

Investigation of Price Adjustment Problems in Ethiopian Construction Projects

(The Case of Arsi Zone Public Building Projects)



By

Asnake Getu Teshome

A Thesis Submitted to

Department of Civil Engineering

School of Civil Engineering and Architecture

Presented in Partial Fulfillment of the Requirement for the Degree of Masters in Civil
Engineering (Specialization in Construction Engineering and Management)

Office of Graduate Studies

Adama Science and Technology University

July, 2021

Adama, Ethiopia

Investigation of Price Adjustment Problems in Ethiopian construction Projects
(The Case of Arsi Zone Public Building Projects)

Asnake Getu Teshome

Advisor

Dr. Meseret Getnet Mehari

A Thesis Submitted to:

Department of Civil Engineering

School of Civil Engineering and Architecture

Presented in Partial Fulfillment of the Requirement for the Degree of Masters in Civil
Engineering (Specialization in Construction Engineering and Management)

Office of Graduate Studies

Adama Science and Technology University

July, 2021

Adama, Ethiopia

APPROVAL SHEET

I the advisors of the thesis entitled “Investigation of Price Adjustment Problems in Ethiopian Construction Projects, the Case of Arsi Zone Public Building Construction Projects” and developed by Asnake Getu Teshome, hereby certify that the recommendation and suggestions made by the board of examiners are appropriately incorporated into the final version of the thesis.

_____	_____	_____
Advisor	Signature	Date

We, the undersigned, members of the Board of Examiners of the thesis by Asnake Getu Teshome have read and evaluated the thesis entitled “Investigation of Price Adjustment Problems in Ethiopian Construction Projects, the Case of Arsi Zone Public Building Construction Projects” and examined the candidate during the open defense. This is, therefore, to certify that the thesis is accepted for partial fulfillment of the requirement of the degree of Master of Science in Construction Engineering and Management.

_____	_____	_____
Chairperson	Signature	Date

_____	_____	_____
Internal Examiner	Signature	Date

_____	_____	_____
External Examiner	Signature	Date

Final approval and acceptance of the thesis is contingent upon submission of its final copy to the Office of Postgraduate Studies (OPGS) through the Department Graduate Council (DGC) and School Graduate Committee (SGC).

_____	_____	_____
Department Head	Signature	Date

_____	_____	_____
School Dean	Signature	Date

_____	_____	_____
Office of Postgraduate Studies,	Dean Signature	Date

DECLARATION AND RECOMMENDATION

DECLARATION

I hereby declare that this Master Thesis entitled “Investigation of Price Adjustment Problems in Ethiopian Construction Projects, the Case of Arsi Zone Public Building Construction Projects” is my original work. That is, it has not been submitted for the award of any academic degree, diploma, or certificate in any other university. All sources of materials that are used for this thesis have been duly acknowledged through citation.

Name of the Student

Signature

Date

RECOMMENDATION

I the advisor of this thesis, hereby certify that I have read the revised version of the thesis entitled “Investigation of Price Adjustment Problems in Ethiopian Construction Projects, the Case of Arsi Zone Public Building Construction Projects” prepared under my guidance by Asnake Getu Teshome submitted in partial fulfillment of the requirements for the degree of Masters of Science in Construction Engineering and Management. Therefore, I recommend the submission of the revised version of the thesis to the department following the applicable procedures.

Advisor

Signature

Date

ACKNOWLEDGEMENT

First and foremost, I would like to thank the Almighty God for his assistance throughout the whole of my life that has enabled me to complete this thesis.

My deepest gratitude goes to my advisor, Meseret Getnet (Dr.), for organizing the study, providing different reference materials, for his critical advice and ideas. His timely and helpful feedback, as well as his strong support and encouragement, guided me through the writing process and contributed significantly to the success of the research

I would like to thank all of the Arsi zone's clients, consultants, contractors, regulatory bodies, and financial institutions for their direct or indirect contributions to the completion of this thesis by providing all of the necessary papers and support. Thank you to everyone who participated in the focus group discussions, as well as those who took the time to complete the questionnaires.

Then, I would want to convey my heartfelt gratitude to my wife, Etagegnehu Sine, for her financial assistance during the writing of my thesis.

Finally, I would want to express my gratitude to my daughters Nardos Asnake and Yemariam Asnake for their unwavering support and unconditional love during my studies.

TABLE OF CONTENTS

ACKNOWLEDGEMENT	i
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ACRONYMS	viii
ABSTRACT	ix
CHAPTER ONE	1
INTRODUCTION	1
1.1. Background of the Study	1
1.2. Statement of the Problem	2
1.3. The Objective of the Study.....	3
1.3.1. General Objective	3
1.3.2. Specific Objectives	3
1.4. Research Questions	3
1.5. Scope of the Study.....	4
1.6. Limitations of the Study	4
1.7. Significance of the Study	4
CHAPTER TWO	5
LITERATURE REVIEW	5
2.1. General Introduction	5
2.2. Price Fluctuation in Construction.....	6
2.3 Price Adjustment in Construction.	7
2.3.1. The benefits of price adjustment in construction contract.....	8
2.3.2. Price adjustment clauses in construction contract	9
2.3.3. Construction price indices in contract	9
2.3.4. Price adjustment in the Ethiopian construction industry	10
2.4. Causing Factors that Lead to Price Adjustment in Construction Projects	11
2.5. The Challenges in Price Adjustment Practices	16
2.5.1. Constant weighting coefficients throughout the project lifetime	16
2.5.2. Difference in weighting coefficients	16
2.5.3. It does not consider actual labor work time.....	16
2.5.4. Change in project cost	17

2.5.5. Computation time	17
2.5.6. Failure to make periodic payment	17
2.6. Impacts of Misapplication of Price Adjustment in Construction Projects	20
2.7. Mitigation Measures for Price Adjustment Implementation	23
2.8. Summary of Literature Review and Research Gap	27
2.8.1. Summary of literature review	27
2.8.2. Research gap	29
CHAPTER THREE	30
RESEARCH METHODOLOGY	30
3.1. Description of the Study Area	30
3.2. Research Approach	30
3.3. Population of the Study and Sampling Frame	30
3.4. Sample Size and Sampling Techniques	31
3.4.1. Sample Size Determination	31
3.4.2. Sampling Techniques	32
3.5. Data Collection Techniques	33
3.5.1. Focused Group Discussion (FGD)	33
3.5.2. Questionnaire Survey	34
3.5.3. Case Study	34
3.6. Method of Data Analysis	37
3.6.1. Factor analysis	37
3.6.2. Relative importance index	38
3.6.3. Excel tools	39
3.7. Data Validity and Reliability Analysis	40
3.7.1. Validity	40
3.7.2. Reliability	40
CHAPTER FOUR	41
RESULT AND DISCUSSION	41
4.1. Response Rate of Questionnaire Survey and Respondent Profile	41
4.1.1. The response rate of a questionnaire survey	41
4.1.2. Respondent profile	42
4.1.3. Respondent profile in taking part in contract administration	43
4.1.4. Respondent work experience in building work	43
4.2. Factor Analysis	44

4.2.1. Preliminary analysis	44
4.2.2. Reproduced correlations	47
4.3. Case Study.....	48
4.4. Causes of price Escalation.....	49
4.4.1. Change order/scope change	51
4.4.2. Lack of schedule oriented supervision	51
4.4.3. Inflation (market volatility)	51
4.4.4. Improper planning	51
4.4.5. Change in costs of material, labor, and equipment.....	52
4.4.6. Contract document gap in handling price adjustment	52
4.4.7. Political interference.....	52
4.4.8. Fluctuation in the money exchange rate	53
4.4.9. Bidders poor understanding of the work they are bidding	54
4.4.10. Poor financial planning and management	54
4.5. Challenges of Price Adjustment Practice	54
4.5.2. Increase in the cost of construction materials.....	56
4.5.3. Client resistant honoring the price adjustment	57
4.5.4. Construction price index may overestimate or underestimate.....	57
4.6. Impacts of Misapplication of Price Adjustment Clauses	58
4.6.1. Additional project cost.....	60
4.6.2. Project delay	61
4.6.3. Termination of project	61
4.6.4. Dispute among parties	62
4.6.5. Loss of profit	63
4.6.6. The rise of claim.....	63
4.7. Mitigation Measures for Price Adjustment in Public Building Projects.....	63
4.7.1. Good decision making at the right time.....	65
4.7.2. The SCC must be drafted by an experienced professional	65
4.7.3. Early material supply commitment.....	66
4.7.4. Regular cost monitoring throughout the project.....	67
4.7.5. Paying full advance payment.....	67
4.7.6. The use of combination methods.....	67
4.7.7. Avoiding late commencement	68
4.7.8. Value engineering for substitute materials	68
4.7.9. Mitigation measures description.....	69

4.8. The Implications of the Study	71
CHAPTER FIVE	72
CONCLUSIONS AND RECOMMENDATIONS	72
5.1. Conclusions	72
5.2. Recommendations	75
5.2.1. Recommendation for practice	75
5.2.2. Recommendation for further research works	76
REFERENCES	77
APPENDIXES-A- QUESTIONNAIRE	81
APPENDIXES-B-SUPPORTIVE DOCUMENTS FOR CASE STUDY	88
APPENDIXES-C-ANALYSIS RESULTS.....	93
APPENDIXES-D-FOCUS GROUP DISCUSSION QUESTIONS	94

LIST OF TABLES

Table 2. 1 Comparison between price adjustment provisions source (Emiru, 2016)	10
Table 2. 2 Causes of price escalation in construction projects	12
Table 2. 3 The challenges in price adjustment practice	18
Table 2. 4 The impacts of misapplication of price adjustment in public construction	21
Table 2. 5 Mitigation measures for improper price adjustment implementation.....	24
Table 3. 1 Profile of terminated public building projects in Arsi zone.....	35
Table 4. 1 The response rate of the questionnaire survey.....	42
Table 4. 2 Respondent profile in a construction project	42
Table 4. 3 Respondent profile in taking part in contract administration	43
Table 4. 4 Respondent work experience in building works.....	43
Table 4. 5 Results of preliminary factor analysis	44
Table 4. 6 Total variance explained.....	46
Table 4. 7 Commonalities result	46
Table 4. 8 Presentation of data obtained from case study.....	48
Table 4. 9 Challenges of price adjustment practice	55
Table 4. 10 Impacts of improper implementation of price adjustment clauses	59
Table 4. 11 Mitigation measures for improper implementation price adjustment clauses	64

LIST OF FIGURES

Figure 2.1 Alternative related to managing price changes	7
Figure 3. 1 Map showing the political administration of Study Area (source:-Elsevier)	30
Figure 4. 1 KMO and Bartlett's Test Results.....	44
Figure 4. 2 Reliability analysis results	45
Figure 4. 3 Scree plot analysis result	47
Figure 4. 4 Percentages of cost lost for case study analysis	48
Figure 4. 5 Fishbone diagram showing factor analysis results	50
Figure 4. 6 Impacts of price adjustment problems on construction	56
Figure 4. 7 Results for impacts of price adjustment	60
Figure 4. 8 Relative importance index result for mitigation measures	65
Figure 4. 9 Mitigation measures flowchart	70

LIST OF ACRONYMS

MOWUD	Ministry of Works and Urban Development
PLC	Private Limited Company
ECO	Engineering Corporation of Oromia
ADB	Asian Development Bank
HVAC	Height Ventilation Air Conditioning
KMO	Kaiser-Mayer-Olkain
CLT	Consultant
CONT	Contractor
RB	Regulatory Body
BOQ	Bill of Quantity
RII	Relative Importance Index
GNP	Gross National Product
IPC	Interim Payment Certificate
OR	Operation Room
AZUHD	Arsi Zone Urban and Housing Development
PAC	Price Adjustment Clause
GCC	General Condition of Contract
SCC	Special Condition of Contract
PPA	Public Procurement Agency
3C's	Client Consultant and Contractor
PBCP	Public Building Construction Project
NGO	None Governmental Organization
GDP	Gross Domestic Product
CI	Construction Industry
PMI	Project Management Institute
KLCA	Kush Ladder Consulting Architects
FI	Financial Institute
FGD	Focused Group Discussion

ABSTRACT

Public building construction projects have become a growing concern. Because the projects ensure the construction of hospitals, colleges, offices, universities, and other public buildings to overcome social issues. However, the Ethiopian building project price adjustment provision was not properly implemented. The expected programs and uses of public building construction projects are adversely affected. Thus, this thesis is aimed to establish a mitigation measures system to a prune problem at the grass route level to solve inappropriate price adjustment implementation. Focused group discussion, case study, and questioner survey are employed as data-gathering instruments in this study. The study was analyzed with the use of statistical package Social Science software and the Relative Importance Index and Cronbach's alpha is used to test the reliability of data and proved reliable. In addition, the validity of the study was checked by the Triangulation method and the results obtained supported each other. Therefore; the outcomes confirmed scope change, supervision problems, inflation, and fluctuating in the exchange rate are the most frequent and severe factors that caused cost escalation in public building construction. While the change in project cost, client resistance to honoring price adjustment, and increase in material, labor, and equipment costs are the major factors impeding price adjustment practice in project execution. Furthermore, wherever price adjustment problems in public building projects are not resolved, project delays, project termination, and project financial problems are encountered as consequences. Hence; good decision making at the right time, a special contract condition must be drafted by experienced professionals, value engineering of alternate materials, paying the contractor in full advance payment, and regular cost monitoring are identified as mitigation steps for this problem. This research addresses the way to mitigate the issue of price adjustment clause misapplication in Ethiopia. More studies in more zones and regions are required to exert positive stresses so that the study's findings can be used to strengthen the national conditions of contract.

Keywords: *Arsi Zone, Construction Project, Price Adjustment, Price Adjustment Problems, Public building*

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

The construction sector plays a vital role in short-term trends, annual and more frequent growth, not just for the construction industry but for all economic activities. Construction activity adds significantly to the country's total activity, at least in terms of the need for materials and labor inputs. The changes in construction activity tend to scale up and drive the economy's broader movements (Mulugeta, 2018).

Ethiopia's construction industry is troubled by plenty of challenges that threaten to curtail efforts to expand the sector. These difficulties are generally related to construction material shortages and market price volatility (Mossa, 2013).

According to ADB, (2018) a price adjustment is a change to the overall price of a contract to account for acceptable changes in the contract's performance costs. These provisions are planned during the planning and bid preparation stages of the procurement cycle, and these clauses are employed as needed during the contract execution stage.

Price change provisions are intended to protect the contractor from increased prices. The cumulative consequences of price escalation might be significant in contracts with longer delivery and completion durations. Large contracts involving price-sensitive materials or goods may see significant price rises. Price adjustments may pass on savings to the borrower as a result of downward price changes (or grant recipient). Borrowers are tempted to shift the risk of variable input costs to contractors, but this usually comes at a higher overall cost (Mulugeta, 2018).

Abdulkadir, et al., (2020) found that construction cost escalation is a common concern in the construction industry, with constant increases in project costs causing major problems with the efficiency of works contracts and their performance in construction projects.

Many infrastructure projects are currently being late for various reasons, and as a result, cost inflation has an impact on the project's budgeted cost. Project costs are a major issue for both owners and contractors in any type of building project. Budgeting for cost escalation is critical during the planning stage of these projects (Muleyl & Purushottam, 2018).

A construction contract, by definition, is a legally binding agreement between two parties to assign the issue, the duties, the responsibilities, and the liabilities involved with the contract's performance. Because it is such a complicated type of contract that usually necessitates a lengthy tendering and negotiation process, terminating it is never an easy decision; employers often hesitate to do so even when the contractor has broken the contract; the reason for this is that it is far too difficult to begin the process of tendering for a new contractor and going through the entire process again. Employers are always hesitant since it is such a difficult decision (Bakey, et al., 2015).

The purpose of this study is to develop a mitigation measures for Ethiopian construction to overcome price adjustment implementation problems. Furthermore, the PA clauses are not clear, effective, or have an easily accessible index to address this issue, preventing the project from being delayed for months or years due to a change in the master schedule.

1.2. Statement of the Problem

Public construction projects take a long time to complete, ranging from a few months to years. Because construction materials and labor prices are so unpredictable, there's always a potential that labor and material costs will fluctuate unpredictably, to a greater or lesser extent, throughout the project (Hafez, 2014).

The contractor is unable to complete the project and resume work on it. The contractor's unit rate is too low to cover even his direct costs; the contract's price adjustment consideration was insufficient to compensate for the soaring price increase; the contractor's severe cash-flow problem has severely harmed the resource supply; there has been a high turnover of project managers, construction engineers, and other key personnel due to the contractor's inability to pay salaries and benefits (Mulugeta, 2018).

According to Moss, (2013) due to frequent market price variations, the unit rate provided by contractors and contained in the contract agreement may be ineffective to support the intended purpose, and Pearl, (1994) found that contractor and supplier fears of future price escalation, as well as the lack of price adjustment clauses in most construction contracts, often leads to higher costs.

The improper application of the price adjustment clause in construction projects inhibits the successful completion of the project within the predefined project cost, completion time, and quality. Furthermore, it has consequences such as project delays, project termination, project financing issues, and so on.

