27	37.5	88.9
41 -50	7	9.7	98.6
50 years and above	1	1.4	100.0
Total	**72**	**100.0**	

The results presented in the table 4.3above shows, 37 (51.4%) of respondents were between the age of 21 to 30 years, 27 (37.5%) were between the age of 31 to 40 years, 7(9.7%) were between the age of41 to 50 years, while only 1 (1.4%) were between the age of 50 years and above which was the smallest proportion. The age composition shows that most of the respondents were between the age of 21 to 30 years and followed by 31 to 40 years which are considered as economically active and plays a crucial role in the construction of condominium housing projects.

4.2.4. Academic Qualification

The respondents were asked to indicate their academic background, which is the education. Table 4.4 below shows the study findings on the respondent's academic background.

Table 4. 4 Academic qualification of the Respondents

Category	Frequency	Percentage (%)	Cumulative percent
Certificate	1	1.4	1.4
Diploma	6	8.3	9.7
Undergraduate	47	65.3	75.0
Postgraduate	18	25.0	100.0
Total	**72**	**100.0**	

Table4.4 above indicates the academic qualifications or educational background of the respondents. Accordingly, out of 72 (100%) participants, 1(1.4%), 6(8.3%), 47(65.3%) and 18(25.0%) of the respondents have Certificate, Diploma, Bachelor Degree and Master's Degree in

different field of areas, respectively. The education qualifications of the respondents suggest sufficient educational qualification to make the information acquired reliable. These findings indicate that most of the respondents were undergraduate degree holders and followed by postgraduate degree holders. The majority of the respondents have basic knowledge about factors that determine cost overrun in condominium housing projects, and their effects on different stakeholders.

4.2.5. Experience of Respondents

The respondents were asked to state their experience in years in governmental housing construction industry projects in order to know their familiarity with factors that determine cost overrun in condominium housing projects.

Figure 4. 1 Respondents' Experience in construction projects
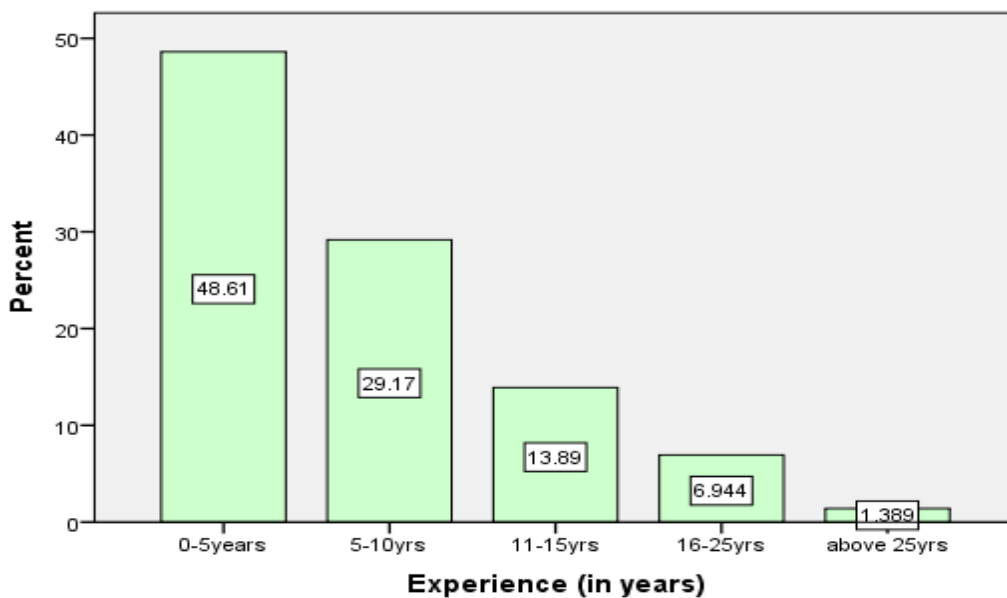
The findings presented in figure above shows that out of 72 (100%) respondents who participated in the study, 35 (48.6%) have 0 to 5 year experience, 21(29.2%) have 5 to 10 year experience, 10 (13.9%) have 11 to 15 year experience, 5 (6.9%) have 16 to 25 year experience, while 1(1.4%) have above 25 year experience which is the smallest proportion. These findings indicate that a greater percentage of individuals working in the field have adequate experience which enables

them to identify the determinant factors of cost overrun in 20/80 condominium housing projects and their effects on participants.

4.2.6. Type of Organization

Respondents were asked about which organization they belongs to in order to be sure about which factor that causes cost overrun relates with client, contractor and consultant .

Table 4. 5 Respondents' type of organization

Group	Frequency	Percentage (%)	Cumulative Percent
Client	22	30.6	30.6
Consultants	24	33.3	63.9
Contractors	26	36.1	100.0
Total	**72**	**100.0**	

Based on the result of the analysis, the above table shows that from a total of 72(100%) of respondents, 22(30.6%) were clients, 24(33.3%) were consultants, while 26(36.1%) were contractors. The result of the findings indicate that from stakeholders involved in the construction of condominium housing projects, the greater percentage of respondents were belongs to contractors.

4.3. Condominium housing projects cost overrun

Respondents were asked on the cost overrun that their company experiences in any one of the past project in order to identify the main causes of cost overrun on condominium housing projects.

Table 4. 6 Condominium housing projects cost overrun

Has the company ever experienced cost overrun in any one of the past project?	Frequency	Percentage (%)	Cumulative Percent
Yes	61	84.7	84.7
No	11	15.3	100.0
Total	**72**	**100.0**	

In any one of the past projects, the results depicted in the above table shows that 61(84.7%) of the respondents said that their company experiences cost overrun, while 11(15.3%) of the respondents said that their company does not experience cost overrun. The finding pointed out that the likelihood of experiencing cost overrun is greater in condominium housing projects which implies that cost overrun in condominium housing projects is obvious.

4.3.1. Responsible Parties of cost Overrun

In order to be sure about which party assumes the responsibility of cost overrun in 20/80 condominium housing projects, the respondents were asked about the party which was responsible for cost overrun.

Table 4. 7 Responsible parties of cost overrun

Category	Frequency	Percentage (%)	Cumulative Percent
main contractor	14	19.4	19.4
Consultant	10	13.9	33.3
Client	15	20.8	54.2
all parties	33	45.8	100.0
Total	**72**	**100.0**	

The findings depicted in the above table shows, respondents that their company experiences cost overrun said that from the parties responsible for cost overrun, 14(19.4%) were main contractors, 10(13.9%) were consultants, 15(20.8%) were clients, while 33(45.8%) were all parties. The result of the finding indicates that the greater percentage of responsibility of cost overrun in condominium housing projects was assumed by all parties.

4.3.2. Main causes of cost overrun based on Questionnaire response

In this part the main causes and responsible body of cost overrun was analyzed based on the questionnaire response. In order to get better and reliable result, the analysis was done in different ways. These are:

➢ Identifying and Classifying all factors into four groups as contractor related; consultant related; client related and external /other factors and prioritized based on their RII.

- Analyzing all factors' based on their level of significance and ranked in the order of the response of participants.
- Selecting the main significant factors of cost overrun based on their Mean Score, Relative Importance Index(RII) and weighted average
- Summary of respondent's response for open ended and interview questions.
- Summary of Inferential statistics such as, correlation and regression analysis

4.3.2.1. Respondents' Ranking of Overall Factors of Cost Overrun Based on Mean Score and Highly Responsible Party

The respondents were asked to rate with likert-scale for factors causing cost overrun in condominium housing projects. The data from respondents were collected with the help of structured questionnaires of 40 cost overrun factors extracted from detailed review of literature and those factors were Computed and ranked based on their Mean scores.

4.3.2.1.1. Summarized Response Analysis

The following table depicts the summary of the results of main causes of cost overrun and highly responsible body for each factor based on questionnaire response.