Zegeye, (2019) studied the impacts and mitigation measures on federal road projects, as well as the assessment of price adjustments problems on Federal Road Projects, was studied by (Mulugeta, 2018).

Indifferently, this study addresses the mitigation measures for the improper application of price adjustment in public building projects, so that, contract terms are followed, implemented equitably and justly, and competent contract administration is produced.

1.3. The Objective of the Study

The main goal of the study is really to evaluate price adjustment problems by looking at the causes of price escalation, the challenges of price adjustment practice, the effects of PA problems, and developing mitigation measures for Ethiopian construction projects.

1.3.1. General Objective

The goal of this study is to investigate price adjustment problems in Ethiopian Construction Projects.

1.3.2. Specific Objectives

1. To investigate the causes of price escalation in public construction projects.
2. To look in-depth at the challenges in price adjustment practice in public construction projects.
3. To investigate the Impacts of price adjustment in public building projects.
4. To evaluate the mitigation measures for price adjustment in public building projects.

1.4. Research Questions

1. What are the main causes for price escalation in Public building construction?
2. What are the challenges in price adjustment practice?
3. What are the impacts of price adjustment problems in public construction projects?
4. What are the mitigation measures for price adjustment problems?

1.5. Scope of the Study

The study's major purpose is to create a mitigation measures system for Ethiopian construction, notably in Arsi zone construction projects, to address inappropriate price adjustment enforcement. This study focuses on public building construction projects. Therefore, the scope of this investigation is confined to evaluating mitigating measures for price adjustment.

1.6. Limitations of the Study

Because this study is aimed at contractors' Grades 1 through 5, working on public construction projects in the Arsi zone all respond nearly in the same way, making dialogue was difficult since they encounter almost similar cases. In addition, it does not include any additional zones or sites as a research area, which is an issue for researchers. Finally, it does not employ the most recent version of SPSS data analysis software tools. As a result, these limits have proven to be a roadblock on the investigator's journey to this point.

1.7. Significance of the Study

This part of the research contains the beneficiary of the research. The beneficiary of the research is: at national level Employers (Institutions and Government Sectors), Consultants (Governmental sectors such as federal MoWUD and private company) Contractors (Grade 1-5), and Regulatory body (Federal Ministry of Construction). At the state level Employers (Institutions and Government Sectors), Consultants (Governmental sectors such as Regional MoWUD Bureau, ECO, and private companies) Contractors (Grade1-5), and Regulatory bodies (Regional Construction Authority Bureau). At the Arsi Zone level Employers (Government Sectorial offices), Consultants (Governmental sectors such as Arsi Zone MoWUD office), Contractors (Grade1-5), and Regulatory bodies (Arsi Zone Construction Authority office). This study mainly deals with for national condition of contracts that are currently applicable in Ethiopian construction industries. The Employers can be benefited from this study in that the employer completes the entire work with a minor adjusted price, saves cost and time for re-award of the terminated project. The consultant ensures effective, coherent, and inclusive contract administration and successful completion of projects with reduced cost and paperwork keeping the predetermined quality.

The contractor also benefited from this study that he/she becomes free from bad project completion history, the contractor financially saved. Refrain from the claim, insolvency, etc. the Regulatory body benefited by ensuring good implementation of contract clause for PA.

CHAPTER TWO

LITERATURE REVIEW

2.1. General Introduction

The construction industry is a vital part of the country's economic growth and development. In many developing countries, the construction industry provides a substantial number of work opportunities for various construction professions and accounts for up to 10% of total GDP. In Ethiopia, the building industry contributes roughly 5.2 % to the national economy (Ferede, 2017). It is a business sector that is in charge of the planning, design, construction, maintenance, and eventual demolition of buildings and structures. All civil engineering works and all sorts of new building projects (including housing) are included in construction, as well as the maintenance and repair of existing facilities (Dadi, 2017).

Construction is a broad term that refers to the process of constructing human settlements and the infrastructure that supports development. This comprises raw material extraction and beneficiation, construction material and component manufacture, the construction project cycle from feasibility through deconstruction, and the management and operation of the built environment (Mulugeta, 2018). A construction project is a mission to build a one-of-a-kind facility, product, or service within the scope, quality, time, and budget constraints. However, in actuality, some building projects experience cost overruns, delays in completion, or poor workmanship following completion. To improve the outputs of the construction sector, price escalation, poor quality craftsmanship, and project delays necessitate an in-depth analysis (Mersha, et al., 2015).

The goal of construction projects is to address society's basic needs through high-quality, appropriate infrastructure development at the national, state, and local government levels while keeping the contract price safe for both sides (State, et al., 2017). A contract is described as a legally enforceable agreement between two or more parties, an agreement that will be enforced by the courts, or an agreement in which the two parties to the agreement undertake particular obligations. This contract establishes legal rights and duties that can be enforced in court. Both parties will violate the contract if they fail to keep their promises (ADB, 2018). Contracts are an important part of practically any engineering project's management. There are a variety of contract models (standard forms of contract) in use to make contractual negotiations between project participants easier. These models, often known as standard forms of contract, are pre-

written terms and conditions that can be modified when creating a contract. Contract terms are rarely the last words, according to practice. The fact that the parties have agreed on a common language (terms and conditions) does not guarantee that every point and term of their agreement will be interpreted the same way. It is probable to come up with complications in many construction projects in such instances (Mulugeta, 2018). Price increases might impair a contractor's financial flow, causing construction delays and lower-quality work. The purpose of price adjustment provisions is to safeguard the contractor from price increases. In contracts with extensive delivery and completion periods, the cumulative effects of price escalation might be significant. Contracts that incorporate huge quantities of price-sensitive goods or commodities may see considerable price scale up. As a result, when such difficulty arises, the pricing should be adjusted to move the project forward (Koirala and Raj, 2019).

As a result, the purpose of this study is to investigate price adjustment problems in Ethiopian Construction Projects specifically in the Arsi zone public building projects, keeping a close eye on price adjustment clauses. The literature review will begin by establishing the major concept of the research's backdrop, followed by an in-depth literature review relevant to the investigation, to meet the study's general and specific objectives, as well as the analysis of the findings.

2.2. Price Fluctuation in Construction

Mossa, (2013) investigated that, the common fact of price escalation is a delay, which affects both clients and contractors. Furthermore, long delays significantly increase the project's cost. Excessive price increases necessitate additional budget, which depletes the country's limited financial resources, resulting in further budget shortfalls for construction projects. Price escalation causes excessive delays in projects, which leads to additional price increases as the project's duration is extended. Building materials are materials that are used in the construction process from beginning to end. Cement, steel, fine aggregate, coarse aggregate, brick, tile, and wood are examples of basic construction materials. The rise in building material prices has become a common occurrence, affecting all three construction stakeholders (Jithin, et al., 2021).

Hailu, et al., (2015) investigated that Contractors, consultants, Client, and End-user are the construction industries most affected by price escalation, according to the study. Regulatory agencies are unaffected by price hikes. Construction work is generally carried out under the pre-determined contract price and contract agreement. However, there may be certain changes

in economic conditions, such as sharp price fluctuations, on which the construction contract is founded and carried out over a lengthy time. Most countries have controlled the escalation clause in the law or the terms of construction contracts to deal with the potential (Mohammed Ercan, 2017). Hailu, et al., (2015) stated that the number of construction projects that have experienced price increases in Ethiopia is higher than the number of projects that have experienced price increases in other countries, necessitating further research. This is one of the main reasons that drew the researcher to investigate it.

Figure 2.1. Depicts a few options for dealing with price increases. When price adjustment implementation is not included in the contract, as indicated in the diagram, the client/employer will not share or assume substantial risk. In this instance, the contractor bears practically all of the risk. On the other hand, if the contract allows for price adjustments, the client/employer will bear the majority of the risk (Mohammed Ercan, 2017).

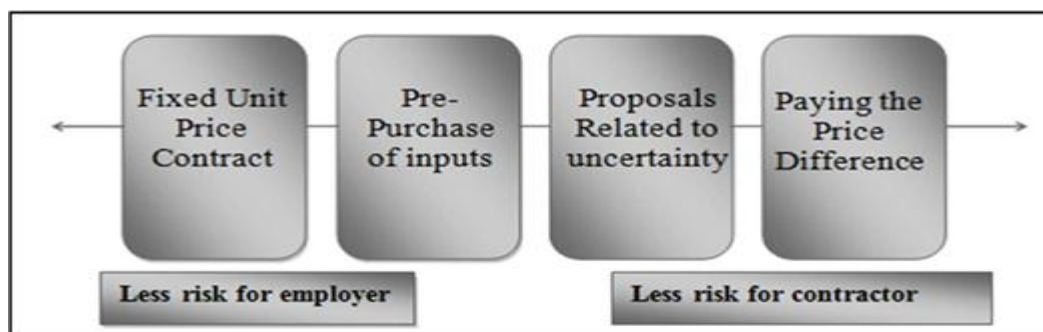


Figure 2.1 Alternative related to managing price changes

Another crucial signal that a project is diverging from its expected goal, particularly its budget, is price fluctuation. Economic conditions are the primary cause of these changes (inflation rate, exchange rate). Because certain countries obtain their essential materials from another country, the low value of their native currency forces them to spend more money on material imports. Furthermore, changes in the price of materials, labor, and services are mostly caused by an unstable inflation rate. This is mostly caused by a lack of materials, an overabundance of resources, and the absence of a cost-adjustment formula in the building business (Habibi, et al., 2018).

2.3 Price Adjustment in Construction.

Koirala and Raj, (219) studied that in contracts with extensive delivery and completion periods, the cumulative effects of price escalation might be significant. Contracts that incorporate huge quantities of price-sensitive goods or commodities may see significant price

hikes. Depending on the contract specified in the bidding document, bidders will factor in the possibility of price escalation when preparing their bids.

Internationally, price adjustments are used to deal with increases or decreases in the costs of materials, labor, and services in building contracts. Prices of commodities and labor are extremely volatile due to price variations caused by a variety of factors. As a result, construction specialists believed it was vital to calculate contract costs based on current prices while leaving room for Price Adjustment to account for possible fluctuations during the project's lifetime (ENR, 2004).

The integrated unit price of this item is used in the quantity bill are related to the purpose of engineering change; the quantity of this item in the original quantity bill differs from the new quantity by more than 15% due to engineering change, the unit price of the item must be adjusted. An item related to an engineering change is not included in the initial quantity bill, the unit pricing for that item must be established fairly. The item is included in the original quantity bill and there are no related items priced in the quantity bill, the contractor must propose an integrated unit price for the item and submit it to the developer for approval (Song, et al., 2016).

The estimates are too low, the bid may appear to be unusually low, disrupting contract execution. The estimations are too high or events do not occur, the borrower pays a large price, which has an impact on the contract's economy and efficiency. In the worst-case scenario, the bid price escalates higher than expected, resulting in a reduction in the requirements or rebidding. The estimations are too low, the bid may appear to be abnormally low, causing contract execution to be disrupted (Rameezdeen, et al., 2018).

2.3.1. The benefits of price adjustment in construction contract

According to Muya, (2014) it can be difficult and costly to modify prices the contract is for a complicated product constantly redefined throughout the contract's life, a price adjustment mechanism can be used to price amendments to the initial agreement.

Some contract and sophisticated construction projects, for example, include cost-plus pricing second, the parties require accurate pricing signals to appropriately coordinate their actions. The price of input was lower than the market price (and the buyer couldn't resell it for more than the contract price), the buyer would be enticed to use "too much" of it. Because this should have been anticipated at the formation phase, both parties bear the costs of inadequate

coordination. This is a classic case of "moral hazard," similar to an insured person overusing health care because the post-insurance price is too low (ENR, 2004).

2.3.2. Price adjustment clauses in construction contract

A contract's adjustment provision also reduces the risk of contractors underestimating cost increases and then experiencing financial difficulties and defaulting on their obligations. A project owner, on the other hand, should benefit from lower bid prices, a lower likelihood of contractors going bankrupt in the middle of a project, and a lower final Contract Price, particularly when costs are declining (Prianka and Seneviratne, 2008).

Price adjustment clauses, also known as escalation clauses in construction contracts, take into account the volatility of materials at the start of a project and allow for some flexibility in responding to price changes. For items such as cement, reinforcement bar, and other materials, these clauses are commonly found in most public building projects. Price adjustment clauses must be carefully drafted and used with caution. These clauses must identify specific materials that may be affected during construction and are subject to significant change (Earl, 2010).

2.3.3. Construction price indices in contract

Zegeye, (2019) studied that Construction price indices are indicators that illustrate the trend of contractor costs in the construction industry. It is a measure of the prices of commodities or sets of materials, with their present values relative to their previous values. A basket of related materials or items is frequently represented by an index. The indexes merely keep track of changes and trends and do not provide current construction costs. The ratio of today's index value divided by the index's base value can be used to alter each of the spending components in the above model. The value of the base index is normally set on the day and value 28 days before tenders are due to be submitted. Constructing by the contractor in construction. They are a measure of the prices of materials or groups of materials.

In general, there are three types of construction price indexes: input price index (measures the change in prices of construction inputs); output price index (measures the change in prices of what is produced by construction activities); and seller price index (measures the change in prices of what is produced by construction activities) (measures the change in the price of construction output as paid by the purchaser or final owner) (Emiru, 2016).

2.3.4. Price adjustment in the Ethiopian construction industry

The Ethiopian construction industry is mostly challenged by price adjustment clause application. This is mostly overseen by different forms of the contract both nationally and is better to compare with international one as shown in Table 2.1 below.

Table 2. 1 Comparison between Price Adjustment Provisions Source (Emiru, 2016)

Issues	MoWUD 1994	PPA2006	PPPAA2011	FIDIC1987	MDB2010
Necessary Conditions for Price Adjustment	Change in cost Of labor& contractor's compulsory contribution	Fluctuation in Cost of inputs	Change in Cost of inputs For projects longer than 18 months	Change in Cost and legislation	Change in Cost and legislation
Base pricing or Indexing date	15 days prior To latest bid submission	28 days prior To latest bid submission	Bid closing or previous Contract price adjustment date	28 days prior To latest bid submission	28 days prior To latest bid submission
Starting date of Price adjustment	-	-	After a year	-	-
Adjustment Application	Individual items	Certified Amount less advance deduction	Contract value (contract price Multiplied by quantity)	BOQ value Except for items With actual price	Amount Payable to contractor
Method(s) of Adjustment	Price difference	Index formula	Index formula	Index formula & price difference	Index formula
Overhead & Profiting price adjustment	Profit excluded	Not explicitly Stated	Not explicitly stated	Overhead & profit excluded	Not explicitly stated

2.4. Causing Factors that Lead to Price Adjustment in Construction Projects

Inflationary increases in the price of construction supplies can generate cash flow issues, as well as delays, profit loss, and poor quality. As a result, it is the driving force behind price adjustments in public projects (ENR, 2004).

Material, labor, and equipment expenditures are the three key components of building expenses that are directly involved. While the cost of these direct cost components rises or falls, price adjustment clauses are included in the provisions (Mulugeta, 2018). Table 2.2, depicts the main causing factors for price escalation in construction projects

Table 2. 2 Causes of price Escalation in Construction Projects

REFERENCE (Authors)	STUDY PARAMETERS	FOCUS	GAP	FINDINGS
Wang, et al., 2004	A questionnaire survey -Methods Severity index - Analysis	Major causes of cost escalation, schedule overruns, and quality shortfalls in the context of the Zambian construction industry	cost escalation, schedule overruns, and quality shortfalls on construction projects often offset the intended contribution of the industry to the economy	The results of the study confirmed the prevalence of cost escalation, schedule delays, and quality shortfalls in construction projects in Zambia. Clients, consultants, contractors, and financiers identified ‘insufficient initial analysis of costs’ and ‘change orders’ as the most frequent and severe factors that caused cost escalation.
Eleyan, 2018.	questionnaire survey -Method - correlation coefficients Analysis	To review the current situation of cost escalation in a construction project, to identify the factors that affect cost escalation of construction projects, and to investigate the reasons that increase the cost escalation	In the Gaza Strip, the construction sector faces numerous challenges, including rising raw material and construction input costs, domestic and international market inflation, and other factors that influence project cost escalation.	The cost of building materials, permits, and approvals, the lack of an effective supervisory system, an incorrect cost estimate, changes in the project, the quality of work, and the machinery and equipment required to carry out the tasks and activities required for the project completion.
Wanjari & Dobariya, 2016	questionnaire survey-Method ANOVA, SPSS- Analysis	Identifying the primary causes of price increases	Delays and cost overruns are common occurrences in projects all over the world. These, however, are particularly severe in developing countries.	These components, such as the client control component, project management component, and contractor control component, would be useful to the various parties involved in the construction activities.

Alinaitwe, et al., 2013.	experimental survey = Method Frequency index, severity index, and importance index values -Means of validation	The main objective of this study was to investigate the causes of construction project delays and cost overruns in Uganda's	Specifically, this study was conducted to identify the causes of delays and overruns and to rank them according to their frequency, severity, and	changes to the scope of work, delayed payments, poor monitoring, and control, the high cost of capital, and political insecurity and instability
Ahmad, 2019	through interviews and surveys using the questionnaire-Methods statistically using SPSS software - Analysis techniques	This study has focused on investigating procurement strategies adopted in MARA large construction projects. It also identified various factors affecting construction cost performance of MARA large construction projects	Very rarely MARA projects are finished within the estimated project cost. For improving cost performance, it is very important to identify the reasons affecting the cost performance of MARA projects. Hence, there is a need for study in understanding the reasons and factors affecting project cost performance of construction projects. Research	This study revealed that fluctuation in the price of the material, cash flow and financial difficulties faced by contractors, shortage of site workers, lack of communication between parties, incorrect planning and scheduling by contractors are the most severe factors while frequent design changes and owner interference are least affecting factors on construction cost performance in MARA large projects.

Mossa, 2013	self-administered open and close-ended questionnaires, desk studies/archival records (four in number), and unstructured interviews.- Methodology The statistical method of Relative Importance Index and Spearman's correlation coefficient –Analysis	this research attempts to assess the causes and effects of price escalation, to identify problems of price escalation and adjustment, and methods to manage/administer price escalation on federal road construction projects	Price escalation is one of the wide-ranging problems that the construction industry is facing currently	The result of finding exposes that Clients resist honoring the price adjustment clauses, Adjustment clauses do not adequately compensate for the increase in prices, Uncompensated increase in the cost of construction materials, Construction Price Indices may overestimate or underestimate the market conditions as at how prices have risen, Selection of the most suitable index in using inflation indices are among the main challenges for the issue of price escalation/adjustment
Mulugeta, 2018	Questionnaire survey, interview, and desk study. Methods Descriptive and inferential statistical Analysis	The research focuses on provisions related to price adjustment; termination; claim substantiation and dispute settlement procedures; conformity of selected clauses with Ethiopian law; understandability of contract forms and the practice of construction management in general and contract administration in particular	A problem of conditions of contract in the construction sector is one of the contributing factors among other	Special conditions must be drafted by experienced professionals to minimize contradictions and ambiguities with the general condition; take the maximum care while drafting particular conditions to reflect real specific project conditions related to price adjustment

ENR, 2004	Structured Interview- Method	to identify the effects of price adjustment /escalation clauses	price escalation/adjustment effects on construction	The impact on the construction industry of the recent, unprecedented price escalation has been multi-fold. Certainly, cries have come from the contractor and subcontractor community of eroded or eliminated profit margins, as well as significant project losses. In addition to lost fees, and damaged or destroyed construction businesses, the ripple effect of this dramatic price escalation has included numerous other impacts
Earl, 2010 .	questionnaire survey – method statistically using SPSS software - Analysis techniques	This paper critically analyses the causes of cost escalation in Utah as a case study	price volatility plays a great role in this state	Contract Administration problem (not follow bids historically and not successful in predicting cost fluctuation § Luck of scheduled and regular supervision to accelerate construction.§ Unable to explore alternative materials while contract document preparation§ Bidders poor understanding of the work they are bidding on§ Unable to allocate budget using an inflation factor with a contingency to cover any price fluctuation

2.5. The Challenges in Price Adjustment Practices

According to the investigator's experience, observation in national and international projects for more than a decade, the most prominent malpractices and challenges are listed hereunder.

2.5.1. Constant weighting coefficients throughout the project lifetime

Zegeye,(2019) studied that the consumption of inputs in construction is not consistent through the project's lifetime. The consumption of cement and petroleum at the start of a project, for example, will not be the same as the consumption at the midpoint or end. It is not uncommon in construction projects where price adjustment is influenced by an index formula to utilize multiple sets of weighting coefficients at different stages of the project while keeping their sum to unity. Unfortunately, this is not the case in practice; the industry employs a constant or average weighting coefficient.

2.5.2. Difference in weighting coefficients

The country that does not have problems with attaching the weighting coefficient as an attachment to the contract document during the document preparation and approval phases, since these coefficients are obtained from other sources such as the Central Statistical Agency. The weighting coefficient to be calculated and applied with various professionals' gates varies, as it is dependent on the quality of raw data provided by the concerned office (Muya, 2014).

2.5.3. It does not consider actual labor work time

The weighting coefficients are determined using regular working hours when determining weights for labor classes. If one tries to incorporate them at the bid or contract signing, it will be a complete guess. Contractors, on the other hand, frequently work overtime to meet deadlines or complete a very urgent or ongoing task, such as concrete casting. Furthermore, a contractor may hire specialized labor for a limited time, such as the installation of HVAC equipment (Emiru,2016).

Furthermore, the contractor may devise several strategies for completing projects, depending on whether they are urgent or must be completed by a specific deadline. Among these approaches, project time trade-off employs scientific and construction management techniques. As a result, in large construction projects such as dam building, tunnel construction, and currently under construction parks in our countries such as Andenet Park, Intoto Parks, and so on, the contractor may employ output and allowance payment modalities. As a result, the price adjustment methodology used in our country now does not take into account the production and allowance systems of labor compensation.

2.5.4. Change in project cost

Most of the time in Ethiopian construction, cost changes, variations, additions, and omissions occur due to a variety of factors. , most of the time water and irrigation projects, feasibility study issues, canal alignment issues, imported pipes, and fitting delay are all factors that cause cost changes. On the other hand considerations such as design changes, alignment changes, and estimation issues play a significant role in the cost of highway construction. Lastly, in the case of public construction projects, this problem emerges as a result of poor interaction between the owner and design teams based on their mutual interests, a lack of soil and feasibility studies, a lack of design that fits the actual circumstances, and managerial turnover, to name a few causes. As a result, these projects are vulnerable to these issues from the beginning to the end of the project's implementation life cycle. When it comes to the final payment issue, the adjusted expenses may not be accommodated, which is a significant hurdle (Data, 2011).

2.5.5. Computation time

There is no clause in the Ethiopian construction guideline that specifies the time it takes to calculate price adjustments. Next, the weighting coefficient may not always be ready for computation, and the document created by them may not be suitable for usage. Furthermore, these weighting coefficients are not available on the contract document generated, necessitating a trip to another office, which is time-consuming, inconvenient, and exhausting, causing public building projects to be delayed (Zegeye, 2019).

2.5.6. Failure to make periodic payment

In the construction of public buildings, frequently encountered difficulties in making payments following contract terms. Furthermore, there is a time-bound among the parties in construction, such as the consultant, owner, and regulatory body, and the respected bodies do not act according to the standard outlined in the contract document and price escalation occurs, we have difficulty adjusting the contract price since, regular payment has not yet been made (Mossa, 2013).

Table 2. 3 The Challenges in Price Adjustment Practice

REFERENCE (Authors)	STUDY PARAMETERS	FOCUS	GAP	FINDINGS
Data, 2011	questionnaire survey – method	By concentrating our efforts on providing the value that our customers require, we can achieve and sustain industry-wide continuous improvement.	Ambitious targets and effective performance measurements are essential to delivering improvement	To achieve these targets the industry will need to make radical changes to the process of project delivery. We must do so to secure our future. It is a challenge for the industry to commit itself to change.
Hafez, 2014	questionnaire survey – method SPSS analysis tools	The objective of this research study is to have an overview of previously used price adjustment methods and to evaluate in detail, the price adjustment formula being used currently in construction contracts, based on FIDIC.	the lack of awareness, practical knowledge, and experience of using the subject formula in construction contracts was found among the stakeholders of the	Results demonstrate that the knowledge among the stakeholders, regarding the phenomenon of price escalation/de-escalation resulting from the fluctuation in prices of construction inputs, is not at all satisfactory.
Zegeye, 2019	self-administered questionnaire survey, interview, and desk study-Methodology a descriptive statistical method has been used for the –Analysis	To identify challenges of price adjustment and methods used to improve price fluctuation administration system on federal road construction projects.		Change in project costs and reliable sources of indices, the use of constant weighting throughout the project lifetime, existence and use of composite (foreign and proxy) indices, failure to make periodic payment, failure to complete projects on time, and adjusting for non-used items are identified as the major challenges of price adjustment using the formula method

Emiru, 2016		Price adjustment methods have their inherent limitations	problems become, even more, worse when adjustment is put into practice	problems worse price becomes, even more, worse when adjustment put into practice among these: Constant weighting coefficients throughout the project lifetime, Different estimators give rise to different weighing coefficients, It does not consider actual labor work time, Change in project cost, Constant input material amounts, Computation time, Considering only extreme prices, Complication of price adjustment formula, Adjustment for non-used items
Mossa, 2013.	self-administered open and close-ended questionnaires, desk studies/archival records (four in number), and unstructured interviews.- Methodology The statistical method of Relative Importance Index and Spearman's correlation coefficient - Analysis	this research attempts to assess the causes and effects of price escalation, to identify problems of price escalation and adjustment, and methods to manage/administer price escalation on federal road construction projects	Price escalation is one of the wide-ranging problems that the construction industry is facing currently	The result of finding exposes that Clients resist honoring the price adjustment clauses, Adjustment clauses do not adequately compensate for the increase in prices, Uncompensated increase in cost of construction materials, Construction Price Indices may overestimate or underestimate the market conditions as at how prices have risen, Selection of the most suitable index in using inflation indices are among the main challenges for the issue of price escalation/adjustment

2.6. Impacts of Misapplication of Price Adjustment in Construction Projects

The building business has been affected by price adjustments in recent years, producing many challenges and forcing many developers to reconsider their plans. Construction projects are delayed, the scope is reduced, or projects are terminated as a result of price adjustments. When it comes to measuring or managing escalation on construction projects, it's critical to first understand what's causing it. This is especially important in the current circumstances, where price variations have been so erratic that predicting or estimating bid prices has been challenging. The most significant aspect of the construction sector is that it must be considered as a single commodity rather than a collection of commodities. Furthermore, unless in the very rare circumstances where all work, including sub-contracts, is purchased through a single vendor, a project's selling price is not the sum of its inputs plus a profit (Yousif, et al., 2020).

When the difficulty of a building project changes, it affects not only the original labor and mechanical costs, but also the types of labor, mechanical, and management risk costs. According to the change valuation principles for the no specified and similar list, the new all-in unit rate can be derived in this scenario. Specifically, the contractor should determine the all-in unit rate based on change engineering data, measurement rules, and valuation methodologies, project cost management agency information price, and the contractor's offering floating rate. Contractors should utilize market pricing of having a genuine basis instead of information price if information price is unavailable (Yigezu, 2008).

The recent, extraordinary price increase has had a multi-faceted impact on the construction industry. Contractors and subcontractors have cried out about dwindling or disappearing profit margins, as well as large project losses. The ripple effect of this huge price increase has had various negative repercussions, in addition to lost revenues and damaged or destroyed construction firms (ENR, 2004). Misapplication of Price Adjustment Clauses in public construction projects depicted in Table 2.5 below.

Table 2. 4 The Impacts of Misapplication of Price Adjustment in Public Construction

REFERENCE (Authors)	STUDY PARAMETERS	FOCUS	GAP	FINDINGS
Mossa, 2013	self-administered open and close-ended questionnaires, desk studies/archival records (four in number), and unstructured interviews.- Methodology The statistical method of Relative Importance Index and Spearman's correlation coefficient – Analysis	this research attempts to assess the causes and effects of price escalation, to identify problems of price escalation and adjustment, and methods to manage/administer price escalation on federal road construction projects	Price escalation is one of the wide-ranging problems that the construction industry is facing currently	Delay, Cash flow (project financing) problem of the projects, Termination of project, Reduce the quality of projects
Yigezu, 2008	self-administered open and close-ended questionnaire- Method	to identify the effects of price adjustments /escalation clauses	price escalation/adjustment effects on construction	Can affect contractors, clients/owners, and the project itself. The major effects of price fluctuation on contractors, if not well compensated is the cash flow (project financing) problem of the projects

Pearl, 1997	interview, questioner	to identify the effects of price adjustment /escalation clauses	price escalation/adjustment effects on construction	Contractor and supplier fears regarding potential, future price escalation, and the absence of price adjustment clauses in most construction contracts, often leads to higher contract prices and larger project costs
ENR, 2004	Structured Interview-Method	to identify the effects of price adjustment /escalation clauses	price escalation/adjustment effects on construction	The impact on the construction industry of the recent, unprecedented price escalation has been multi-fold. Certainly, cries have come from the contractor and subcontractor community of eroded or eliminated profit margins, as well as significant project losses.
Groton, 1997	a self-administered open and close-ended questionnaire	to identify the effects of price adjustment /escalation clauses	price escalation/adjustment effects on construction	The main impacts are Delayed and Cancelled Projects, Reduced Numbers of Bidders, Higher Project Costs, Dispute Among Parties, poor project quality.

2.7. Mitigation Measures for Price Adjustment Implementation

When there are few indices of basic item listings, the price adjustment difference remains valid. At least, it should be until a trustworthy construction price index is published by the central statistic agent. However, depending on the nature of the items, a combination of index formula and price difference adjustment is also reasonably accurate. The validity and legitimacy of index formula adjustments are largely determined by coefficients and indices availability. Furthermore, if the weighting coefficients are recalculated and past price adjustments are paid, the results of this procedure will be better. Bid and contract paperwork are also improved (Emiru, 2016).

Consider including a price administration clause in the contract, designing with locally available materials in mind, conducting regular cost monitoring throughout the project, and developing program-wide contingencies and risk management protocols as major methods for managing/administering price escalation through price adjustment (Mossa, 2013).

Special conditions must be created by qualified professionals to avoid inconsistencies and ambiguities with the general conditions; special conditions must be created with extreme caution to represent real-world project situations connected to price adjustment (Mulugeta, 2018).

Because the payment would be made after the completion of the work, the contractor should acquire working capital before beginning the primary job. As a result, if the contractor is not given an interest-free advance payment due to the conditions of his contract, he may secure the initial working capital by borrowing money from a bank at the current interest rate, which will instantly raise the project cost (Rameezdeen, et al., 2018)

Failure to finish the project within the contract completion term as specified in the master schedule may expose both the contractor and the employer to greater risk of price escalation, necessitating a price adjustment in the construction contract (Gebeyehu, 2017).

Table 2. 5 Mitigation Measures for Improper Price Adjustment Implementation

REFERENCE (Authors)	STUDY PARAMETERS	FOCUS	GAP	FINDINGS
Wang, et al., 2004	questionnaire survey -method model	This study aims to identify and evaluate these risks, as well as their effective mitigation measures, in order to create a risk management framework that international investors, developers, and contractors can use when contracting construction work in developing countries.	It is important to manage the multifaceted risks associated with international construction projects	A risk model, named Alien Eyes' Risk Model, which shows the hierarchical levels of the risks and the influence relationship among the risks, is also proposed. Based on the findings, a qualitative risk mitigation framework was finally proposed which will benefit the risk management of construction projects in developing countries.
Doloi, 2013	questionnaire survey -method Confirmatory factor analysis	This study aims to reveal the industry's perception of cost performance being heavily reliant on the contractor's performance alone.	Nevertheless, the underlying responsibility of the keys take holders(clients, consultants, and contractors) in managing this chronic problem in the Australian construction industry remain unclear	Planning and scheduling deficiencies have the highest impact on cost performance from clients, consultants, and contractors' perspectives. Confirmatory factor analysis on the combined responses across all three groups suggests that robust control procedures and adequate programming, along with efficient design, and effective site management, are the most critical factors

Emiru, 2016		Price adjustment methods have their inherent limitations	problems become, even more, worse when adjustment is put into practice	It is also reasonably accurate to use the combination of index formula and price difference adjustment based on the nature of the items. The validity and the legitimacy of adjustment using the index formula largely depend on coefficients and the availability of indices. Furthermore, the application of this method will yield better results if weighting coefficients are recalculated and previous price adjustments are payment. Bid and contract documents also better are drafted with
Mossa, 2013	self-administered open and close-ended questionnaires, desk studies/archival records (four in number), and unstructured interviews.- Methodology The statistical method of Relative Importance Index and Spearman's correlation coefficient -Analysis	this research attempts to assess the causes and effects of price escalation, to identify problems of price escalation and adjustment, and methods to manage/administer price escalation on federal road construction projects	Price escalation is one of the wide-ranging problems that the construction industry is facing currently	Consider price administration clause, consider locally available materials in design, regular cost monitoring throughout the project, and develop program-wide contingencies and risk management protocol are identified as major methods to manage/administer price escalation through price adjustment

Rameezdeen, et al., 2018		The research focuses on the price escalation /adjustment solving mitigation	the problems of contract administration concerning securing advance payment with the recommended percentage in document	To commence the construction of the main work the contractor should secure a working capital since the payment will be paid after execution of the works. Therefore, if the contractor is not provided with an advance payment free of interest due to the terms of his contract then he might secure the initial working capital by borrowing money from the bank with the prevailing interest rate as a result the project cost will automatically rise up
Gebeyehu, et al., 2017	questionnaire survey- method SPSS Analysis	The research focuses on the time and price escalation /adjustment solving mitigation	the problems of contract administration concerning Master schedule with the recommended percentage in document	Failure to complete the project within the intended contract completion period as per the master schedule will impose additional risk both on the contractor and employer concerning price escalation which needs price adjustment in the construction contract
Alves, et al., 2018		The research focuses on the schedule performance	the problems of contract administration concerning Master schedule with the recommended percentage in document	Schedule Performance Indicators such as Design change, Poor site management, and supervision, severe weather condition, financial issues by the client among the problems which needs a solution in a price adjustment scenario
Sukumaran, et al., 2018		The research focuses on the schedule performance	the problems of contract administration concerning Master schedule with the recommended percentage in document	Minimization of internal administrative problems, reducing payment delays, developing good communication between construction parties, and good decision making at the right time can narrow down the gap of the construction cost escalation that will be adjusted

2.8. Summary of Literature Review and Research Gap

2.8.1. Summary of literature review

Price adjustments are caused by a variety of circumstances. According to Hameed, et al., (2014) material price fluctuations, Contractors' cash flow, and financial difficulties, a shortage of site workers, a lack of communication between parties, and incorrect planning and scheduling by contractors are the most severe factors affecting construction cost performance in Lahore, while frequent design changes and owner interference are the least affecting factor.