Table 4. 8 Respondents' Ranking of Factors of Cost Over run based on their Mean Scores and Highly Responsible Parties – From General perspective

No	Factors of cost overrun	Sum	Mean Score	Rank	Highly Responsible Party
1	Inappropriate planning and scheduling	256	3.56	8	Contractor
2	Project complexity	223	3.10	27	External
3	Improper project management	276	3.83	2	Consultant
4	Lack of contractor experience	249	3.46	11	Contractor
5	Financial difficulties faced by contractors	258	3.58	6	Contractor
6	Relationship between management and labour	232	3.22	21	Contractor
7	Errors during construction	249	3.46	11	Contractor
8	Extension of time	260	3.61	5	Contractor
9	Incompetent sub-contractor	247	3.43	14	Contractors

10	Unsuitable construction equipment's	239	3.32	18	Contractor
11	Improper construction methods	255	3.54	9	Contractor
12	Poor financial control on site	263	3.65	3	Contractor
13	Poor contract management	254	3.53	10	Consultant
14	Mistake in design	234	3.25	19	Consultant
15	Underestimate project duration	257	3.57	7	Consultant
16	Slowdown in design preparation	225	3.12	26	Consultant
17	Delay in approval of design changes	227	3.15	24	Consultant
18	Lack of cost plan/monitoring	245	3.40	15	Consultant
19	Inadequate project preparations	242	3.36	17	Consultant
20	Lack of coordination at design phase	233	3.24	20	Consultant
21	Incomplete design at tendering stage	197	2.74	36	Consultant
22	Lack of consultant team experience	230	3.19	23	Consultant
23	Financial problems faced by owner	227	3.15	24	Client
24	Practice of assigning contract to lowest bidder	184	2.56	39	Client
25	Lack of communication with consultant	212	2.94	31	Client
26	Changes in clients requirements	205	2.85	34	Client
27	Delay in payment	248	3.44	13	Client
28	Re-measurement of provisional sum	209	2.90	33	Client
29	Shortage of foreign currency	232	3.22	21	External
30	Market inflation	281	3.90	1	External
31	Unforeseen site conditions	214	2.97	29	External

32	Shortage of site workers	211	2.93	32	External
33	Delay in material procurement	261	3.63	4	External
34	Unpredictable weather conditions	184	2.56	39	External
35	Poor labor productivity	216	3.00	28	External
36	Unskilled labor	213	2.96	30	External
37	Equipment failure	193	2.68	37	External
38	Labour absenteeism	187	2.60	38	External
39	Power disruption	243	3.38	16	External
40	Land acquisition	198	2.75	35	External

As depicted in the above table 4.8 through a comprehensive literature review 40 factors were shortlisted and classified into four categories as client related, contractor related, consultant related and external/ other factors. There are six factors grouped under client related factors, ten factors grouped under contractor related factors, eleven factors grouped under consultant related factors and thirteen factors grouped under external/ other factors.

Based on the results of respondents questionnaire analysis indicated in the above table, factors of cost overrun were computed and ranked according to their total sum and mean score. As the overall results in the above table pointed out the top ten factors of cost overrun were market inflation, improper project management, poor financial control on site, delay in material procurement, extension of time, financial difficulties faced by contractors, underestimated project duration, inappropriate planning and scheduling, improper construction methods and poor contract management respectively.

Market Inflation: is ranked as first major contributor factor of cost overrun with a total sum value of 281 and with a mean score value of 3.90.

Improper Project Management: is ranked as the second major contributor factors of cost overrun with a total sum value of 276 and with a mean score value of 3.83.

Poor Financial Control on Site: is ranked as the third major contributor factors of cost overrun with a total sum value of 263 and with a mean score value 3.65.

Delay in Material procurement: is ranked as the fourth major contributor factors of cost overrun with a total sum value of 261and with a mean score value of 3.63.

Extension of Time: is ranked as the fifth major contributor factor of cost overrun with a total sum value of 260 and with a mean score value of 3.61.

Financial Difficulties Faced by Contractors: is ranked as the sixth major contributor factor of cost overrun with a total sum value of 258 and with a mean score value of 3.58.

Underestimate Project Duration: is ranked as the seventh major contributor factor of cost overrun with a total sum value of 257 and with a mean score value of 3.57.

Inappropriate Planning and Scheduling: is ranked as the eighth major contributor factor of cost overrun with a total sum value of 256 and with a mean score value of 3.56.

Improper Construction methods : is ranked as the ninth major contributor factor of cost overrun with a total sum value of 255 and with a mean score value of 3.54.

Poor Contract Management: is ranked as the tenth major contributor factor of cost overrun with a total sum value 254 and with a mean score value 3.53.

Condominium housing projects rarely face cost overrun by *unpredictable weather conditions* and *Practice of assigning contract to lowest bidder.* Both *Unpredictable weather conditions* and *Practice of assigning contract to lowest bidder were* ranked the last of the forty causes of cost overrun factors with the same total sum value of 184 and mean score value of 2.56. This shows that condominium housing projects are not sensitive to unpredictable weather conditions and practice of assigning contract to lowest bidder; *labour absenteeism* was rated the third from the last with a total sum value of 187 and mean score value of 2.60; *Equipment failure* was ranked the fourth, from the last with a total sum value of 193 and mean score value of 2.68 and incomplete design at tendering stage was ranked fifth, from the last with a total sum value of 197 and mean score value of 2.74 which are considered as least significant by respondents.

4.3.3. Preliminary Ranking Factors Affecting Construction Cost
Table 4. 9 Contractor related factors based on RII

No.	Contractor related factors of cost overrun	RII	Rank
1	Inappropriate planning and scheduling	0.711	4
2	Lack of contractor experience	0.692	6
3	Financial difficulties faced by contractors	0.717	3
4	Relationship between management and labor	0.644	10

5	Errors during construction	0.692	6
6	Extension of time	0.722	2
7	Incompetent sub-contractors	0.686	8
8	Unsuitable construction equipment's	0.664	9
9	Improper construction methods	0.708	5
10	Poor financial control on site	0.731	1

As the above table demonstrates, based on the ranking of RII the top five most important contractor related causes of cost overrun in condominium housing projects as perceived by respondents are;

Poor Financial Control on site: is ranked as first major contributor of contractor related factors of cost overrun with a RII value of 0.731.As money is spent, statements should be updated to reflect how much was spent, how it was spent, and what it obtained.

Extension of time: is ranked as the second major contributor of contractor related factors of cost overrun with a RII value of 0.722. Construction contracts generally allow the construction period to be extended where there is a delay that is not the contractor's fault.

Financial difficulties faced by contractors: is the third major contributor of contractor related factors of cost overrun with a RII value of 0.717. In agreement with this Memon et al (2012), based on the research conducted on "The Cause Factors of Large Projects Cost Overrun: A survey in the southern part of Peninsular Malaysia" ranked financial difficulties faced by contractors as the 3rd major contributor of cost overrun. Similarly, Shehu et al (2014) based on the research conducted on "Factors Contributing to Project Time and hence Cost Overrun in the Malaysian Construction Industry" ranked financial difficulties faced by contractors as the 1st major contributor of Cost overrun. Financial difficulties include the difficulty to get working capital and the challenge to provide competitive credit to suppliers and sub-contractors.

Inappropriate Planning and Scheduling: is the fourth major contributor of contractor related factors of cost overrun with a RII value of 0.711. This is supported by Taye (2016), the research conducted on "Assess of Time and Cost overruns in Construction projects: A case Study at Defense Construction Enterprise" ranked inappropriate planning and scheduling as

the 1st major contributor of cost overrun. Similarly, in agreement with this Danso & Antwi (2012) based on a research conducted on "Evaluating of the factors Influencing Time and Cost Overruns in Telecom Tower Construction in Ghana" inappropriate planning and scheduling ranked as the 1stmajor contributor of cost overrun.

Improper Construction Methods: is the fifth major contributor of contractor related factors of cost overrun with a RII value of 0.708. Construction methods are the means used to transform resources into constructed products.