Bakey, et al., (2015) established that price increase in public construction projects is the responsibility of all parties involved: Clients, consultants, contractors, and financiers identified 'inadequate initial cost analysis' and 'change orders' as the most common and severe causes of cost escalation. Wanjari & Dobariya, (2016) investigated that components, such as client control, project management, and contractor control, to see if they are valuable to the various stakeholders engaged in the construction process. According to Eleyan, (2018) the cost of building materials, permits, and approvals, the availability of an effective supervisory system, an incorrect cost estimate, changes in the project cost, the quality of work, and the machinery and equipment required to carry out the tasks and activities required for project completion are the main reasons for rising construction costs. Greetings Yousif, et al., (2020) Variation in design change, late payment to the contractor, delay in decision making, delay in receiving clearance, and financial difficulties faced by contractors are among the main causes of time overrun, while variation in material cost, frequent change in specification and design, inaccurate cost estimation, high transportation costs, and poor contraception are among the main causes of cost price escalation.

When it came to issuing price modifications to contractors, the process faced several obstacles, including the findings of Mossa, (2013) which revealed that clients are unwilling to honor price adjustment agreements. Price increases are not fully compensated by adjustment clauses. Increases in the cost of construction materials that are not reimbursed, In terms of how prices have risen, construction price indices may overstate or underestimate market circumstances. Choosing the most appropriate index when employing inflation indices is one of the most difficult aspects of the price escalation/adjustment problem. Furthermore, when these changes are implemented, the problems get substantially worse: Weighting factors that remain constant throughout the project's life cycle, Weighing coefficients fluctuate depending on which estimator is used, it does not take into account actual labor time.

The cost of the project has changed. Constant input material amounts, computation time, and only considering extreme costs are all factors to consider. The formula for price adjustment is complicated (Emiru, 2016). Adjustment for non-used products according to Zegeye,(2019) the major challenges of price adjustment using the formula method include changes in project costs and reliable sources of indices, the use of constant weighting throughout the project lifetime, the existence and use of composite (foreign and proxy) indices, failure to make periodic payments, failure to complete projects on time, and adjusting for non-used items. Ethiopian construction these days, incorrect execution of price adjustment clauses in common.

These facts have an impact on public construction projects in general and public building construction projects in particular. Among the effects are: Contractors, clients/owners, and the project itself can all be affected by price fluctuations. The main effect of price fluctuation for contractors, if not adequately compensated, is the project's cash flow (finance) difficulty. Price escalation, according to Groton, (1997), ENR, (2004), Yigezu, (2008), and Mosa, (2013) cause's delays, cash flow (project funding) problems, project termination, and a reduction in project quality.

To have a clear way of thinking about this title, it is better to note the mitigation measures to be flourished in overcoming the improper implementation of price adjustment clauses problems in our coworkers'. According to Emiru, (2016) it is preferable to combine the index formula with price difference adjustment based on the nature of the commodities. The validity and legitimacy of index formula adjustments are largely determined by the coefficients and indices available Gebeyehu, (2017), Muluget, (2018), and Rameezdeen, et al., (2018) investigated that, Special conditions must be drafted by experienced professionals to minimize contradictions and ambiguities with the general condition; take the greatest care when drafting particular conditions to reflect real specific project conditions related to price adjustment Mulugeta, (2018) investigated that, because the payment would be made after the completion of the work, the contractor should acquire working capital before beginning the primary job. As a result, if the contractor is not given an interest-free advance payment due to the conditions of his contract, he may obtain the initial working capital by borrowing money from a bank at the current interest rate, causing the project cost to climb automatically.

Internal administrative difficulties can be minimized, payment delays can be reduced, excellent communication between construction parties can be developed, and timely decision-making

can be made to close the gap in the construction cost escalation that will be adjusted (Sukumaran, et al., 2018).

In general, whatever the range, public buildings constructed in the Arsi zone face the above problems. Knowing this, the study investigates in-depth the causing factors for price escalation, dig out the challenges of price adjustment practice on our side, investigates the impacts of improper price adjustment clauses, and establishes the improper implementation of price adjustment clauses mitigation measures framework.

2.8.2. Research gap

According to Wang, et al., (2004) cost escalation, schedule overruns, and quality shortfalls on construction projects often offset the intended contribution of the industry to the economy, Eleyan, (2018) identified that, In the Gaza Strip, the construction sector faces numerous challenges, including rising raw material and construction input costs, domestic and international market inflation, and other factors that influence project cost escalation, Mossa, (2013) studied that, Price escalation is one of the wide-ranging problems that the construction industry is facing currently, while this gap is supported by Mulugeta, (2018) that, a problem of conditions of contract in the construction sector is one of the contributing factors among others.

The lack of awareness, practical knowledge and experience of using the subject formula of PA in construction contracts is sorted as a huge gap by Hafez, (2014), and Zegeye, (2019) it was stated that developing a good administration system in construction can solve the challenges of price adjustment problems.

Price escalation is one of the wide-ranging problems that the construction industry is facing currently among the impacts: project delay, Cash flow (project financing) problem of the projects, termination of the project, reduce quality of projects (Mossa, 2013). According to Yigezu, (2008) price escalation has impacts on contractors, clients/owners, and the project itself. The major effects of price fluctuation on contractors, if not well compensated it affect the cash flow (project financing) problem of the projects.

Doloi, (2013) studied that, the underlying responsibility of the keys stakes (clients, consultants, and contractors) in managing this chronic problem. Hence, program-wide contingencies and risk management protocols are identified as major methods to manage/administer price escalation through price adjustment (Mossa, 2013).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Description of the Study Area

Arsi is one of the zones of the Oromia Region in Ethiopia. Arsi is bordered by Bale on the south, the West Arsi Zone on the southwest, East Shewa on the northwest, the Afar Region on the north, and West Hararghe on the east.

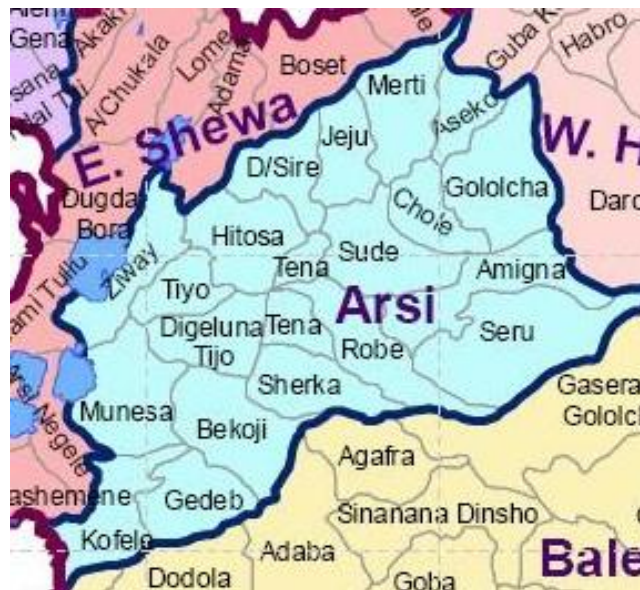


Figure 3. 1 Map showing the political administration of Study Area (source:-Elsevier)

3.2. Research Approach

The purpose of this quantitative and qualitative descriptive type of research is to establish price adjustment problem mitigation approaches to construct a flowchart for dealing with price adjustment concerns in public building projects.

3.3. Population of the Study and Sampling Frame

A descriptive research design was adopted in this study. The information was gathered from the relevant Arsi Zone public building projects who are (consulting firms, contractors, clients, regulatory bodies, and financial institutions) to investigate various stakeholders' perceptions of price escalation/adjustment, the challenges of a price adjustment clause on price impacts, and set mitigation measures for this problem in Arsi Zone public building projects

Data and information sources were identified using the research design as a guide. The research tools were chosen based on the data and information sources, and all relevant documentary materials were reviewed. Within Arsi Zone Housing and Urban Development, the review comprises books, journals and articles, internet sources, and archive document searches such as progress reports, completion reports, and contract papers. The purpose of the case study was to gather reasons for price increases and to show the impacts of new construction, Upgrading and extra blocks construction projects that were completed/substantially completed, ongoing projects, and terminated projects improper implementation of the price adjustment clause that was finished/substantially completed.

Finally, following a thorough review of the literature and a focused group discussion, a questionnaire was prepared and distributed to twenty questionnaires were distributed to employers, fourteen to consultants, twenty-one to contractors, eleven to regulatory bodies, and nine to financial institutions, of which seven distributed to highly professionals working as Grade -1 contractors, senior consultants, and financial institution higher experts in Arsi Zone.

3.4. Sample Size and Sampling Techniques

Among the population planned contractors with Grade 1-5 general or building contractors, consultancy, regulatory bodies, financial institutions, and clients actively working in Arsi Zone for this study. Contractors with Grades 1-5 were chosen for the study because, in Arsi Zone, public building projects with budgets over ten million birrs are granted to these contractors, and the clients of the projects are planning budgets that take more than two years to accomplish. As a result, the projects are likely to face price escalation and require price adjustment; as a result, the price adjustment clause may not be appropriately applied.

3.4.1. Sample Size Determination

A variety of methods can be used to calculate the sample size for categorical data. To determine the sample size, in this study, the Cochran formula was used (Cochran, 1963).

$$n = \frac{p(1 - p)Z^2}{E^2} \text{-----} Eq - 3.1$$

Where;

n is the required sample size

P is the percentage occurrence of a state or condition (which is 50%)

E is the percentage maximum error required (5% is acceptable)

Z is the value corresponding to the level of confidence required (1.96 for 95% confidence level)

Researchers should use 50% as an estimate of P, as this will result in the maximization of variance and produce the maximum sample size.

$$n = \frac{p(1-p)Z^2}{E^2}$$

$$n = \frac{0.5(1-0.5)*(1.96)^2}{(0.05)^2} \approx 385$$

❖ Correction for finite Population:

$$n_{new} = \frac{n}{n + \frac{n-1}{SPS}} \text{ --- Eq - 3.2.}$$

SPS is the population of the proposed classes from Grade 1-5 general and building contractors, consulting firms, clients, regulatory body and financial institutions who are currently working in Arsi Zone

Hence

$$n_{new} = \frac{385}{1 + \frac{385-1}{70}} \approx 59$$

The above-mentioned formula states that the minimum number of responses to be obtained should be 59, 10% of the random sample was added to compensate for the non-response rate, and a total number of questionnaires distributed to contractors, consultants, clients, regulatory bodies, and financial institutes. Were 75 (seventy-Five) which represent a respondent from each contracting firm.

3.4.2. Sampling Techniques

Stratified random sampling methods were used to select the research population from the three major stakeholders (client, consultant, and contractor), the regulatory body and financial institutions from Arsi Zone Urban Housing Development Office, Oromia Engineering Corporation Consulting Engineers, Kush Lader Consulting Engineers, client-side (Arsi Zone Education Office, Arsi Zone Health Office, and other weredas sectorial offices)

Professionals with experience in contract administration, involved in the procurement process, and those who are responsible to certify the check, approve payment certificates, and follow up as well as supervise public building commissioning were selected from consulting firms, client-side engineers, contractor-side engineers, regulatory body engineers, and finance

professionals. On the other hand, Site engineers, project managers, and office engineers who have exposure to prepare payment certificates and compiling documents relevant to price adjustment were selected from the contractors' side. The resident engineers, acting resident engineers, and quantity surveyors were selected from consulting firms due to their experience in contract administration and price adjustment-related issues.

3.5. Data Collection Techniques

This study's data collection strategy incorporates both primary and secondary sources. The primary data for this thesis came from a questionnaire, focused group discussion, and case study, while secondary data came from renowned civil engineering journals, particularly those focusing on price escalation/adjustment and other contract conditions used both nationally and internationally, internet sources, and reviewing related archival documents (such as termination issues) on contract. These many data collection methods have been employed so that the data or information collected from one can be supplemented by the data or information gained from the others.

Data has been checked and sorted after collecting the desired data. The data was then evaluated to double-check the correctness and consistency of the information gathered during the research project. This was followed by in-depth conversations to reach a conclusion and make recommendations based on the study's findings.

A questionnaire survey, focused group discussion, and case study were utilized to collect all data pertinent to the study among the various data collecting instruments available.

3.5.1. Focused Group Discussion (FGD)

In Arsi Zone, focus group discussions are held at both the wereda and zone levels. In both cases, a group of persons consisting of four to six professionals participated in each group. The group of professionals is selected four to six because on the building sites at least four professionals at most six Engineers are found hence, it is suitable to conduct the FGD.

Project managers, site engineers, resident engineers, and client-side supervisor engineers were involved at the wereda project level, while regulatory body engineers, professionals from the finance and economic office, consulting engineers from ECO, KUL, and AZUHD, and client-side supervisor engineers were involved at the zone level.

The researcher prefers to use focus group discussions (FGD) as a data collection strategy since the indicated engineering experts and others have extensive expertise in construction and are

willing to contribute their skills, knowledge, and exposure through discussion. This encourages more people to endorse the data that would be acquired by a questioner poll and a case study, resulting in a more positive conversation.

3.5.2. Questionnaire Survey

To conduct the study, a questionnaire was distributed to a random sample of construction stakeholders, including public employers, domestic contractors, and domestic consultants, regulatory bodies, and financial institutions, and survey respondents were selected at random from employer organizations, contractor consultants, and regulatory bodies who have been involved in the domestic construction process. These professionals were given the questionnaire, this had an unanswered question the researcher created a total of six main parts to obtain the necessary information and data from the sampled population via a questionnaire.

The first part is about the respondent's profile information, the second part is about factors that cause price escalation, the third part is about potential challenges of price adjustment practice, the fourth part is about the consequences of improper implementation of price escalation adjustment, and the fifth part is about price escalation mitigation measures. The final section discusses the overall. More than 75 (Seventy-Five) questionnaires were distributed and collected among the sampled population.

3.5.3. Case Study

The investigator sorted twelve projects as a case study from four main regions of Arsi Zone projects, including four projects in Arba Gugu, five projects in Ticho, two projects in Northern Cilalo, and one project in the Southern Cilalo region. The goal of the case study is to fill in the gaps left by the survey. Those are, OR block construction (Project “A”), administration building construction (Project “B”), office construction (Project “C”), and cluster construction (Project “D”) are the projects, and the project codes are listed in brackets. Projects A, B, C, and D were chosen from four different portions of the Arsi zone.

Each case's data source is archival documents such as completion reports, progress reports, payment certificates, and contract documents, as well as termination minutes, and payment up to termination. Appendix B contains general information about the selected project's case study documents.

Table 3. 1 Profile of Terminated Public Building Projects In Arsi Zone

(Source Arsi Zone Urban Housing Development 10 April 2021, Asella, Ethiopia)

No.	Project Name	Former Project cost	New project cost (After Termination)	Project Cost deference	1 st contractor	2 nd contractor	yrs of 1st deliver y	Former Completio n time	yrs of 2nd-year deliver y	the New completio n time	yrs where terminate d
1	Dereba Health Center construction	3,408,837.22	2,287,993.54	- 1,120,843.68	Gadula construction G.C	Selamawit & Bemnet MIP	2007	2009	2011	2012	2010
2	Colle Health center OR Block construction	1,672,844.14	3,618,655.32	1,945,811.18	Habtaamuu Dagiffee G.C	Birruk,Kidist MI	2008	2009	2012	2013	2010
3	Abajema Health center OR Block construction	1,786,799.14	1,355,835.88	-430,963.26	ANA Construction(Ani war Aliyi)GC	Sintayehu Adisalem MIP	2008	2009	2012	2013	2010
4	Jeju Health center OR Block construction	1,534,677.69	2,472,378.16	937,700.47	Biruuk Tsagaayee GC	Abdusemed,Abebe MIP	2008	2009	2012	2013	2010
5	Seru Health center OR Block construction	1,733,147.58	1,761,376.80	28,229.22	Fireehun Ergannoo BC	Nigusie,Hamnot MIP	2008	2009	2012	2013	2010
6	Adelle Health center OR Block construction	1,942,229.10	2,062,292.64	120,063.54	Lioul Kaasaa GC	Tekalign,Befirdu MIP	2008	2009	2012	2013	2010

7	Tena Health center OR Block construction	1,715,193.19	1,355,835.88	- 359,357.31	Dekeba & Endeshaw G.C	Apreham,Biniyam MIP	2008	2009	2012	2013	2010
8	Iteya Health center OR Block construction	1,564,322.22	1,999,042.64	434,720.42	Abraham Asafaa G.C	A/Manna,Saiyid MIP	2008	2009	2012	2013	2010
9	Sagure Health center OR Block construction	1,808,186.02	2,291,876.80	483,690.78	Mirxihun Ballaxxaa GC	Ashanafi,Maseret MIP	2008	2009	2012	2013	2010
10	Canco Public Cervice office construction	11,854,625.89	27,364,458.32	16,780,776.39	Yonas Yinkelo Hadera G.C	Pr	2010	2012	2013	2015	2013
11	Sude Wereda Administration office Construction	10,583,681.93	21,999,385.15	11,415,703.22	Girma G/silasie B.C	Daadhii Nagaasaa G.C	2008	2010	2012	2014	2012
12	Bekoji town klaster store Construction	2,352,919.37	6,828,519.32	4,475,599.95	Muluken,Tesfaye MIP	OLIFAN Construction PLC	2010	2011	2012	2013	2012

3.6. Method of Data Analysis

3.6.1. Factor analysis

Factor analysis in SPSS (using principal component analysis) software was used to extract factors; before the factor analysis, the researcher fed the data into the variables view section of the SPSS software, where there were forty variables distributed for 75 stakeholders involved in public building projects in the Arsi zone. Sixty-one respondents are returned correctly without missing values among these questioners. As a result, the forty variables are entered in variable view under the name column nominated by (F1, F2, F3, F4, ----- F40), the type column is numeric, the width column is 15 characters, two decimals are fixed under the decimal column, and under the label column, every variable distributed for respondent and nominated under name column has been fully written in words. Furthermore, the frequency of occurrence is based on the representative numbers 0=Never, 1=Seldom, 2=Sometimes, 3=Often, 4=Always entered in the Value column, and the missing data values are sorted before data entry in SPSS, therefore none was chosen. In addition, eight characters were chosen for the column, the data entry was aligned to the center, and the type of measure employed was unique because it was quantitative research. Finally, the input is left alone in the role column of the SPSS part's variable view. The data display section of SPSS is the second and most significant portion of data entry. Here, the variables are entered along the horizontal (X-row) which totaled forty variables, and the respondents are entered along the vertical (Y-axis) which totaled sixty=one. In light of these circumstances, each respondent's frequency rate, which was obtained from them by a questioner, was recorded and the data was ready for analysis.

Choose dimension reduction in the Analyze box, then factor the forty variables under the factor analysis column, while the variables were selected and transferred to the variable empty column. By clicking the top arrow, it is opted to display an empty box, which moves all variables from the first box to the next box. The variables on the left hand should be picked and transported to the right variable.

The description box was picked as the third step, and when the element appeared, just the first answer was selected by default. In addition, as indicated in fig 5 below, univariate descriptive, coefficients, significant levels, determinants KMO, and Bartlett's test of sphericity, inverse, reproduce, and anti-image were ticked for analytical purposes.

The extraction dialog box was clicked in the fourth step to check for some crucial inputs. In the method dialog box, principal component analysis was selected, while in the analyze box, correlation matrix, unrotated factor solution, and scree plot were clicked. Other left defaults (Eigenvalue greater than one, maximum alteration four, convergence twenty-five) were ticked.

The fifth step is to check for rotation. In this example, the orthogonal rotation system varimax was selected under technique and rotated solution, with maximum alteration four and convergence twenty-five ticked by default for the display. The score dialog box should be checked after it displays the save as variable, then the Anderson-Rubin box should be ticked.

The seventh step in factor analysis was to display the settings dialog box, which had rejected case list wise as missing value by default and sorted by size, suppresses tiny coefficients, and absolute value below 0.4 ticked and fixed, respectively.

3.6.2. Relative importance index

The research objectives (objective 2, objective 3, and objective 4) were evaluated using Excel tools to obtain the best results. As a consequence, it was discovered that to explain proper data analysis methodologies. to carry out the initial objective's analysis Before beginning the factor analysis, the researcher feeds the data into the variable view portion of the SPSS (using principal component analysis) program to extract components using SPSS statistics of the SPSS software there were forty variables which are distributed for seventy-five stakeholders who are involved in the construction of public building projects in Arsi zone.

Among these questionnaires distributed sixty-one respondents are returned properly without missing values. Hence; the forty variables are entered in variable view under the name column nominated by (F1, F2, F3, F4-----F40), under type column numeric is used, while under width column 15 character is used, two decimals are fixed under the decimal column, under label column, every variable distributed for respondent and nominated under name column have been written in words fully. Besides; under the value column the frequency of occurrence is based on the representative numbers 0=Never, 1=Seldom, 2=Sometimes, 3=Often, 4=Always entered, the missing data values are sorted before data entry in SPSS so none was selected.

Furthermore, eight characters were selected under the column, the data entry was aligned to the center, and the type of measure used was original since it is quantitative research. Finally, input is left as it is under the role column of variable view of SPSS part. The second and the most important part of SPSS used for data entry is the data view part here, the variables are entered along the horizontal (X-row) these were forty variables while the respondents are

entered along the vertical (Y-axis) which was sixty-one in number. Considering these facts each respondent's frequency rate which was collected by a questioner from the respondent was entered and data ready for analysis.

In the Analyze box choose dimension reduction then factor the forty variables are displayed under factor analyzed the second, third, and fourth objectives questioner variables were distributed to the sixty-one respondent in the Arsi zone the frequencies rate of the respondent entered to the excel sheet, the variables are entered along the horizontal (X-row) these were eight, ten and fourteen variables respectively for objective two to four while the respondents are entered along the vertical (Y-axis) which was sixty-one in number then these data are sorted to know the frequency of each rate,

In addition; it is analyzed by an excel tool to rank and to calculate percentile so that it is suitable to set its tables and graphs. Finally, from the data entry to the excel sheet and excel tool analysis the researcher ended up with a table showing a frequency of response rating deferent frequency level according to objectives and presented in graphs.

The response from sixty-one respondents was subjected to statistical analysis for further insight. The contribution of each of the factors to the overall causing factor for price escalation in public building projects was examined and the ranking of the attribute in terms of their critically as perceived by the respondent was done by the use of the Relative Importance Index (RII) which was coopted using equation 4

$$R = \frac{\sum W}{A*N} \quad (0 \leq RII \leq 1) \text{ ----- (4)}$$

Where:

W - Is the weight given to each factor by respondents ranges from 0 to 4 (where 0=Never, 1=Seldom, 2=Sometimes, 3=Often, 4=Always)

A- Is the highest weight (e. i “4” always? Extremely important, 5-Very high impact)

N-the total no of respondents

3.6.3. Excel tools

Twelve public building projects in Arsi Zone were terminated due to inappropriate execution of public building projects from 2008 to 2012, as shown in case study section 3.5.3. This demonstrates the implications of the misapplication of this provision in the zone.

3.7. Data Validity and Reliability Analysis

3.7.1. Validity

This study is legitimate since a preliminary survey was completed before the questioner survey was distributed and the FGD questions were presented to the target audience. The experienced engineer's debate which notion should be introduced, omitting the ambiguous one and becoming extremely fixated on the FGD issue. Furthermore, several data gathering and analysis methods were utilized to collect and process the data, and the data obtained from various sources almost supported each other.

3.7.2. Reliability

This research is thought to be trustworthy. Cronbach's alpha, the internal consistency of the between-item scale, is used to assess its reliability. Click scale from the Analyze toolbar, then to Reliability Analysis, and make sure Alpha is selected under the box. The statistics dialog box was the next phase in Cronbach's alpha that needed to be taken into account. In this box, under the description for a menu item, scale, and scale if item deleted, inter-item menu correlation should be on, and summary menu means and correlation should be ticked, then click proceed boom ok.

Cronbach's Alpha

$$\alpha = \frac{K}{K-1} \left[1 - \frac{\sum S^2y}{S^2x} \right]$$

Where:

K=the number of test item

S^2y =is the sum of item variance

S^2x =is the variance of the total score

CHAPTER FOUR

RESULT AND DISCUSSION

This section describes, evaluates, and analyzes the results of the focused group discussion, case study, and questionnaire survey in detail. The analytic restrictions of the local conditions of price adjustment clauses are not well implemented, according to the findings. Finally, based on the results and constraints discovered, a discussion resulted.

4.1. Response Rate of Questionnaire Survey and Respondent Profile

4.1.1. The response rate of a questionnaire survey

The probe has had a significant impact on the local construction industry's stakeholders. Organizations were chosen based on their category and assessable position in the Arsi zone, such as governmental and commercial consulting firms, domestic contractors of cl Grade 1-5, a public regulatory body, and financial institutions that engaged in project monitoring and evaluation. Organizations primarily involved in public buildings were included in the survey. In Arsi Zone, the questionnaire was delivered to professionals directly involved in contract administration, public building design, and supervision, and consultancy, regulatory and financial institutions, at random from the cluster category.

The survey took place between March 20th and April 15th, 2021. 66 professionals replied to the survey, representing 18(90), 12(85.71), 18(85.71), 10(90.91), and 8(88.89) from the Employers, Consultants, Contractors, Regulatory Bodies, and Financial Institutions, respectively

The returned questionnaires were evaluated for reliability before beginning the study. One questionnaire from the Employers and two surveys from the contractors were discarded due to incompleteness, one questionnaire from the consultant and one questionnaire from the contractors were rejected due to missing values, leaving 61 questionnaires appropriate for data analysis. This results in a 62.47 percent response rate. During the analysis, all responses are crucial. In addition, questionnaire responses were coded with their respondent categories as Em for Employer, CLT for Consultants, CONT for the contractor, RB regulatory Body, and FI for finance institute for the analysis to distinguish between them so that the study could proceed easily. Table 4.1 summarizes the details of respondent responses as well as their rate.

Table 4. 1 The Response Rate of the Questionnaire Survey

Category of Respondent	Questionnaires		Percentage	Valid Response	Percentage
	Distributed	Collected			
Employer	20	18	90.00	13	65.00
Consultant	14	12	85.71	8	57.14
Contractor	21	18	85.71	13	61.90
Regulatory body	11	10	90.91	8	72.73
Financial Institution	9	8	88.89	5	55.56
Total	75	66	88.25	47	62.47

The data is also validated using correlation by SPSS in principal component analysis which resulted in 27% less than 50% it is getting ok, and the triangulation method of validity was checked since the researcher used the FGD, questioner survey, and case study as data collection.

4.1.2. Respondent profile

Years of experience in the construction organization/office for which the target group specialists have worked have a significant impact on the quality of the response they provide to the researcher when considering this issue. Participants included 14 professionals with less than 5 years of experience, 17 professionals with 5 to 10 years of experience, and 30 professionals with more than 10 years of experience participated.

Table 4. 2 Respondent Profile in Construction Project

Yrs. of experience	Employer		Consultant		Contractor		Regulatory body		Financer		Total	%
	No	%	No	%	No	%	No	%	No	%	No	%
<5	5	31.25	1	9.091	3	18.75	5	50			14	27.27
5~10	4	25	4	36.36	5	31.25	2	20	2	20	17	22.11
>10	7	43.75	6	54.55	8	50	4	40	5	71.4	30	50.70
Total											61	100

4.1.3. Respondent profile in taking part in contract administration

As shown in Table 4.3, engineering experts engaging in public building project work have a lot of experience. It is recommended that an experienced professional with better know-how participate in contract administration.

Table 4. 3 Respondent Profile in Taking Part In Contract Administration

Yrs of experience	Employer		Consultant		Contractor		Regulatory body		Financer		Total	%
	No	%	No	%	No	%	No	%	No	%	No	%
<5	3	18.75		0.00	3	18.75	2	20	2	2	10	17.05
5~10	5	31.25	4	36.36	6	37.5	5	50	2	20	22	35.02
>10	8	31.25	7	63.64	7	43.75	3	30	5	71.4	29	48.01
Total											61	100

4.1.4. Respondent work experience in building work

Building projects are complicated by the existence of many items in the BOQ, not to mention the fact that the number and complexity of design and specification arise with the kind, purpose, and size of the structures utilized, therefore professional experience with building projects should be considered.

Table 4. 4 Respondent work Experience in Building Works

Yrs of experience	Employer		Consultant		Contractor		Regulatory body		Financer		Total	%
	No	%	No	%	No	%	No	%	No	%	No	%
<5	6	37.5	4	36.36364	8	50	4	40	2		24	32.70
5~10	3	18.75	2	36.36364	3	18.75	5	50	2	20	15	28.77
>10	7	31.25	5	45.45455	5	31.25	2	20	3	71.4	22	38.55
Total											61	100

4.2. Factor Analysis

This section of the study, which looks at the factors that cause price increases in public building construction projects (objective 1), uses factor analysis and principal component analysis techniques to find clusters of variables. There are three main applications for these techniques: One employed component analysis to try to understand the structure of the latent variables.

4.2.1. Preliminary analysis

The first set of findings is concerned with data screening, hypothesis testing, and sampling adequacy. Several massive tables (or matrices) that reveal fascinating information about data can be found here depicted in Table 4.5.

Table 4. 5 Results of Preliminary Factor Analysis

Preliminary Analysis	Result
Descriptive Statics	OK missing data is sorted before
Correlation Matrix	Determinant 0.014>P(0.00001) Ok
KMO	0.594 > 0.5 <i>OK</i>
Anti-image correlation matrix	0.5 ≥0.5 OK
Factor Extraction	>1 Eigen Values OK
Total Variance	74.314%>50% OK
Reproduced Correlations	27% <50% <i>OK</i>

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.594
Bartlett's Test of Sphericity	Approx. Chi-Square	1476.540
	df	780
	Sig.	0.000

Figure 4. 1 KMO and Bartlett's Test Results

The outcome includes the Kaiser–Meyer–Olkin sample adequacy metric as well as the Bartlett's sphericity test. The KMO value is 0.594, which is significantly greater than the

minimum threshold of 0.5, indicating that the sample size is likely sufficient for factor analysis. Individual variable KMO values are generated on the diagonal of the anti-image correlation matrix. Check to see if the diagonal elements of the anti-image matrix are greater than or equal (i.e., 0.660, 0.5, 0.773, 0.606, 0.644, 0.702, 0.618, 0.710, 0.579, 0.753, and 0.822) and preferably greater. All of the results for these data are significantly greater than 0.5, which is fantastic news. As a result, no variables are excluded from the analysis.

Bartlett's measure is used to test the null hypothesis that the original correlation matrix is an identity matrix. We intend for this to be a serious test. Given the large sample sizes used in factor analysis, this test is almost certainly significant ($p < 0.001$). A non-significant test would undoubtedly indicate a major problem, but this significant number simply indicates that we do not have a major problem, which is useful to know; thus, the significance level here from output is $0.00 \leq 0.05$, indicating that it is statistically significant.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.807	0.808	18

Figure 4. 2 Reliability Analysis Results

Based on the findings of Cronbach's Alpha, a result of 0.808 based on the standardized items, its internal consistency became good because the value of Cronbach's alpha falls between 0.8 and 0.89 values.

In general, the Kaiser–Meyer–Olkin sample adequacy metric, as well as Bartlett's sphericity test and the Cronbach's Alpha, demonstrated that the study was reliable in terms of data used, as the KMO result was 0.59 greater than 0.5, the significance level is 0.00, which is less than 0.05, and the Cronbach's Alpha was 0.808 greater than 0.7. As a result of this evidence, the investigation is feasible.

Table 4. 6 Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared L			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.6	26.452	26.452	10.581	26.452	26.452	3.81	9.525	9.525
2	2.81	7.018	33.47	2.807	7.018	33.47	3.447	8.617	18.142
3	2.31	5.78	39.251	2.312	5.78	39.251	2.806	7.016	25.158
4	2.18	5.441	44.692	2.177	5.441	44.692	2.798	6.994	32.152
5	1.93	4.811	49.503	1.925	4.811	49.503	2.315	5.788	37.94
6	1.87	4.676	54.179	1.87	4.676	54.179	2.306	5.766	43.706
7	1.71	4.272	58.451	1.709	4.272	58.451	2.284	5.711	49.416
8	1.41	3.52	61.971	1.408	3.52	61.971	2.254	5.635	55.051
9	1.36	3.402	65.373	1.361	3.402	65.373	2.147	5.366	60.417
10	1.34	3.338	68.711	1.335	3.338	68.711	1.974	4.936	65.354
11	1.14	2.859	71.569	1.144	2.859	71.569	1.911	4.777	70.131
12	1.1	2.745	74.314	1.098	2.745	74.314	1.673	4.183	74.314

The percentage of variance explained is calculated using the eigenvalue (e.g., factor 1 explains 26.452 percent of total variance). The first few components (particularly factor 1) explain a significant amount of variance, but later factors only explain a minor amount. The twelve variables with a total cumulative percentage variance of 74.314 percent of rotation sums of square loading are next extracted, leaving us with twelve factors with eigenvalues larger than 1.