Table 4. 10 Consultant related factors based on RII

No.	Consultant related factors	RII	Rank
1	Improper project management	0.767	1
2	Poor contract management	0.706	3
3	Mistake in design	0.650	6
4	Underestimate project duration	0.714	2
5	Slowdown in project preparation	0.625	10
6	Delay in approval of design changes	0.631	9
7	Lack of cost plan/monitoring	0.681	4
8	Inadequate project preparations	0.672	5
9	Lack of coordination at design phase	0.647	7
10	Incomplete design at tendering stage	0.547	11
11	Lack consultant team experience	0.639	8

A result in the above table indicates, from consultant related factors of cost overrun the five most important factors are: Improper project management, underestimate project duration, poor contract management, lack of cost planning/ monitoring and inadequate project preparations. Based on the ranking of RII, the top five most important consultants related causes of cost overrun in condominium housing projects as perceived by respondents are;

Improper project management: is ranked as first major contributor of consultant related factors of cost overrun with a RII value of 0.767. This is supported by Durdyev et al (2017), a research conducted on "Significant Contribution to Cost Overruns in Construction Projects of Cambodia" ranked improper project management as the 4th major contributor of cost overrun.

Underestimate project duration: is ranked as the second major contributor of consultant related factors of cost overrun with a RII value of 0.714.In agreement with this Taye (2019), conducted a study on "Simulation Modeling of Cost Overrun in Construction Project in Ethiopia" ranked inaccurate time estimation as the 5th major contributor of cost overrun.

Poor Contract Management: is ranked as the third major contributor of consultant related factors of cost overrun with a RII value of 0.706. In agreement with this Taye (2016), conducted a research on "Assessment of Time and Cost Overruns in Construction Projects: case study at Defense construction Enterprise" and ranked poor contract management as the 2nd major contributor of cost overrun.

Lack of Cost plan/ monitoring: is ranked as the fourth major contributor of consultant related factors of cost overrun with a RII value of 0.681. In any project, it's vital to put in place measures to contain costs. While well-designed cost control systems can take time and attention to implement, it's a mistake not to make the investment.

Inadequate Project Preparations: is ranked as the fifth major contributor of consultant related factors of cost overrun with a RII value of 0.672. Cost overrun in many construction projects suffers as a result of inadequate project preparatory work.

Table 4. 11 Client related factors based on RII

No.	Client related factors	RII	Rank
1	Financial problems faced by owner	0.631	2
2	Practice of assigning contract to lowest bidder	0.511	6
3	Lack of communication with consultant	0.539	4
4	Changes in clients requirements	0.569	5
5	Delay in payment	0.689	1
6	Re-measurement of provisional sum	0.581	3

Findings in the above table show that from client related factors of cost overrun the first three most important factors are: delay in payment, financial problem faced by owner and re-measurement of provisional sum. Based on the ranking of RII, the top three most important

clients related causes of cost overrun in condominium housing projects as perceived by respondents are:

Delay in Payment: is ranked as first major contributor of clients related factors of cost overrun with a RII value of 0.689. This is supported by a research conducted by Bekr (2017) on "Significant Factors Causing Cost Overruns in Construction Industry, in Afghanistan" ranked delay in progress payment by client as the 2nd major contributor of cost overrun. Similarly, in agreement with this memon et al (2012) conducted a research on "The Cause Factors of Large Projects Cost Overrun: A Survey in the Southern part of Peninsular Malaysia" ranked delay in payment as the 3rd major contributor of cost overrun.

Financial Problems faced by owner: is ranked as the second major contributor of clients related factors of cost overrun with a RII value of 0.631. In agreement with this Oluyemi et al (2019) conducted a research on "Most Critical Factors Responsible for Cost Overrun in Nigeria Building Construction Project" ranked lack of financial power of the client as the 2ndmajor contributor of cost overrun. This is also supported by El-Kholy (2015), a study conducted on "Predicting Cost Overrun in Construction Projects" ranked financial condition of the owner as the 1st most important factors of cost overrun.

Re-measurement of provisional Sum: is ranked as the third major contributor of clients related factors of cost overrun with a RII value of 0.581. A provisional sum is an allowance (or best guesses) usually estimated by a cost consultant that is inserted into tender documents for a specific element of the works that is not yet defined in enough detail for tenders to accurately price.

Table 4. 12 External/ other factors based on RII

No.	External/other factors	RII	Rank
1	Project complexity	0.619	5
2	Shortage of foreign currency	0.644	4
3	Market inflation	0.781	1
4	Unforeseen site conditions	0.594	7
5	Shortage of site workers	0.586	9

6	Delay in material procurement	0.725	2
7	Unpredictable weather conditions	0.511	13
8	Poor labour productivity	0.600	6
9	Unskilled labour	0.592	8
10	Equipment failure	0.536	11
11	Labour absenteeism	0.519	12
12	Power disruption	0.675	3
13	Land acquisition	0.550	10

The Results of respondent's analysis as indicated in the above table, from external/other factors of cost overrun the most important factors are: market inflation, delay in material procurement, power disruption, shortage of foreign currency and project complexity. Based on the ranking of RII, the top five most important external/ other related factors of cost overrun in condominium housing projects as perceived by respondents are:

Market Inflation: is ranked as first major contributor of external/ other factors of cost overrun with a RII value of 0.781. This is supported by a research conducted by Bekr (2015), on "Identifying Factors Leading to Cost Overrun in Construction Projects of Jordan" ranked inflation as 1st major contributor of cost overrun. Similarly, in agreement with this El-kholy (2015) conducted a study on "Predicting Cost Overrun in Construction Projects" ranked material cost increase due to inflation as the 4th major contributor of cost overrun.

Delay in Material Procurement: is ranked as the second major contributor of external/ other factors of cost overrun with a RII value of 0.725. This is supported by a research conducted by Tejale et al(2015), on "Analysis of Construction Project Cost Overrun by Statistical Method" ranked late delivery of materials & equipment as the 3rd major contributor of cost overrun.

Power Disruption: is ranked as the third major contributor of external/ other factors of cost overrun with a RII value of 0.675.In recent years, with an increasing load demand for rural electrification and industrialization, the Ethiopian power system has faced a more frequent, widely spread and long lasting blackout which in turn affects condominium housing projects.

Shortage of Foreign Currency: is ranked as the fourth major contributor of external/ other factors of cost overrun with a RII value of 0.644.This is supported by a research conducted by

Taye (2019), on "Simulation Modeling of Cost Overrun in Construction Project in Ethiopia" ranked poor economic condition (currency) as the 3rd major contributor of cost overrun.

Project Complexity: is ranked as the fifth major contributor of external/ other factors of cost overrun with a RII value of 0.619. Project complexity caused by the project's location or purpose can make early design work very challenging and lead to internal coordination problems and project component errors.

4.3.3.1. Reliability Test Analysis

The data collected from the questionnaire must be reliable and consistent so that the valuable information can be collected regarding the reason behind the cost overrun in condominium housing projects. For such analysis, cronbach alpha for reliability is calculated using statistical tool SPSS v20. When the reliability of the data is less than 0.3, then the collected data will not be reliable and cannot be adopted. Reliability will be at high level only when the cronbach alpha is more than 0.6-0.9.

Table 4. 13 Reliability test for Cost Overrun Factors

Factors	Cronbach alpha
Contractor Related Factors	0.788
Consultant Related Factors	0.880
Client Related Factors	0.677
External/other factors	0.863
Overall Cronbach alpha value	**0.802**

As results in the above table indicates the Cronbach alpha value of Contractor related factors were 0.788, consultant related factors were 0.880, client related factors were 0.677and external/other factors were 0.863 and the overall Cronbach alpha value was 0.802. This shows that the collected data was reliable.

4.3.3.2. Weighted average analysis

In this section the respondents' response have been categorized by 3 parties that are; client's response, consultant's and contractor's response. Each party had its own rank of significance and finally by using weighted average the main causes of cost overrun were selected. To make

generalization and reliability the average weighted method was better than the above merged result.

Table 4. 14 Factors of cost overrun based on Mean Score and weighted average – From clients, Consultants and contractors perspective.

No	Factors of cost overrun	Client		Consultant		Contractor		Weighted Average	
		MS of Client	Rank	MS of consultant	Rank	MS of Contractor	Rank	Average MS	Average Rank
1	Inappropriate planning and scheduling	3.45	10	3.25	21	3.92	2	3.54	8
2	Project complexity	3.41	17	3.17	22	2.77	28	3.12	27
3	Improper project management	3.86	2	3.88	2	3.77	5	3.84	2
4	Lack of contractor experience	3.45	10	3.50	10	3.42	11	3.46	11
5	Financial difficulties faced by contractors	3.68	6	3.67	4	3.42	11	3.59	6
6	Relationship between management and labor	3.32	21	3.29	18	3.08	21	3.23	21
7	Errors during construction	3.36	18	3.50	10	3.50	8	3.45	12
8	Extension of time	3.68	6	3.87	3	3.31	17	3.62	5
9	Incompetent sub-contractors	3.36	18	3.58	6	3.35	13	3.43	14
10	Unsuitable construction equipment's	3.32	21	3.17	22	3.46	10	3.32	18
11	Improper construction methods	3.32	21	3.46	12	3.81	3	3.53	10
12	Poor financial control on site	3.59	8	3.54	7	3.81	3	3.65	3
13	Poor contract management	3.73	4	3.54	7	3.35	13	3.54	8
14	Mistake in design	3.50	9	3.29	18	3.00	22	3.26	19

15	Underestimate project duration	3.82	3	3.67	4	3.27	18	3.59	6
16	Slowdown in design preparation	3.45	10	3.00	30	2.96	24	3.14	26
17	Delay in approval of design changes	3.23	25	3.42	14	2.85	27	3.17	24
18	Lack of cost plan/monitoring	3.45	10	3.42	14	3.35	13	3.41	15
19	Inadequate project preparations	3.45	10	3.46	12	3.19	20	3.37	16
20	Lack of coordination at design stage	3.36	18	3.13	26	3.23	19	3.24	20
21	Incomplete design at tendering phase	2.95	30	2.83	36	2.46	36	2.75	35
22	Lack consultant team experience	3.45	10	3.17	22	3.00	22	3.21	22
23	Financial problems faced by owner	3.23	25	3.29	18	2.96	24	3.16	25
24	Practice of assigning contract to lowest bidder	2.95	30	2.50	39	2.27	39	2.57	39
25	Lack of communication with consultant	3.37	24	2.83	36	2.77	28	2.99	29
26	Changes in clients requirements	2.95	30	3.00	30	2.62	33	2.86	34
27	Delay in payment	3.45	10	3.54	7	3.35	13	3.45	12
28	Re-measurement of provisional sum	2.95	30	2.88	34	2.88	26	2.90	33

29	Shortage of foreign currency	2.95	30	2.92	33	3.73	6	3.21	22
30	Market inflation	3.73	4	4.00	1	3.96	1	3.90	1
31	Unforeseen site conditions	3.00	29	3.17	25	2.77	28	2.98	30
32	Shortage of site workers	2.91	36	3.13	26	2.77	28	2.94	32
33	Delay in material procurement	4.05	1	3.38	17	3.50	8	3.64	4
34	Unpredictable weather conditions	2.86	37	2.33	40	2.50	35	2.56	40
35	Poor labor productivity	3.14	27	3.12	27	2.77	28	3.01	28
36	Unskilled labour	3.05	28	3.13	26	2.73	32	2.97	31
37	Equipment failure	2.64	39	2.96	32	2.46	36	2.69	37
38	Labour absenteeism	2.59	40	2.75	38	2.46	36	2.60	38
39	Power disruption	2.95	30	3.42	14	3.69	7	3.35	17
40	Land acquisition	2.77	38	2.88	34	2.62	34	2.76	36

As pointed out in the above table 4.14, the top ten most significant factors of cost overrun are: market inflation, improper project management, poor financial control on site, delay in material procurement, extension of time, underestimated project duration, financial difficulties faced by contractors, poor contract management, inappropriate planning and scheduling and improper construction methods. Based on the ranking of weighted average, the top ten most important factors of cost overrun of condominium housing projects as perceived by respondents are:

Market Inflation; is ranked fourth by the client with a mean score value of 3.73, ranked first by consultant with a mean score value of 4.00, ranked first by contractors with a mean score value of 3.96 and ranked first by the overall weighted average value of 3.90.

Improper Project Management: is ranked second by the client with a mean score value of 3.86, ranked second by consultants with a mean score value of 3.88, ranked fifth by contractors with a mean score value of 3.77 and ranked second by the overall weighted average value of 3.84.

Poor Financial Control on Site: is ranked eighth by the client with a mean score value of 3.59, ranked seventh by consultants with a mean score value of 3.54, ranked third by contractors with a mean score value 3.81and ranked third by the overall weighted average value of 3.65.

Delay Material Procurement: is ranked first by the client with a mean score value of 4.05, ranked seventeenth by consultants with a mean score value of 3.38, ranked eighth by contractors with a mean score value of 3.50 and ranked fourth by the overall weighted average value of 3.64.

Extension of Time: is ranked sixth by the client with a mean score value of 3.68, ranked third by consultants with a mean score value of 3.87, ranked seventeenth by contractors with a mean score value of 3.31 and ranked fifth by the overall weighted average value of 3.62.

Underestimate Project Duration: is ranked third by the client with a mean score value of 3.82, ranked fourth by consultants with a mean score value of 3.67, ranked eighteenth by contractors with a mean score value of 3.27 and ranked sixth by the overall weighted average value of 3.59.

Financial Difficulties Faced by Contractors: is ranked sixth by the client with a mean score value of 3.68, ranked fourth by consultants with a mean score value of 3.67, ranked eleventh by contractors with a mean score value of 3.42 and ranked sixth by the overall weighted average value of 3.59.

Poor Contract Management: is ranked fourth by the client with a mean score value of 3.73, ranked seventh by consultants with a mean score value of 3.54, ranked thirteenth by contractors with a mean score value of 3.35 and ranked eighth by the overall weighted average value of 3.54.

Inappropriate Planning and Scheduling: is ranked tenth by the client with a mean score value of 3.45, ranked twenty first by consultants with a mean score value 3.25, ranked second by contractors with a mean score value of 3.92 and ranked eighth by the overall weighted average value of 3.54.

Improper Construction Methods: is ranked twenty first with a mean score value of 3.32, ranked twelfth by consultants with a mean score value of 3.46, ranked third by contractors with a mean score value of 3.81 and ranked tenth by the overall weighted average value of 3.53.

The above table indicated that results in the average weighted rank has no differences from the mean score results of table 4.8.The rank of main causes of cost overrun based on their mean score value in table 4.8 is similar to the rank of those factors based on their weighted average in table 4.14.Therefore, we can say most of the respondents were rational when giving responses to the questionnaires.

4.3.3.3.   Relative Important Index (RII)

Relative Important index (RII) have been employed and calculated for ranking of causes of cost overrun in the construction project. The RII is used to rank the different causes. These rankings make it possible to cross-compare the relative importance of the factors as perceived by the groups of respondents. Each individual cause's RII perceived by all respondents should be used to assess the general and overall rankings in order to give an overall picture of the causes of condominium housing cost overrun in construction industry. The following formula is used to compute the Relative Importance Index (RII).

$$RII = \frac{\sum W}{A \times N} \quad (0 \leq RII \leq 1)$$

W   = is the Weight given to each factor by the respondents and ranges from 1 to 5
A   = Highest weight (i.e. 5 in this case)
N   = Total number of respondents

Table 4. 15 Respondents ranking of factors based on Relative Importance Index (RII) – From General perspective.