Table 4. 7 Commonalities Result

	Initial	Extraction
Change order/scope changes	1.000	0.738
Lack of schedule oriented supervision	1.000	0.709
Inflation (Market Volatility)	1.000	0.695
Improper planning	1.000	0.784
Change in costs of material, labor, and equipment	1.000	0.706
Contract document gap in handling price adjustment	1.000	0.619
Political Interference	1.000	0.675
Fluctuating in the money exchange rate	1.000	0.645
Bidders poor understanding of the work they are bidding	1.000	0.736
Financial difficulties on the part of the Contractor	1.000	0.687
Changes in Drawings & Specifications	1.000	0.793
Delayed or nonpayment of IPCs	1.000	0.712

Extraction Method: Principal Component Analysis.

The communalities are a form of best guess before extraction because factor analysis starts by estimating the common variance. We can better estimate how much variance is common once the factors have been retrieved. Another way to think about these communalities is in terms of how much variance the underlying elements explain. Remember that we deleted some factors after extraction (in this case, only twelve were kept), Thus, after extraction, the communalities represent the amount of variance in each variable that can be explained by the components that were kept.

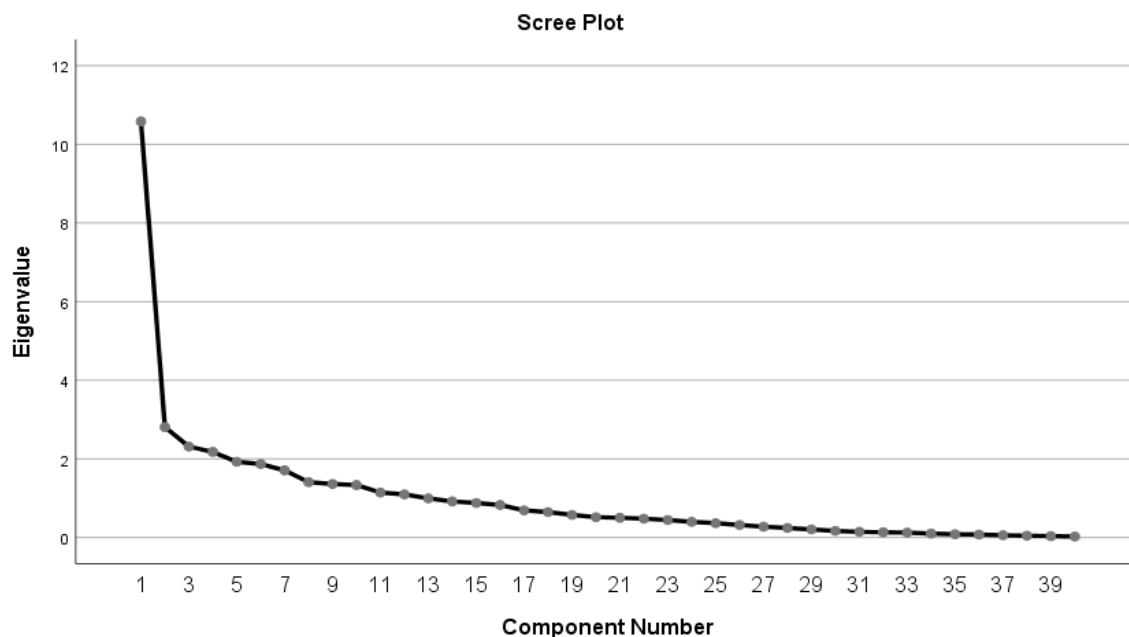


Figure 4. 3 Scree Plot Analysis Result

The screen plot graph has two axes: the y axis, which is represented by Eigenvalues (0,1,2-12) determined from factor analysis, and the X-axis, which is represented by component factor numbers (1-39) Starting with the lowest values of Eigenvalue and working up to the highest 0.035 to 10.581, the values are spread out on the graph. For the sample size greater than 250 and the communalities' average is 0.6 or higher. For a sample size of 200 or more participants, a scree plot can be used to determine whether or not the factor is preserved

4.2.2. Reproduced correlations

In the output at the bottom of the table labeled Reproduced Correlations, look for the percentage of "no redundant residuals with absolute values greater than 0.05. This percentage was discovered to be 27.0 percent, which is less than 50%, and the lower the percentage, the better. Because of Communalities and the column labeled Extraction, the first technique, Kaiser's

criterion, is not relevant here. Because, values aren't all 0.7 or higher, and there are more than 30 variables, the default (Kaiser's criterion) isn't utilized.

Since the sample size after adjustment is $75 < 250$ and the average of the communalities is 0.6 or larger (0.74), the second approach, the Scree Plot, is not employed. Alternatively, with 200 or more participants, the scree plot can be used to narrow the elements to be retained. However, because two conditions were not met, the scree plot was not acceptable to refine the variables to be retained.

The third way was to look at the percentage of there are no redundant residuals whose absolute values are greater than 0.05 at the bottom of the table labeled Reproduced Correlations. This number should be less than 50%, and the lower the proportion, the better. There are 212 (27.0 percent) 'There are still no redundant residuals with absolute values greater than 0.05' in the result of replicating correlation at the bottom of the table. As a result, 27.0 percent of the time, less than 50 percent of the time, twelve components are extracted and preserved.

4.3. Case Study

Table 4. 8 Presentation of Data Obtained from Case Study

Presentation of case study				
Name of Projects	A	B	C	D
Amount of cost lost	1,945,811.18	11,415,703.22	16,780,776.39	4,475,599.95
Percentage of cost lost	46.3	48.11	43.32	34.5

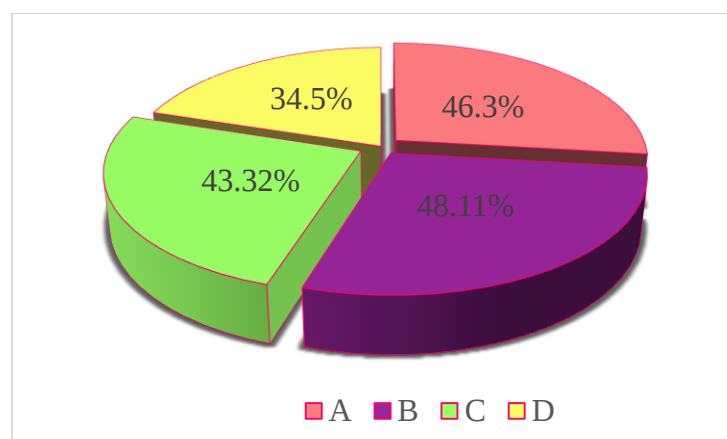


Figure 4. 4 Percentages of cost lost for case study analysis

The bar graph above demonstrates that PBP is vulnerable to suspension and termination problems in the Arsi Zone. This occurs as a result of PAC not being applied correctly. Besides,

it has ramifications for public-building projects, such as a lack of quality, financial loss, and the loss of planned service as a result of project completion.

Furthermore, these projects were built to provide social services such as operating rooms for public health, offices for servicing the people, and administration buildings to develop good administration to the surrounding residents. As a result, to overcome escalation issues, this clause must be used properly.

4.4. Causes of price Escalation

The fishbone diagram which is created using EDraw Max software is used to display the results of route cause extracted from factor analysis, as shown in Fig.4.5.below. It is proven that twelve elements were preserved after extraction and forwarded to the discussion phase of the SPSS analysis utilizing principal component analysis methodologies.

The factors categorized under methods depend on the causing factors which affect the price escalation because of the construction method employed, changes encountered during executions of the project. Besides factors included in Measure are the basic measuring factors such as planning methods and some financial measuring scales since these inputs are the measure of performance. In addition, those variables included under the people are the causes of price escalation that can be brought because of people's faults in general.

Furthermore, Materials are mostly fluctuating by market volatility and fluctuation in the money exchange rate, while the working environment affects the overall wellbeing of the issue raised and political factor is among the leading one. Lastly, variables categorized under the machinery are related to interim payment delays since it is related to the extra payments for the downtime of machinery.

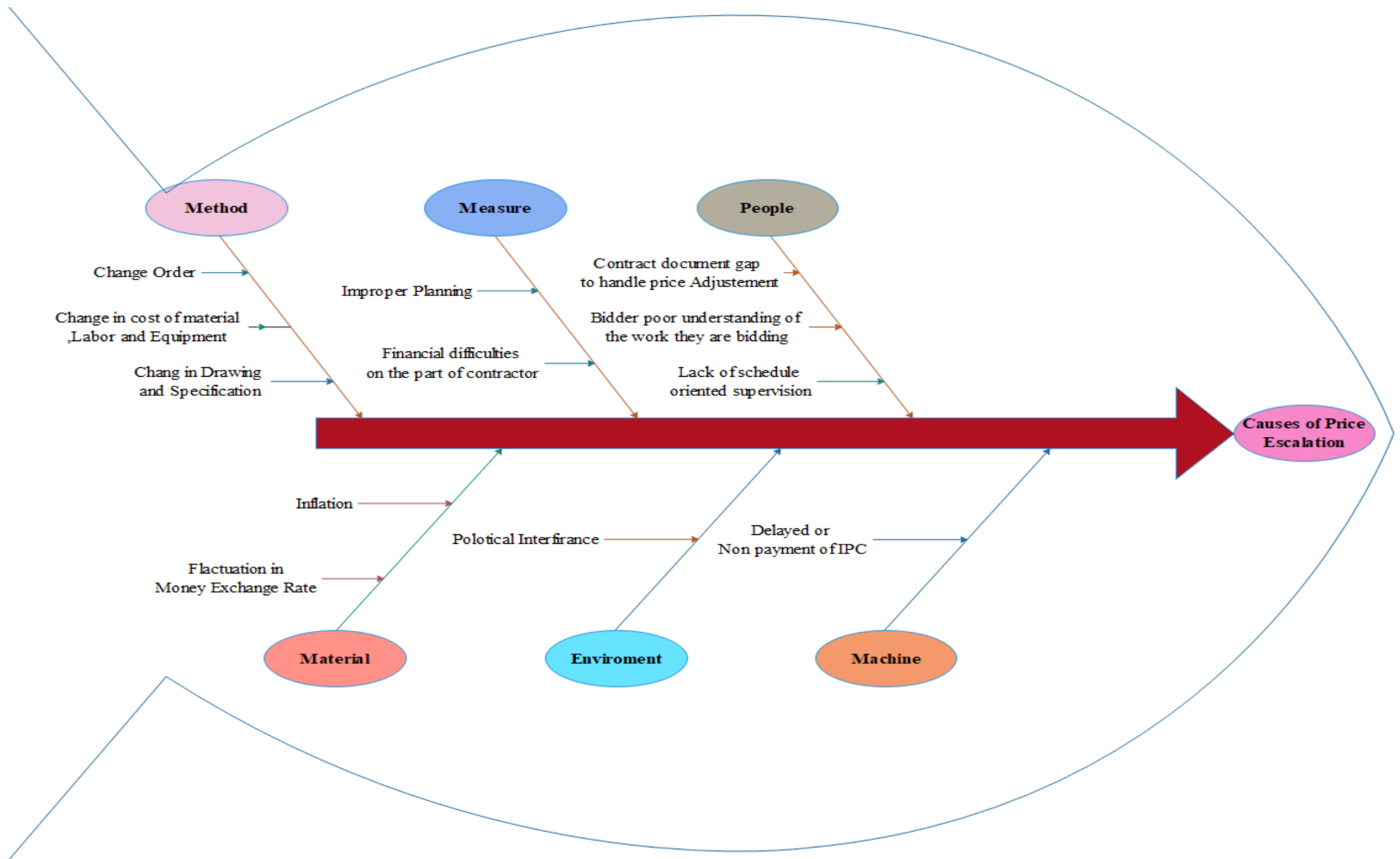


Figure 4. 5 Fishbone Diagram Showing Factor Analysis Results

4.4.1. Change order/scope change

From the correlation matrix results diagonal results bearing 1 value key factor to cost escalation has been found as Change Order/Scope Change. This was supported by research in Rwanda, (Tuyishime, 2020), Gaza, (Pearl.1997), Jordan, Alinaitwe, et al., (2013), and Uganda, (Eleyan, 2018).

Wherever change orders are encountered during the execution of public building projects, the scope gate increases symmetrically, as does the budget required to complete the project's tasks and activities. As a result, scope change is the primary cause of rising construction costs.

The findings of this study are comparable to those of (Muya, 2014), However, this thesis examined this aspect across all public projects and concludes that. Scope change is the top cause of price increase in public building projects, according to this study, and it stands out from the others.

4.4.2. Lack of schedule oriented supervision

During the project's execution, it is expected that the project progress following the contractor's master schedule, which has been approved and accepted by consulting firms. In addition, regular supervision should be conducted to safeguard the project in all aspects, including technical, financial, and progressive follow-up.

The lack of schedule-oriented oversight is recognized as the second cause of price escalation in public building projects, according to the results of the analysis, which are interpreted. This was supported by findings in Gaza, (Alinaitwe, et al., 2013). As a result, proper schedule-oriented management on building projects would always reduce cost escalations.

4.4.3. Inflation (market volatility)

Inflation was also noted as a major factor in cost increases according to (Apolot, et al., 2013). Especially the local researcher Mulugeta, (2018) and Nega, (2008) in Ethiopia, took into consideration the effects of inflation. This could pose serious financial challenges especially in years where annual inflation rates exceeded the Gross National Product (GNP) growth.

4.4.4. Improper planning

Poor planning factors that hinder improved delivery of construction projects include insufficient initial cost estimates or inadequate allocation of funds inconsistent release of funds

by clients or delayed settlement of IPCs; and poor financial management by contractors (Muya, 2014).

This was identified from literature Mossa, (2013) in Ethiopia and confirmed to be true concerning this study. Inadequate planning affects building construction projects in Arsi Zone because most projects are planned to be executed without a sufficient source of budget, good design and specification mode of delivery, procurement schedule and completion time, and so on. As a result, when it comes to the project execution stage, it becomes difficult to proceed.

4.4.5. Change in costs of material, labor, and equipment

In public building project execution, the higher percentage of cost spent on construction material, labor and equipment. Considering this effect Change in costs of Material, Labor, and equipment became the major causing effect of price escalation as consistent with (Muya, 2014).

In conclusion, these papers go through Changes in costs of material, labor, and equipment together for public building projects and are found to be one of the prominent factors for price escalation this makes it different from other previous researches.

4.4.6. Contract document gap in handling price adjustment

Any problem encountered was solved by the contract document prepared by the consultant and gate approved by the regulatory body and later signed by the client and contractor as a part of a contract agreement.

For that matter, wherever binding documents became weak and not inclusive regarding the price adjustment clause it is difficult to issue the price adjustment for escalated lists of items in construction contracts during the execution of public building projects.

The results from the case study of two projects i.e. the construction of the Sude wereda administration building and the construction of Ticho wereda OR block in Arsi Zone confirms that the contract document prepared and gate approved is not correct enough to handle the price adjustment even if the clients of the projects are volunteer to pay cost encountered by price adjustment as the letter written from project owner confirms.

4.4.7. Political interference

The political interference in public building projects starts from its delivery and during its bidding system. The limitless politics in our country highly affects the project execution by

exposing the project to price escalation. Among these cases: the project committee head both at Zone level and wereda level is led by a politician not engineering professional, in line with this decision are not quick and proper secondly, the clients of the projects are interfering in the project delivery, execution and in highly corrupted way that, unless their needs are not satisfied, politician suspend the projector made it to be terminated without any liability.

The interpreted result shows that political interference is among the major causing factors price escalation in public building projects this causing factor is more investigated and dealt with through focused group discussion with experienced engineering professionals at the respective level of the Arsi zone and weredas in the Arsi zone. Furthermore, this was proved with studies by Alinaitwe, et al., (2013) high cost of capital, political insecurity, and instability are the high problems of price escalation in construction projects.

In conclusion, the former researcher mainly deals with the peace and political instability is causing Price escalation in construction projects but this paper viewed the case in a different way that the political position related to project administration is not fit enough with the skill, experience, and knowledge of project management and the politician unlawfully interfere in the project planning, delivery, execution, and project closing investigated to the main factors for price escalation.

4.4.8. Fluctuation in the money exchange rate

Fluctuating in the money exchange rate hurts public building project price escalation this was in agreement with studies by Mossa, (2013) in Ethiopia, from a practical viewpoint experienced engineers, from the client-side, consulting engineers, regulatory body engineers, professionals from finance and economic development office are coming to gather to discuss in focused group discussion of 4 to 6 professional per group.

The professional on the discussion made a great debate at the beginning, in the middle, and after the projects when fluctuating in money exchange rate happened the public projects got in difficulty because the former project cost was not fair to complete the project.

The case study investigated was mostly the terminated public building projects in the Arsi zone from this it is concluded that most of the terminated projects were due to fluctuating in the money exchange rate. Hence this factor is considered to be the major factor for price escalation

4.4.9. Bidders poor understanding of the work they are bidding

Lack of Capacity among Contractors to forecast the future cost-plus lack of academics and experience in building works negatively affect the building works and became the cause for price escalation. Specification for building work has many complicated items coherent items especially items related to electrical and sanitary as well as electromechanical works require great care during bidding.