NO	Factors of cost overrun	RII	Rank
1	Market inflation	0.781	1
2	Improper project management	0.767	2
3	Poor financial control on site	0.731	3
4	Delay in material procurement	0.725	4
5	Extension of time	0.722	5
6	Financial difficulties faced by contractors	0.717	6
7	Underestimate project duration	0.714	7
8	Inappropriate planning and scheduling	0.711	8
9	Improper construction methods	0.708	9
10	Poor contract management	0.706	10
11	Lack of contractor experience	0.692	11
12	Errors during construction	0.692	11
13	Delay in payment	0.689	13

14	Incompetent sub-contractors	0.686	14
15	Lack of cost plan monitoring	0.681	15
16	Power disruption	0.675	16
17	Inadequate project preparations	0.672	17
18	Unsuitable construction equipment's	0.664	18
19	Mistake in design	0.650	19
20	Lack of coordination at design at design phase	0.647	20
21	Relationship between management and labour	0.644	21
22	Shortage of foreign currency	0.644	21
23	Lack of consultant team experience	0.639	23
24	Financial problems faced by owner	0.631	24
25	Delay in approval of design changes	0.631	24
26	Slowdown in design preparation	0.625	26
27	Project complexity	0.619	27
28	Poor labour productivity	0.600	28
29	Unforeseen site conditions	0.594	29
30	Unskilled labour	0.592	30
31	Lack of communication with consultant	0.589	31
32	Shortage of site workers	0.586	32
33	Re-measurement of provisional sum	0.581	33
34	Change in clients requirements	0.569	34
35	Land acquisition	0.550	35
36	Incomplete design at tendering stage	0.547	36
37	Equipment failure	0.536	37
38	Labour absenteeism	0.519	38
39	Practice of assigning contract to lowest bidder	0.511	39
40	Unpredictable weather conditions	0.511	39

Based on the ranking of Relative Importance Indices (RII), the top five most important causes of cost overrun in condominium housing projects as perceived by respondents are discussed as follows;

Market inflation: is ranked as first major contributor of cost overrun with a RII value of 0.781. Currently, the major problem in condominium housing projects is a consistent increase in the general price level of construction materials. The result is supported by Wiguna & Scott (2005), identified high inflation as a critical factor of cost overrun. It is also confirmed by Ahady, et al (2017), conducted a study on causes of cost overrun in construction industry in India and identified inflation as a critical factors of cost overrun.

Improper project management: This factor is ranked the 2nd most significant contributor of cost overrun with a RII value of 0.767. This is also supported by Subramani, Sruthi & kavitha (2014) conducted a survey in India and identified improper project management as a major cause of cost overrun.

Poor financial control on site: This indicator is another major problem in contributing to cost overruns in condominium housing projects. This factor is ranked 3rd with a RII value of 0.731.

Delay in material procurement: This factor is also a significant cause of cost overrun. This factor is ranked 4th with a RII value of 0.725. The result is supported by Shiferaw et al (2016), described delay in supply of raw materials as the main causes of cost overruns.

Extension of time: This is another important factor that causes cost overrun and ranked 5th with a RII value of 0.722. This result is supported by S.Mulla, et al (2015), identified time delay as a major factor of cost overrun.

Similar with results in mean score, Condominium housing projects rarely face cost overrun by *unpredictable weather conditions* and *Practice of assigning contract to lowest bidder*. Both *Unpredictable weather conditions* and *Practice of assigning contract to lowest bidder were* ranked the last of the forty causes of cost overrun factors with the same RII value of 0.511. This shows that condominium housing projects are not sensitive to unpredictable weather conditions and practice of assigning contract to lowest bidder; *labour absenteeism* was rated the third from the last with a RII value of 0.519; *Equipment failure* was ranked the fourth, from the last with a RII value of 0.536 which are considered as least significant by respondents.

Table 4. 16 Top ten most significant factors of cost overrun based on RII – From client, Contractors and Consultants perspective.

Causes of cost over run	Overall		Client		Contractors		Consultants		Category
	RII	Rank	RII	Rank	RII	Rank	RII	Rank	
Market inflation	0.781	1	0.745	4	0.792	1	0.800	1	External
Improper project management	0.767	2	0.773	2	0.754	5	0.775	2	Consultant
Poor financial control on site	0.731	3	0.718	8	0.762	3	0.708	7	Contractor
Delay in material procurement	0.725	4	0.809	1	0.700	8	0.675	17	External
Extension of time	0.722	5	0.736	6	0.662	17	0.775	2	Contractor
Financial difficulties by contractors	0.717	6	0.736	6	0.685	12	0.733	4	Contractor
Underestimate project duration	0.714	7	0.764	3	0.654	18	0.733	4	Consultant
Inappropriate planning and scheduling	0.711	8	0.691	10	0.785	2	0.650	21	Contractor
Improper construction methods	0.708	9	0.664	21	0.762	4	0.692	12	Contractor
Poor contract management	0.706	10	0.745	4	0.669	15	0.708	7	Consultant

As pointed out in the above table 4.16, the top ten most significant factors were selected from a total of forty shortlisted factors of cost overrun based on their RII. Based on the ranking of Relative Importance Indices (RII), the top ten most important causes of cost overrun in condominium housing projects as perceived by respondents are:

Market Inflation: is ranked first by the overall RII value of 0.781, ranked fourth by the client with a RII value of0.745, ranked first by contractors with a RII value of 0.792 and ranked first by consultants with a RII value of 8.00.

Improper Project Management: is ranked second by the overall RII value of 0.767, ranked second by the client with a RII value of 0.773, ranked fifth by contractors with a RII value of 0.754 and ranked second by consultants with a RII value 0.775.

Poor Financial Control on Site: is ranked third by the overall RII value of 0.731, ranked eighth by the client with a RII value of 0.718, ranked third by contractors with a RII value of 0.762 and ranked seventh by consultants with a RII value 0.708.

Delay in Material Procurement: is ranked fourth by the overall RII value of 0.725, ranked first by the client with a RII value 0.809, ranked eighth by contractors with a RII value of 0.700 and ranked seventeenth by consultants with a RII value of 0.675.

Extension of Time: is ranked fifth by the overall RII value of 0.722, ranked sixth by the client with a RII value of 0.736, ranked seventeenth by contractors with a RII value of 0.662 and ranked second by consultants with a RII value 0.775.

Financial Difficulties by Contractors: is ranked sixth by the overall RII value of 0.717, ranked sixth by the client with a RII value of 0.736, ranked twelfth by contractors with a RII value of 0.685 and ranked fourth by consultants with a RII value 0.733.

Underestimated Project Duration: is ranked seventh by the overall RII value of 0.714, ranked third by the client with a RII value of 0.764, ranked eighteenth by contractors with a RII value of 0.654 and ranked fourth by consultants with a RII 0.733.

Inappropriate Planning and Scheduling: is ranked eighth by the overall RII value of 0.711, ranked tenth by the client with a RII value 0.691, ranked second by contractors with a RII value of 0.785 and ranked twenty first by consultants with a RII value of 0.650.

Improper Construction Methods; is ranked ninth by the overall RII value of 0.708, ranked twenty first by the client with a RII value 0.664, ranked fourth by contractors with a RII value of 0.762 and ranked twelfth by consultants with a RII value 0.692.

Poor Contract Management: ranked tenth by the overall RII value of 0.706, ranked fourth by the client with a RII value of 0.745, ranked fifteenth by contractors with a RII value of 0.669 and ranked seventh by consultants with a RII value of 0.708.

4.4. Summary of Respondent's response for open ended and interview questions

Most of the respondents were not willing to write and give their opinions for open ended questions that were needed to be supported by interviews. Individuals with better knowledge and experience in condominium housing construction projects were selected for interview. An interview was made with two individuals from each stakeholder (i.e., contractors, consultants and clients). The result of respondent's response for open ended and interview questions were summarized as follows.

1. **Other factors determining cost overrun:** respondents were asked to list other factors in addition to the forty shortlisted factors of cost overrun. The respondent's responses were classified into three: contractor's response, consultant's response and client's response.

   1.1 Contractors Response: According to the response of contractors other factors in addition to the 40 shortlisted factors of cost overrun are;-Corruption; unfair materials distribution by the client; unskilled labor provided by the consultant team; the client and the contractor have unfair financial relationship with the consultant team(in terms of corruption);management problems highly affect project sites in terms of time, cost and quality; lack of serious supervision on site to check material quality and technical workmanship assigned in project site.

   1.2 Consultants Response: According to the response of consultants other factors in addition to the 40 shortlisted factors of cost overrun are; Poor management of market; corruption; negligence of the three parties especially the client to construct the project based on their schedule, budget and quality; salary of consultant engineers plays a major role in quality of the project then quality problems makes the project to cost more than the forecasted project cost and change in contractors standard.

   1.3 Clients Response: According to the response of clients, other factors in addition to the 40 shortlisted factors of cost overrun are; on the different branch projects most of project managers are unskilled or not professionals but they are political leaders, then also in the head office of AAHCPO previous leaders were politically assigned; improper Preparation of bill of quantity; lack of political stability - as a result of political instability around the

project sites contractors are uncertain to properly manage their site; and equipment failure of the government.