Generally, Bidders Poor understanding of the work they are bidding on has a profound effect on the price escalation of public building construction. This was identified from the literature. The study by in Canada, (Earl, 2010), in Zambia (Bogdanski, et al., 2000).

4.4.10. Poor financial planning and management

Poor financial planning and management factors that hinder improved delivery of construction projects include: Financial difficulties on the part of the Contractor, Delayed or nonpayment of IPCs. Delayed payments almost always result in increased project costs because the risk is transferred to clients who have to bear the burden of interest payments (Muya, 2014).

This result confirmed findings by Alinaitwe, et al., (2013) and Pearl, (1997) the financial difficulty related to the contractor which the causing factor for price escalation due to letting the supply of materials to the site unable to pay the salary of daily labor professionals this bears its impact on project progress. This was confirmed by a literature review in Rwanda (Yousif, et al., 2020).

4.5. Challenges of Price Adjustment Practice

From the Excel tool analysis techniques result it is proved the analyzed variables with relative importance index > 0.523 which will be shown in the ranked table are identified for the discussion.

Table 4. 9 Challenges of Price Adjustment Practice

Item (Factors)	Frequency of "4" Response	Frequency of "3" Response	Frequency of "2" Response	Frequency of "1" Response	Frequency of "0" Response	Total Respondent (N)	Weighted Total $4n_4+3n_3+2n_2+1n_1+0n_0$	A*N	RII	Rank
change in project cost	14	16	14	10	7	61	142	244	0.58	1
Uncompensated increase in cost of construction materials	14	11	21	8	7	61	139	244	0.57	2
Client resistant honoring the price adjustment clauses	9	19	16	9	8	61	134	244	0.56	3
construction price index may over estimate or under estimate	11	16	14	13	7	61	133	244	0.55	4

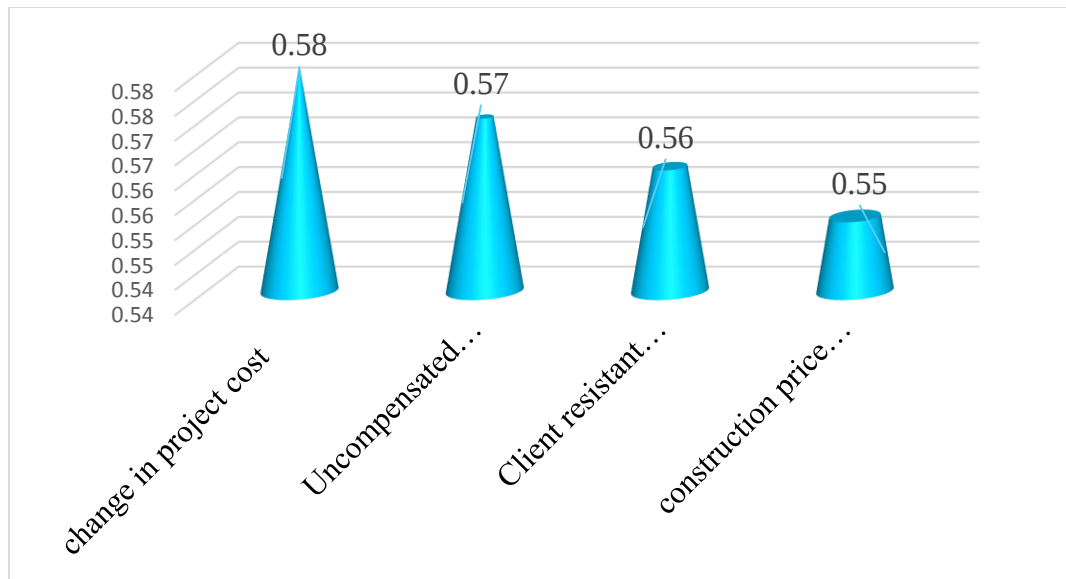


Figure 4. 6 Impacts of Price Adjustment Problems on Construction

4.5.1. Change in project cost

The amount stated in the contract can only be a reasonable estimation. The actual cost usually goes up or rarely the actual cost may get down at the end of a project. Besides, there may be an alteration, addition, or omission of works (variations) or claim for extra payments and times.

All these affect the weighting coefficients and then the price adjustment factor too. If weighting coefficients are left unrevised at final payment and price adjustment is not recalculated for all interim payments, the adjusted price no longer reflects the true or reasonable value.

This fact of Change in project cost is one of the main challenges of price adjustment practice Ethiopian construction studied and confirmed in Ethiopia by (Emiru, 2016) and (Zegeye, 2019). Besides, the issue of price adjustment dealt with in this paper is that the escalation that increases the project cost mostly happens in the Arsi zone which becomes different from the researcher.

In general, this study change in project cost is proved to be the leading factor for the challenge of price adjustment practice with a relative importance index of 0.58 in Arsi zone public building construction projects frequently.

4.5.2. Increase in the cost of construction materials

Escalation of material prices is affecting the liquidity of projects and the cost performance of projects. The cost of construction materials increases from time to time because of limited

suppliers, factories, shortage of raw materials and cost of transportation from foreign countries, market volatility in countered, the change of exchange rate, during that occasion the unit rate submitted by contractor unable to cover the escalation suddenly happened as the result issuing price adjustment becomes obligatory. However; the building construction uses GCC index type of price adjustment method may not surely compensate for the increase in the cost of construction material and became a bottleneck for project execution.

This was in agreement within Ethiopia studied by (Mossa, 2013), and in Ghana (Data, 2011). Furthermore, uncompensated increase in the cost of construction materials case raised experienced engineers through focus group discussion held at Arsi zone finance construction and Economy hall as one method of data collection, two engineers strongly argued that the price adjustment to be paid for contractors not compensate the increase in the price of material due to the rise in the exchange rate in the past three years.

In conclusion, the summary from the RII table assures concerning the review of literature as well as focused group discussion that uncompensated increase of construction material in public building projects was the major challenge in price adjustment Practice in the country.

4.5.3. Client resistant honoring the price adjustment

Most of the time when the project cost increased due to different reasons weather change orders, missed items, and price adjustment the client of the project is perceived as it would be done for only cheating purposes between engineering professionals (consulting engineers supervisor engineer, etc.) and contractors who execute the public building project.

This wrong expectation sometimes negatively affects the project execution where ever price escalation is faced to honor price adjustment practice. Besides, the perception of the owner should increase regarding this problem.

4.5.4. Construction price index may overestimate or underestimate

It is quite apparent that many contractors may have their preferences and peculiar method of construction, estimations, and output or productivity. Estimators may end up with quite different weighting coefficients. One may argue that it is the same with price difference adjustment.

However, slight weight changes affect adjustment factor and price adjustment amount heavily unlike price differences adjustment. This due to the PPA only uses the index methods of price adjustment due to this fact the index preparation system is incorrect we are forced to gate the

wrong result it may be overestimated or underestimated. This result was confirmed in Ethiopia's findings by (Mossa, 2013) and (Emiru, 2016).

4.6. Impacts of Misapplication of Price Adjustment Clauses

From the Excel tool analysis techniques result it is proved the analyzed factors for the impacts of improper implementation of price adjustment clauses with $RII \geq 0.84$ which will be shown in the ranked relative importance index table are identified for the discussion.

Table 4. 10 Impacts of Improper Implementation of Price Adjustment Clauses

Item (Factors)	Frequency of "5" Response	Frequency of "4" Response	Frequency of "3" Response	Frequency of "2" Response	Frequency of "1" Response	Total Respondent (N)	Weighted Total $5n_5+4n_4+3n_3+2n_2+1n_1$	A*N	RII	Rank
Project financing problem	14	26	10	8	3	61	223	244	0.91	1
Additional Project Costs	9	29	14	6	3	61	218	244	0.89	2
Project Delay	13	23	10	8	7	61	210	244	0.86	3
Termination of project	18	15	10	12	6	61	210	244	0.84	4
Dispute Among Parties	13	14	23	7	4	61	208	244	0.82	5
Loss of Profit	14	21	9	10	7	61	208	244	0.80	6
Claim	11	18	17	11	4	61	204	244	0.78	7

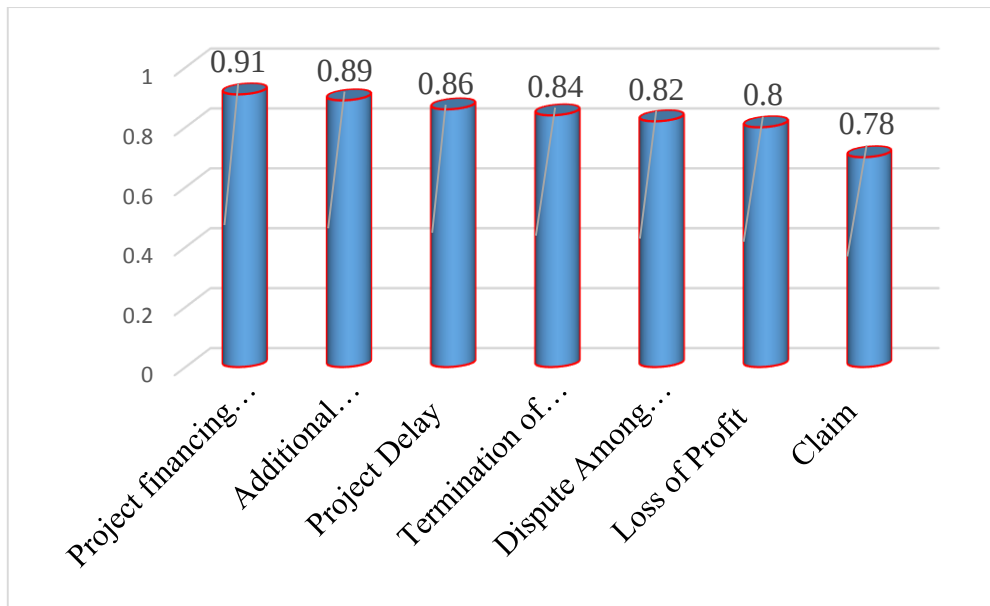


Figure 4. 7 Results for Impacts of Price Adjustment

Public bodies are faced with the alternatives of putting projects on hold while supplemental funding is sought, canceling the project if additional money is not available, or attempting to scale down the project scope (Van der Schans, 2005). In the same way, the project financing problem was highly debated through focus group discussion, and one of the professionals from the Arsi zone Finance and Economic Development office explained that wherever the price escalation occurred and price adjustment was not issued, the contractor requests the case, and no solution is responded to him, then the project became either terminated nor completed as per time frame set and pre-determined budget. As a result of this, the financier such as CDC asks the budget, they donate threefold. Hence the project faced financing problems until other finance sources were obtained.

To conclude since financial resources are scarce and the backbone of the project at every stage project financing became the main impact of improper implementation of the price adjustment clause in Arsi Zone public building projects as has been rushed out in the table and bar chart above which was bearing 0.91 relative importance index and 3.66 item means.

4.6.1. Additional project cost

Contractor and supplier fears regarding potential, future price escalation, and the absence of price adjustment clauses in most construction contracts, often lead to higher contract prices and larger project costs (Pearl, 1997).

Therefore; the project cost to be executed got increased meanwhile due to the higher and higher increase in the cost of projects the public building projects stopped for years and encountered

project financing problems. This fact is in line with Turkey by (ENR, (2004). The impact on the construction industry of the recent, unprecedented price escalation has been multi-fold. Among these additional projects, costs took severely. Besides, the result from the case study assured that; terminated project history from 2008 to 2012 due to improper implementation of price adjustment clause, the project cost increase in three and two folds.

Hence, the impact of improper implementation of price adjustment clause was faced by looking for additional project costs in Arsi Zone public building construction projects. Accordingly, the RII table above assured 0.89RII value and 3.57 item mean as additional project cost was the high impact.

4.6.2. Project delay

The contractor signed the contract with the owner of the project requests in letter the price adjustment issue after twelve months for a contract having more than 18-month contract life and if the client refuses to answer back immediately, most of the time the project got suspended or stopped for some days, a week, a month, etc. Along with this reason, the completion time set before got outdated, the contractor was forced to ask for an extended time if his request is agreed upon and the client loses the expected service from the project.

In addition, the owner refuses to provide the price adjustment for a contractor the project may be terminated this again exposes the project for extra delay. This fact coincides with the study in Turkey, Van der Schans, (2005), in Ethiopia, Mossa, (2013), and Zambia (Muya, 2014).

Van der Schans, (2005) and Muya, (2014) studied that the impact of improper implementation of the price adjustment clause as it causes the project to be a delay for public projects while Mossa, (2013) investigated the project delay was among the impact of not providing price adjustment for road projects. Indifferently, this paper deals with this project delay impact in public building projects.

Therefore, this paper bears 0.86 relative indexes and 3.44 item mean to assure project delay was among the impact of price adjustment clause incorrect utilization in the zone.

4.6.3. Termination of project

Termination of a project is carried on, either termination by employer or termination by a contractor to avoid such occurrences, the wastage of capital and resource due to the employer's default is high and sometimes this wastage arises from the engineer's negligence; hence, the employer needs to act timely and as per the contractor's request while another employer

suggests that the employer should not give or approve suspension order unless there is a pressing need (Mossa, 2013).

From FGD two consultants, even if such clauses are provided in conditions of contract, it is not practicable in the current construction trend. one regulatory body office engineer and three supervisor engineers also argued that the termination we encountered in the Arsi zone was due to the gap of contract document regarding price adjustment clause because the SCC is not read each other with GCC. Hence, we experienced a high impact from the terminated project. As confirmed by the researcher in Ethiopia, Mulugeta, (2018) and Turkey, (ENR, 2004).

From the case study above table collected and served from Arsi Zone Urban Housing Development Office clearly shows that the impacts of improper implementation price adjustment clause for public building projects also shows the other impact factors such as project financing problem, additional project cost, project delay, termination of project and loss of service, etc observed.

Generally, termination of a project which bears 0.86 relative importance index from excel analysis and the case study collected from consulting office for public building projects confirms termination of a project is among serious impacts of improper implementation of price adjustment clauses in building projects.

4.6.4. Dispute among parties

Most of the typical disputes are caused by factors such as unrealistic contract duration and costs, impact and ripple effects of delays, evaluation of the quality and quantity of works, differences in the interpretation of plans and specifications, unfulfilled duties, inefficiency, and disruption, as coincides with the study by (Van der Schans, (2005) Groton, (1997), and (Mulugeta, 2018)).

From the table above when the price adjustment issue is not solved yet the execution of the project got at risk, the parties under the contract (the employer, the consultant, and the contractor) as main stakeholders and the financial institution, the suppliers, Banks, regulatory body as stakeholders needs to escape from this bad contract situation as the result, a dispute among parties arose and become the serious impact on public building construction. Above all, the dispute among parties from relative importance table 0.85 and this shows this fact brings an impact on public building projects.

4.6.5. Loss of profit

The impact on the construction industry of the recent, unprecedented price escalation has been multi-fold. Certainly, cries have come from the contractor and subcontractor community of eroded or eliminated profit margins, as well as significant project losses. In addition to lost fees, and damaged or destroyed construction businesses, the ripple effect of this dramatic price escalation has included numerous other impacts (ENR, 2004).

Beyond this, the contractors become insolvent and put on the blacklist for one budget year if they terminate the project due to this scenario, this is balanced with the literature review by (ENR, (2004) and (Mulugeta, (2018)).

This paper is different in investigating public building construction while Mulugeta, (2018) Studied federal road projects in Ethiopia. From the analysis result using excel tools 0.85 relative importance index and 3.41 item mean implies that loss of profit in contractor and subcontractor side is imposed high impacts due to improper implementation of the clauses.

4.6.6. The rise of claim

Mulugeta, (2018) investigated that a dispute arose between the parties completed in losing solution or unsolved claim arise between them, due to outstanding advance, extra payment and payments upon termination project suspension without reason.

Meanwhile, when the claim arose between the contracting parties, they are exposing themselves to extra loss of money, time, etc. To conclude, the table using excel tools as analysis relative importance index 0.84 and indicate the raise of claim among parties in construction is among the severe impact in public building construction projects.

4.7. Mitigation Measures for Price Adjustment in Public Building Projects

The main objectives of the research are to set mitigation measures for improper price adjustment clause implementation in public building projects from excel tool analysis techniques to result in it is proved that analyzed factors for the impacts of improper implementation of price adjustment clauses with $RII \geq 0.62$ which will be shown in the ranked relative importance index table are identified and presented in a bar graph for the discussion.