2. **Some of the effects of Cost Overrun:** Respondents were asked to mention some of the effects of cost overrun on condominium housing project stakeholders. The respondent's responses were observed from the perspective of contractor, consultant and client.

2.1 Clients opinion: According to the response of clients, some of the effects of cost overrun were:-house owners are required to pay more than the initial agreed amount; an unexpected(unplanned) expenditure for the government; high cost to the government and people; delay to deliver houses to the people; supplementary agreement; adversarial relations among stakeholders and budget shortfalls of project owner; schedule delay in infrastructure; procurement can have a damaging economic role; the client cannot supply materials properly; the project can apply the subcontractor to the main contractor (electrical, sanitary, metal work, etc.) to properly do by contractual agreement; the consultant do not properly consult the client by contractual law; the capacity of the contractor diminishes then these problems leads to close contractual agreements; and government parties are forced to carry some or part of the cost as subsidy.

2.2 Contractors opinion: According to the responses forwarded by contractors, some of the effects of cost overrun on condominium housing projects are:- delay of construction project; poor contractor management System and a mismatch of contractor and consultant scheduling system; lack of skilled labor from contractor side; delay of project; liquidation damage (in terms of property); and the owner of the house may face many problems such as house problem due to project delay.

2.3 Consultants opinion: According to the responses forwarded by consultants, some of the effects of cost overrun on condominium housing projects are:-delay of project completion; design change; time to time audit of the project by government office makes stock over for 6-8 months that results more inflation on the project; by delaying the project makes the value of foreign currency to extremely increase and in turn end – users were forced to pay more than the initial agreed amount; delay in material supply; delay in payment for the contractor; market inflation; lack of coordination in all project parties;

increase overall cost of a project; extends finishing time of a project; financial instability occurred in the project; delay in project period; contractors start to use poor workmanship in order to compensate the overrun cost; negligence of quality control; poor material handling; Poor work quality and time delay.

3. **The Strategic measures that can be taken to improve successful project delivery:** The respondents were asked to suggest some of the possible measures that can be taken to mitigate cost overrun in condominium housing projects. Similarly, respondent's responses were classified into three; client's response, contractor's response and consultant's response.

   3.1 Clients Response: According to the opinions forwarded by clients, some of the possible strategic measures that can be taken to reduce cost overrun in condominium housing projects are:- there should be the assignment of workers based on their profession rather than their political status (the right person to the right place); the management team should be hired based on their qualification and competency; planning the project wisely; goals should be properly set; make proper organizational structure; preparing good project feasibility study; perform good planning and design schedule; make and set strategic plan; investigate and mitigate different risks in the project; continuously evaluating the projects progress in order to know the percentage of project completion and percentage in progress and set a benchmark for the future; the budget for AAHDPO should be delivered by Addis Ababa City Administration; selecting the contractors(contractors must be selected by clients); avoiding political interference in projects; improving project handling by giving training; projects can be managed by experts not by politically assigned 'cadres'; there should be an improvement in material supply; appropriate planning and preparing bill of quantity; managing the project with skilled manpower; the project preliminary feasibility study should be done; evaluation and monitoring policy should be done; accountability and transparency strategies should be done; project feedback should be given and documented to take a lesson for the future; project workers should be well trained and share experience from other trainee stakeholders; apply proper project management system; proper monitoring system to

develop cash flow and physical status; adequate project preparation(must); the contract must be 'supply and fix'; and proper planning and scheduling.

3.2 Contractors Response: According to the opinions of contractors some of the strategic measures that can be taken to reduce cost overrun in condominium housing projects are:- focus on high profile projects by increasing their success; plan projects and prioritize resources; coordination among team members; monitoring performance goal; doing based on client's order, proper service delivery and monitor project progress in real; adopt on time & on budget project delivery system; using modern technologies to improve project success rates but not to avail; projects should be well estimated in terms on finance and time; 'Least cost' or 'least bidder' concept has to be modernized; the government should create a good organizational structure and coordination; all stakeholders of the project should be well trained; it's better to give supply and fix agreements to contractors; there must be proper and fair delivery of project materials; the consultant must give attention for work procedure and schedule; the client must also give full attention for the consultant; the client must give quick response for payment which is asked by the contractor; applying damaged time penalty 1/1000birr/day; approved the skilled and unskilled labors output; change the scheduling preparation system (the schedule must);proper project preparation should be made by the contractors and checked and controlled by the consultant; the politicians should be separated from the project; and proper project design and scheduling.

3.3 Consultants Response: According to the response of consultants, some of the strategic measures that can be taken to reduce cost overrun in condominium housing projects are:- Proper preparation and strict follow up of the schedule; avoidance of poor design methods; giving training to all parties; be active to react with the current Economic conditions; clear drawings; proper project management; proper utilization of resources such as materials; skilled man power; proper management; the project should be done on schedule based on plan; upgrading management skills; use skilled professionals; select highly qualified contractors; proper supervision; proper management of time; smooth relationship between all parties; applying 'supply and fix' method to give all material cost to the contractor; more focus should be on Proper scheduling and monitoring activity; and proper use of budget.

4.5. Correlation Test

The strength of associations of pairs of variables understudy was determined by correlation relationships. The 3 commonly used methods for ascertaining the strength of association between 2 variables is the Pearson correlation method, the Spearman rank correlation method and the Chi-square test of independence method. Since the data collected on this study were meant for non-parametric analysis using ordinal variables, the powerful method of examining the relationship between pairs of variables is by using spearman's rank order correlation (Bryman & Cramer, 2002).

Spearman correlation test was performed to examine the relation between the factors affecting construction cost. As results in a correlation analysis revealed, among the four related factors of cost overrun a strong correlation is observed between client related factors and external/other related factors with a correlation value of 0.762**, followed by contractor related factors and consultant related factors with a correlation value of (0.667**), client related factors and consultant related factors with a correlation value of (0.652**), external/ other related factors and consultant related factors with a correlation value of(0.589**), contractor related factors and external/other related factors with a correlation value of (0.511**) and a moderate correlation is observed between contractor related factors and client related factors with a correlation value (0.499**). Ideally, the correlation coefficient value of ± 1 is said to be a perfect correlation. A correlation coefficient value lying between ± 0.5 and ± 1 reflects a high degree of correlation, a value lying between ± 0.3 and ± 0.5 reflects a moderate degree of correlation, while a value lying between ± 0.1 and ± 0.3 reflects a low degree of correlation. A correlation coefficient value lying around zero means that there is no correlation (Cohen, 1988).

Table 4. 17 Relationship between factors causing cost overrun

		Construction cost overrun	Contractor Related Factors	Consultant Related Factors	Client Related Factors	External/other Related Factors
Construction cost overrun	Correlation Coefficient	1.000	.056	-.139	.021	-.001
	Sig. (2-tailed)	.	.641	.245	.864	.994
	N	72	72	72	72	72
Contractor Related Factors	Correlation Coefficient	.056	1.000	.667**	.499**	.511**
	Sig. (2-tailed)	.641	.	.000	.000	.000
	N	72	72	72	72	72
Consultant Related Factors	Correlation Coefficient	-.139	.667**	1.000	.652**	.589**
	Sig. (2-tailed)	.245	.000	.	.000	.000
	N	72	72	72	72	72
Client Related Factors	Correlation Coefficient	.021	.499**	.652**	1.000	.762**
	Sig. (2-tailed)	.864	.000	.000	.	.000
	N	72	72	72	72	72
External/other Related Factors	Correlation Coefficient	-.001	.511**	.589**	.762**	1.000
	Sig. (2-tailed)	.994	.000	.000	.000	.
	N	72	72	72	72	72

**. Correlation is significant at the 0.01 level (2-tailed).

4.6. Regression Analysis

This is a statistical process for estimating the relationships among variables. It analysis the degree of the relationship between a dependent variable and one or more independent variables. Multiple regression analysis models allow one to test several predictor variables that may explain different attributes about the response variables. Though complex, one can test all the factors that one thinks have an effect on a given response variable. This is unlike other inferior models that allow for only one predictor variable. Moreover with the use of several variables, the accuracy of prediction is also improved. The terms dependent variables, response variables, and others have been used in the existing regression literatures interchangeably. As for independent variables it is also known as regressors or predictors. In this study, the dependent variable is construction cost overrun, and independent variables are factors which are related with contractors, consultants, client and external/ other factors. Regression analysis helps to understand how the typical value of the dependent variable changes when the independent variable is varied. Different regression models were analysed and the one with the highest predictive power was selected.

The regression model was as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Where;

Y = condominium housing projects cost overrun

β_0 = constant term

$\beta_1, \beta_2, \beta_3, \beta_4$ = Beta coefficients

X_1 = Contractor related factors

X_2 = Consultant related factors

X_3 = Client related factor

X_4 = External/other related factors

e = Error term

Forward stepwise process is used to formulate the regression model. Since it may not be the best fitting model, predictor variables with significant correlation with dependent variable is identified using spearman correlation and models are again formulated with forward pass backward stepwise and forced entry. Out of formed models, the optimum model is selected based 0n strength of correlation (R^2) which is a direct measure of % variance explained (Field, 2005).

Table 4. 18 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of Estimate	R Square Change	F change	df1	df2	Sig. F Change
					Change Statistics				
1	.945(a)	.894	.887	.198	.894	140.967	4	67	.000

a. *Predictors:* (Constant), Total external/other related factors, Total contractor related Factors, Total client related factors, Total consultant related factors
b. *Dependent Variable*: Construction Cost Overrun

Generally, R is the measure of correlation between cost overrun and related factors of cost overrun. The result of the regression analysis from Table 4.18 above showed a strong correlation between contractor related factors, consultant related factors, client related factors and other/ external factors and cost overrun of condominium housing projects(R= 0.945). This implies that there exists strong positive relationship between related factors of cost overrun and cost overrun of construction projects.

The R square (R^2) value of 0.894 on the other hand is the square of correlation and indicates the proportion of the observed cost overrun in the variation which can be accounted for by this equation. Therefore, it could be concluded that this model could account for 89.4% of the cost overrun. This implies that 89.4% of cost overrun can be attributed to contractor, consultant, client and external/ other related factors and 10.6% being accounted for by other factors not included in the equation.

As the value of R^2 changes rapidly with the addition of new dependent variables in the model, a good measure of strength in the model is adjusted R^2 values. The adjusted R^2 values and the change from R^2 values give the idea of how well the model generalizes the predictive strength of the dependent variable (Doloi, 2009). In an ideal case, values of R^2 and adjusted R^2 should be the same. The difference between R^2 and adjusted R^2 gives the predictive strength of the model, the lesser the difference is, the stronger the model.

Table 4. 19 ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	22.033	4	5.508	140.967	.000[b]
Residual	2.618	67	.039		
Total	24.651	71			

a. *Predictors:* (Constant), Total external/other related factors, Total contractor related Factors, Total client related factors, Total consultant related factors
b. *Dependent Variable*: Construction Cost Overrun

ANOVA findings (p – value of 0.000) in table 4.19 above, shows that there is correlation between the predictor variables (contractor related factors, consultant related factors, client related factors and external/other related factors) and the dependent variable (construction cost overrun).

Table 4. 20 Coefficients of regression equations

	Unstandardized coefficients		Standardized coefficients	T	Sig.
	β	Std.Error	Beta		
(*Constant*)	.039	.148	.262	.794	
Total contractor related factors	.138	.045	.152	3.031	.003
Total consultant related factors	.207	.050	.262	4.167	.000
Total client related factors	.255	.047	.297	5.362	.000
Total external/other related factors	.336	.049	.409	6.905	.000

Dependent Variable: Construction Cost Overrun

Multiple regression analysis performed on the four related factors of cost overrun (contractor, consultant, client and external/ other factors) scores highlighted the influence of the four related factors (p<5%) on cost overrun was significant.

It was observed from analysis (relationship between cost overrun and related factors) that the probability value of contractor related factors (0.03), consultant related factors (0.00), client

related factors (0.00) and external/ other factors (0.00) was less than the 0.05 (5%) significance level, and an R- square value of 0.894. Therefore, it is inferred that the relationship was statistically significant.

To validate the developed framework, techniques that can be applied include the use of R^2(value of coefficient of linear determination) for this study, a test for validity of multiple regression model was conducted and the developed model can therefore be presented as valid model for predicting cost overrun from the four related factors, though not devoid of limitations. Those limitations are expected to be part of future research.

There is no adequate literature regarding the adoption of regression model on this particular research title that makes it difficult to support the regression output of this study by the work of other researchers.

Based on the goodness of the model fit, the values shown in table 4.20 are acceptable with reasonable strengths.

The final regression model for condominium housing projects cost overrun can be expressed as:

Construction cost overrun = (+ 0.039)

+ 0.138 (contractor related factors)

+ 0.207 (consultant related factors)

+ 0.255 (client related factors)

+ 0.336 (external/ other related factors)

As clearly shown in the regression model, external/ other related factors have maximum impact on cost overrun in condominium housing projects in Bole sub- city, Addis Ababa, Ethiopia. Followed by client related factors, consultant related factors and contractor related factors respectively.

Regression Assumptions:

i.   **Linearity** (correct functional form); Residual plots and Likelihood ratio (LR) indicates that the functional form is correct, both the coefficients and standard errors in the output are reliable.

ii.   **Homoskedasticity**; there is a constant variance between the initial regression analysis output and homoskedasticity outputs.

iii.   **Normality**: histograms or $Q - Q$ plot, Shapiro-wilk test, komolgorov-smirnov test and Anderson-darling test indicates that regression model analysis is normal.

iv.   **Multicollinearity;** occurs where the X variables are themselves are related. This is checked by looking at correlation (p) between X variables.

v.   **Model fitness;** the overall assumption indicates regression analysis is a good model fit.

After the regression assumptions such as linearity, normality, multicollinearity, heteroscedasticity, model fitness and other tests have been checked, the regression model come up with the following output.

The established multiple linear regression equation equals:

$$Y = 0.039 + 0.138 \, X_1 + 0.207 \, X_2 + 0.255 \, X_3 + 0.336 \, X_4$$

Where;

Constant = 0.039, shows that if contractors related factors, consultant related factors, client related factors and other/ external factors all rated as zero, condominium housing projects cost would be 0.039.

$X_1 = 0.138$, shows that one unit change in contractor related factors results in 0.138 units increase in condominium housing project costs

$X_2 = 0.207$, shows that one unit change in consultants related factors results in 0.207 units increase in condominium housing project costs

$X_3 = 0.255$, shows that one unit change in client related factors results in 0.255 units increase in condominium housing project costs

$X_4 = 0.336$, shows that one unit change in other/ external factors results in 0.336 units increase in condominium housing project costs

CHAPTER FIVE
5. RECOMMENDATIONS AND CONCLUSION

5.1 INTRODUCTION

Having collected data from the field, analyzed and interpreted it in the previous chapter, the researcher is now able to conclude and give recommendations on the findings. The main aim of this chapter is to draw conclusions and give recommendations to the research dealing with research objectives and questions introduced in chapter one. The objective of this study was to identify the causes and effects of construction cost overrun and strategic measures that can be taken to minimize their occurrence on condominium housing construction projects in Bole-sub city, Addis Ababa.

5.2 . CONCLUSIONS

Based on the results of the analysis of respondents' response of the questionnaire and interview, the following conclusions could be drawn based on study;

- ❖ A total of 40 factors of cost overrun were identified through detailed literature review and from a total of 40 factors, 10 factors were related with contractors, 13 factors were related with consultants, and 6 factors were related with clients while 13 were external / other factors.

- ❖ The result of the regression model asserted that external/ other related factors affects the overall cost of condominium housing projects in Bole sub – city, Addis Ababa, Ethiopia significantly.

- ❖ As the results of the study revealed, some of the effects of cost overrun on 20/80 condominium housing projects which are agreed by all parties (i.e., clients, contractors and consultants) are; house owners are required to pay more than the initial agreed amount, delay of project completion, delay in material supply, etc.

- ❖ As suggested by respondents, the possible measures that can be taken to reduce or mitigate cost overruns on 20/80 condominium housing projects are; appropriate planning and scheduling, coordination among team members, apply "supply and fix" method to give all material cost to the contractor, use skilled professionals, proper supervision, proper project management, etc.

- ❖ As the overall results of respondents revealed, the top most important causes of cost overrun in 20/80 condominium housing projects based on their RII and Mean score are sequentially ranked as:

- market inflation ranked 1st (RII = 0.781 and MS = 3.90);
- improper project management ranked 2nd (RII = 0.767 and MS = 3.83);
- Poor financial control on site ranked 3rd (RII = 0.731 and MS = 3.65);
- delay in material procurement ranked 4th (RII = 0.725 and MS = 3.63);
- extension of time ranked 5th (RII = 0.722 and MS = 3.61);
- financial difficulties faced by contractors ranked 6th (RII = 0.717 and MS = 3.58);
- underestimate project duration ranked 7th (RII = 0.714 and MS = 3.57);
- inappropriate planning and scheduling ranked 8th (RII = 0.711 and MS = 3.56);
- improper construction methods ranked 9th (RII = 0.708 and MS = 3.54); and
- poor contract management ranked 10th (RII = 0.706 and MS = 3.53).

5.3. RECOMMENDATIONS

In order to overcome the issues mentioned above, all stakeholders have to play their role for removing barriers, especially clients, consultants and contractors, who are mostly directly or indirectly involved in causing cost overruns. The following are some recommendations that should be thought upon in mitigating and minimizing cost overruns.

➤ There should be an urgent attention given to external/ other related factors to achieve substantial cost performance in avoiding project failure.

➤ The government should try to create a stable market for construction inputs in order to accomplish condominium housing projects within budget. It is suggested to remove price escalation clause from the contact document as most of the professionals have the opinion that major cause of cost overrun was price escalation and if it is removed from the tender document that may save the project from the cost overruns.

➤ Planning and scheduling are continuing processes during construction and match with the resources and time to develop the work to avoid cost overrun and disputes. Proper planning and scheduling of the works should be ensured with the application of training, techniques and software so as to keep watch on critical activities and strive to complete projects within the specified time while meeting quality and cost requirements.

➤ There should be timely procure and maintenance of suitable inventory system based on the identification of materials to be required. It is also better for engineers and contractors to have time schedule for material delivery process to the site in order to avoid shortage or lack of materials.

➤ The project needs to be completed on time and if delay is caused by slow work progress by the contractor, financial damages may be imposed.

➤ Contractors should ensure that they have enough cash flow to execute the works and desist from the practice of diverting particular project funds to non-project activities to avoid being cash-strapped during the execution of the works.

➤ There should be proper project management for effective and efficient team working because the success of any construction project depends on how well the various participants carry out their duties and responsibilities.

- There should be good contract management system to reduce cost overrun and to increase corporate profitability by conducting an audit of all things contract related, conduct a formal contract management framework and use technology to make it easier.
- There should be proper construction methods in order to avoid concrete dislocation, concrete scaling, concrete curling, concrete crazing, or concrete cracking in turn it reduces cost overrun.
- In order to accomplish the project on time and in turn to reduce cost overrun there should be accurate estimation of project duration. Project durations should be estimated by experienced planners and expertise in the use of scheduling software packages.
- There should be proper financial control in site. In order to accomplish the project within budget the contractor, especially site engineers should properly control the amount of money spent in each project activity.

Moreover, it is recommended that other factors that contribute to construction cost overruns in condominium housing projects should be identified in further study.

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Appendices

Appendix, I: Letter of transmittal

Abebe Kassie

<div align="right">

E-mail: abueka12@yahoo.com

Ethiopia

</div>

Jan, 2020

Dear Respondents,

RE: DETERMINANTS OF COST OVERRUN: THE CASE OF CONDOMINIUM HOUSING PROJECTS IN BOLE SUB-CITY, ADDIS ABEBA, ETHIOPIA

I am a master's student at Jimma University, college of Business and Economics in Ethiopia currently conducting a research study as entitled above.

I wish to inform that you have been selected as one of the respondents to assist in providing the essential data and information for this study. I kindly request you to spare a few minutes and answer the attached questionnaire. The information obtained will be used for academic purposes only, will be treated with utmost confidentiality and will not be shared with anyone whatsoever. Do not write your name anywhere on the questionnaire.

I therefore requested you to respond to all the questions with utmost honesty.

<div align="center">

Thank you, most sincerely for your support.

Yours Sincerely

Abebe Kassie

</div>

Appendix, II: Research questionnaire

Please tick (✓) the boxes that matches your answers or fill the space provided.

Section A: General Information

Date

----

1) What is your sex? (tick one)
   a. Male ☐   b. Female ☐
2) What is your age bracket? (tick one)
   a. 21-30 ☐   b. 31-40 ☐

   c. 41-50 ☐   d. 50 year and above ☐

3) State your highest level of education?

   a. Certificate (on construction industry) ☐   b. Diploma ☐

   c. Under graduate ☐   d. postgraduate ☐

   4). Type of your organization

   a. Clients (executor of the project) ☐   c. Contractor ☐

   b. Consultant ☐   d. Others ☐

5) What is your experience in years in governmental housing construction industry projects?

   a.   0-5yrs ☐   b. 5-10yrs ☐   e. above 25yrs ☐

   c. 11-15yrs ☐   d. 16-25yrs ☐

Section B: Determinants of condominium housing projects cost overrun

6. Has the company ever experienced construction cost overruns in any one of the past project?

   a. yes ☐   b. No ☐

7. If YES to question 6, which construction party was responsible for the cost overrun?

   a. Main contractor ☐   b. Consultant ☐

   c. Client ☐   d. Other factors ☐

   Specify (other factors) ---

8. The following is a table showing some common determinants of cost overrun in condominium housing projects. Please rank the list of factors that determine cost overrun based on their level of importance by putting (✓) in the empty box on a scale of 1 to 5.

(1= Not significant; 2= slightly significant; 3= moderately significant; 4= very significant;

5= extremely significant)

No.	Factors of cost overrun	Relative importance					Responsible parties			
		1	2	3	4	5	Client (government)	Contractor	Consultants	Others/external
1	Inappropriate planning and scheduling									
2	Project complexity									
3	Improper project management									
4	Lack of contractor experience									
5	Financial difficulties faced by contractors									
6	Relationship between management and labor									
7	Errors during construction									
8	Extension of time									
9	Incompetent Sub-contractors									
10	Unsuitable construction equipment's									
11	Improper construction methods									
12	Poor financial control on site									
13	Poor contract Management									
14	Mistake in design									
15	Underestimate project duration									
16	Slowdown in design preparation									
17	Delay in approval of design changes									
18	Lack of cost plan/ monitoring									
19	Inadequate project preparations									
20	Lack of coordination at design phase									
21	Incomplete design at tendering stage									
22	Lack consultant teams experience									
23	Financial problems faced by owner									
24	Practice of assigning contract to lowest bidder									

25	Lack of communication with consultant									
26	Changes in clients requirements									
27	Delay in payment									
28	Re-measurement of provisional sum									
29	Shortage of foreign Currency									
30	Market inflation									
31	Unforeseen site conditions									
32	Shortage of site workers									
33	Delay in material procurement									
34	Unpredictable weather conditions									
35	Poor labor productivity									
36	Unskilled labour									
37	Equipment failure									
38	Labour absenteeism									
39	Power disruption									
40	Land acquisition									

9. Please, can you mention other factors determining cost overrun in your project site in addition to the above listed?

Section C: Effects of condominium housing projects cost overruns

1. Do construction cost overruns have negative effects to projects?
   a. Yes [   ]   b. No   [   ]

2. If YES, Which of the following project parties is worst affected with the occurrence of condominium housing cost overruns?

   a. Client [   ]   b. Contractor [   ]   c. Consultants [   ]

   d. All project parties' [   ]   e. None [   ]

3. Please, can you mention some of the effects of cost overrun that occurred on condominium housing projects?

Section D: The strategic measures that can be taken to improve successful project delivery

1. What are the strategic measures that can be taken to improve successful projects delivery in terms of budget?

    1. --
    2. --
    3. --
    4. --
    5. --
    6. --