Table 4. 11 Mitigation Measures for Improper Implementation Price Adjustment Clauses

Item (Factors)	Frequency of "4" Response	Frequency of "3" Response	Frequency of "2" Response	Frequency of "1" Response	Frequency of "0" Response	Total Respondent (N)	Weighted Total $4n_4+3n_3+2n_2+1n_1+1n_0$	A*N	RII	Rank
Good decision making at the right time	19	27	12	3		61	184	244	0.75	1
Special conditions must be drafted by experienced professionals to minimize contradictions and ambiguities with general condition	16	24	15	5	1	61	171	244	0.70	2
Early Material Supply Commitments	12	28	15	4	2	61	166	244	0.68	3
Regular cost monitoring throughout the project	13	22	22	2	2	61	164	244	0.67	4
Paying full Advance payment to commence the construction of the main work	12	27	15	5	2	61	164	244	0.65	5
The use of a combination of index formula and price difference adjustment based on the nature of the items is better.	10	24	18	7	2	61	155	244	0.64	6
Avoiding late commencing	13	22	13	9	4	61	153	244	0.63	7
Value Engineering for Substitute Materials	11	20	19	9	2	61	151	244	0.62	8

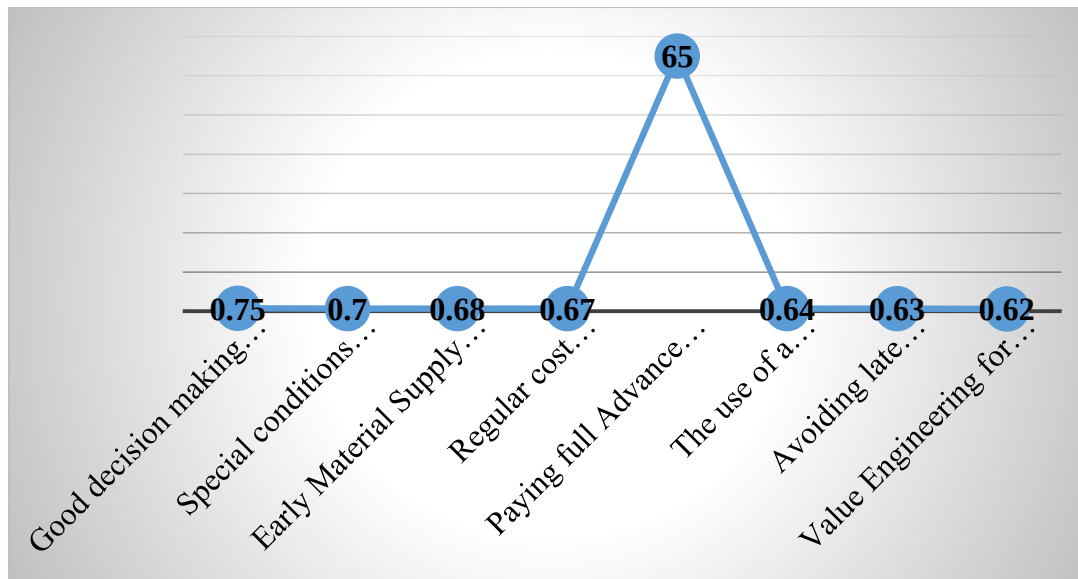


Figure 4. 8 Relative Importance Index Result for Mitigation Measures

4.7.1. Good decision making at the right time

Good decision-making at the appropriate time can help to close the construction cost gap, the escalation adjusted properly when the project is executed, theirs exists a problem that was solved between client, contractor, consultant (stakeholders in construction). The reason which decision needs technical, financial, right of way, etc. During this time, the concerned body should give quick decisions so that the project is not delayed lapsed some days, weak months, and years. This was backed by research by (Kanchana & Sukumaran, (2020) and (Alveset, et al., 2018).

Focused group discussion held at the wereda level, assures one of the client-side supervisor engineers forwards his idea that the project committee at wereda levels are not quick and positive to make a binding decision when problems arise at the project side. Two of the consulting engineers strongly comment that no need for project commitment and technical committee decision during project execution rather than the case should be discussed and solved by stakeholders and the regulatory body engineer decision. In the clincher, from the distributed questioner response the relative importance index result of 0.75 implies that good decision making at right time is extremely important to mitigate improper implementation of price adjustment clause in a public building project.

4.7.2. The SCC must be drafted by an experienced professional

Special conditions must be drafted by experienced professionals to minimize contradictions and ambiguities with general conditions; take the maximum care while drafting particular

conditions to reflect real specific project conditions related to price adjustment (Mulugeta, 2018).

Besides, after drafting the SCC there should be a continuous seminar, conference, and training before the condition of a contract is going to be implemented. This systematic refinement and cross-check-up of the condition play a vital role in making the price adjustment clause that can solve the problems of price escalation inclusively and persuasively. This fact was inlined with research by (Zegeye, 2019).

From the case study, it is perceived from terminated project contract document in the Arsi zone the price adjustment issue is not focused on and corrected during document preparation. Among this PPA, 2011 GCC Clause 62.13 the fraction for each specified element and an exact combination of elements that will be applied in the formula for price adjustment shall be determined in the SCC. Likewise, the fraction for each specified element and the exact combination of elements that will be applied in the formula for price adjustment shall be as follows but not specifying it such problem of incompleteness and ambiguities should be corrected.

Overall, from the analysis of relative importance index 0.7 and 2.8 item mean result is considered to be the special condition of contract must be drafted by experienced professional worths extremely important to bring the mitigation measure wanted to be brought for proper implementation in building construction projects.

4.7.3. Early material supply commitment

Kanchana & Sukumaran, (2020) and Gebeyehu, et al., (2017) investigated whether builders and contractors have procurement process options when they predict a cost increase. They may want to have a strategic delivery/product storage plan in place so that materials can be tactically supplied and staged ahead of time.

Techniques could include purchasing materials ahead of time or paying subcontractors to do so through payment for stored materials. Both approaches may encounter issues such as cost, contract, insurance, and a variety of technological implications.

This paper studies the issue of early material supply commitment indifferently from a back researcher that they delt about purchasing and storing but this thesis also investigates the supply to the site.

4.7.4. Regular cost monitoring throughout the project

In construction projects cost monitoring and cost management are critical. If the cost is monitored regularly, there exists equal perception, feeling, and know-how about the escalated items among main stakeholders (Client, consultant, and contractor) plus regulatory body and financial institution.

In addition, the monitoring system will be supported by a monthly progress report which contains the escalated item the cost difference with the original rate, the causes of price escalation, and a forward recommendation on how to fix this problem. This was supported by Mossa, (2013) and Rameezdeen, et al., (2018) indifferently from this paper they study for road and highway projects respectively.

The price adjustment becomes easy and the proper price adjustment clause is again insured, the project progress will be held as per the master schedule. From the result of statistical analysis using RII method 0.67 relative importance neatly, it is an indication of regular cost monitoring throughout the project is very important to mitigate the improper price adjustment clause in public building construction problems.

4.7.5. Paying full advance payment

Rameezdeen, et al., (2018) investigated that to commence the construction of the main work the contractor should secure a working capital since the payment will be paid after execution of the works. Therefore, if the contractor is not provided with an advance payment free of interest due to the terms of his contract, then he might secure the initial working capital by borrowing money from a bank with the prevailing interest rate, as a result, the project cost will automatically rise.

Wang, et al., (2004) confirmed that project delivery without having full advance payment based on the findings, a qualitative risk mitigation framework was finally proposed which will benefit the risk management of construction projects in developing countries concerning the advance payment. From the analysis result paying it is ended up 0.67 RII value shows full advance payment for the contractor is important to mitigate price adjustment implementation problems.

4.7.6. The use of combination methods

Emiru, (2016) studied that it is also reasonably accurate to use the combination of index formula and price difference adjustment based on the nature of the items. The validity and the legitimacy of adjustment using the index formula largely depend on coefficients and the availability of indices. Furthermore, the application of this method will yield better results if

weighting coefficients are recalculated and previous price adjustments are payment. Bid and contract documents also better are drafted with

Indifferently, in this paper using such a combination method of price adjustment is for complex work such as dam construction tunnel construction but building works is not that much important. Hence from the RII analysis result, 0.64 relative importance index is an implication of the use of combination (index formula and price deference adjustment) methods are important for complex and large construction to mitigate price escalation problems and foster good adjustment implementation

4.7.7. Avoiding late commencement

During the project delivery stage after a letter of award has been given to the contractor, the project has to commence early as per the contract document because if it is delayed there may exist price escalation due to different reasons either by an internal factor or external factor. Along with this, the process of commencing the site is not quick enough as per contract and price escalation is encountered it is difficult to manage it because it is about stakeholders.

The price adjustment is only provided for clear escalation for a reason it happened without any delay in project execution, This is confirmed in Zambia by Muya, (2014), and in Ethiopia (Zegeye, 2019). The result of the study in this paper 0.63 relative importance index shows avoiding late commencement is taken as a mitigation measure for price adjustment proper implementation.

4.7.8. Value engineering for substitute materials

Subcontractors are on the front line, and they have the advantage of proximity to suppliers and labor to see emerging escalation potential, whether from manpower issues or supply dynamics. Working with subs to identify value engineering and alternates when a specified material or practice exposes a construction firm to potential escalation can be invaluable. However; the concept of value engineering for the substitute materials is technology-intensive the concept this value should have to be worked starting from the grass route level this is confirmed by (Earl, (2010), Wanjari & Dobariya, (2016) and (Omoregie & Radford, 2006)).

One can reduce by preparing alternate materials the exchange rate, time of execution, make regular improvement, proud of being own product, less costly, less risky easily accessible and less environmental pollution. In conclusion, value engineering for substitute materials

from the analysis output is 0.62. Relative importance index and 2.48 item mean indicates this factor is important to mitigate the price adjustment clause improper implementation.

4.7.9. Mitigation measures description

To address the issue of improper price adjustment in public building projects, the researcher creates a flowchart. The flowchart depicted in Figure 4.6 shows that specific objectives are used as independent variables, while variables classified under dependent variables are labeled as independent variables. Finally, the mitigation measures studied in the investigation are assigned to which dependent variable they are appropriate for as a solution to the price adjustment problem.

The mitigation measures flowchart flourished in Fig.4. 9 has been evaluated by consultants group in Arsi Zone Among these consultants Oromia Engineering Corporation, Kush Lader Consulting Engineers, Arsi Zone Urban Housing and Development Engineers, have been debated and finally accept to be the remedial measure for this issue. Regulatory body (Arsi Zone Construction office Engineers), the experienced client-side Engineers, and Contractor side Professionals have forwarded their idea and suggestion concerning focused group discussion held during data collection.

From the contractor side ABDI Construction PLC Grade one contractor, Girma G/Silasie B.C Grade 2 contractor and, Dereje Shiferaw B.C Grade five contractor confirmed that the flowchart developed by the researcher can mitigate the misapplication of price adjustment.

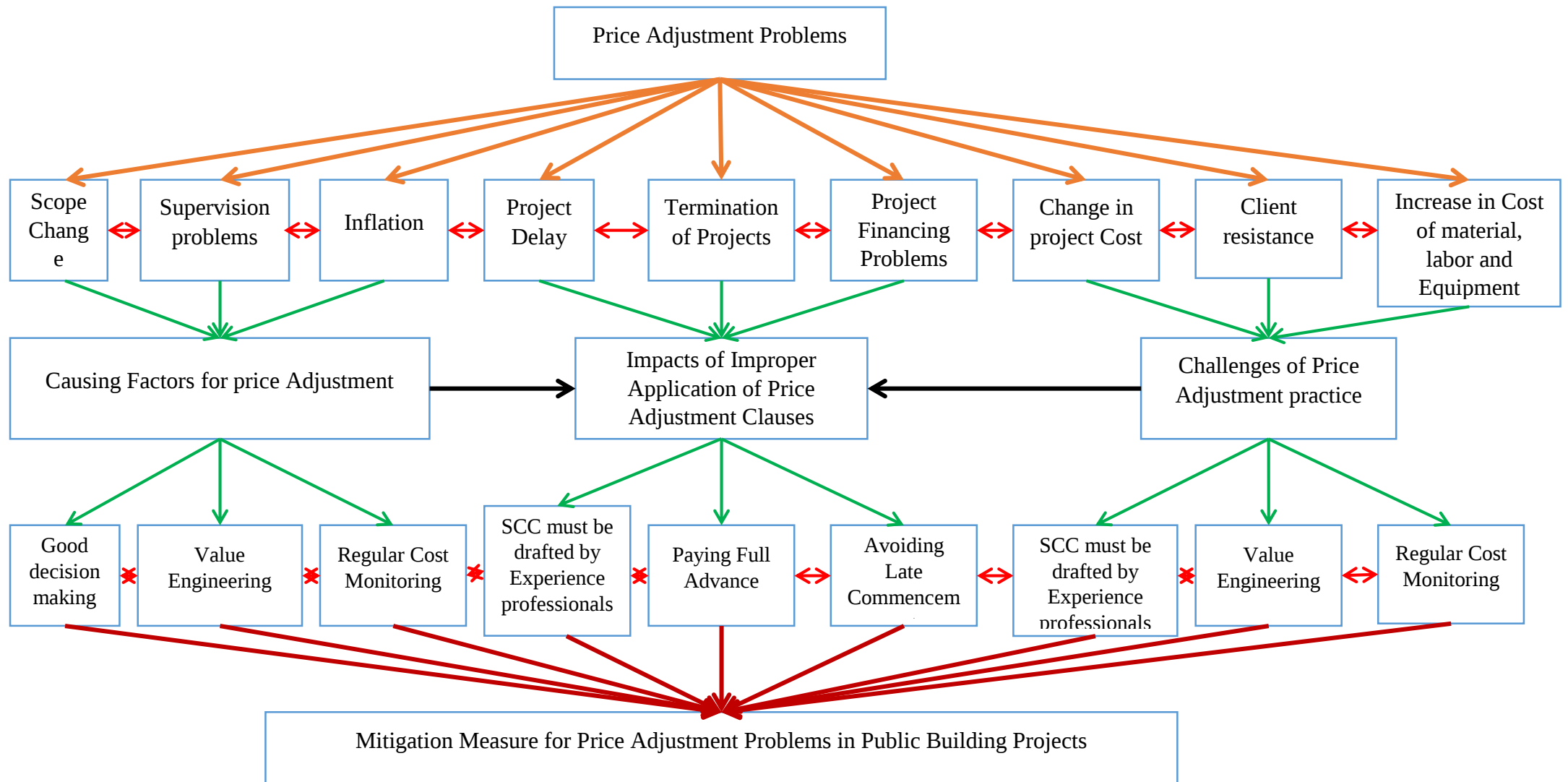


Figure 4. 9 Mitigation Measures Flowchart

4.8. The Implications of the Study

This paper studies the mitigation measures for improper implementation of price adjustment

Theoretically, this investigation has its contribution to mitigation measures to be taken on improper implementation of price adjustment clauses in public building projects. Because the researcher added new variables on theory so that it could cover wider perspectives.

Practically, the main stakeholders and the regulatory body have addressed by finding of the research this implies the client needs to pass good decision-making at write time and expected to pay full advance. The consulting should seek value engineering for alternative materials. The contractor should commit to early material supply and avoid late commencement. The regulatory body needs to consult the government as a special condition of contract must be drafted by experienced professional, while they share making regular cost monitoring throughout the entire life of the project equally.

In general, the research findings are largely consistent with the expected outcome, which has been stated to benefit stakeholders as well as regulatory bodies ranging from the federal to the state level. However, because the study is limited to the Arsi zone, respondents reflect their failing in a remarkably similar manner, making the discussion somewhat difficult.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

According to the analysis results drawn from the Case study and respondents responses to the questionnaires regarding improper implementation of price adjustment clauses in Ethiopian construction projects, the study's primary goal is to prevent improper price adjustment clause implementation by establishing a mitigation measures framework, as stated in the introduction section's section 1.3. To achieve this goal, the study's goal was divided into four parts

Price escalation is a potential hindrance to project completion. The study reported in this paper established that wherever cost escalation occurred, several causal factors must be adequately addressed. Despite being a topic of discussion for several years, cost escalation in construction projects continues to exist. The findings presented in this paper may assist the owner, consultant, contractor, and regulatory body in understanding and managing factors that significantly increase the cost of public building construction projects.

The results of factor analysis using SPSS presented by fishbone diagram in this paper suggest that main stakeholders plus regulatory body in the Arsi Zone public building construction projects should be committed to improving changes that happened method wise (change orders/scope change, change in the cost of material, labor and equipment and change in drawing and specification), changes related measures (improper planning and financial difficulties on part of contractor), there are also people related changes (contract document gap in handling price adjustment, bidders understanding of work they bidding on and lack of schedule oriented supervision), changes related to material (inflation (market volatile), and fluctuating in the money exchange rate), changes related to the environment (political interference), and changes caused by machine (delay or nonpayment of IPC)

Whenever possible, the main stakeholders of construction (3C's) and regulatory body understand, recolonize and work on these identified changes in price and minimizes their negative impact on public building construction

The factors identified in this study that adversely affect successful project delivery must be investigated and understood by managers to address significant barriers of cost escalation and foster project execution performance.

From the literature review, the challenge of misapplication of price adjustment clause is mainly because of non-regular adjustment, constant input materials, and adjustment for non-used items.

Indifferently, in this paper, the result obtained from relative importance index statically, analysis result and presented by frequency tables and bar charts were change in project cost, client resistance in honoring price adjustment, uncompensated increases in the cost of material, and the construction index overestimate or underestimate is identified the most challenging factors in price adjustment practice in Arsi Zone public building projects.

According to the writer's view, the problems in contract price adjustment practice may be best approached by practicing bid contingency cost, increasing the client awareness by creating a continuous cost database, conducting regular market assessment and developing reporting system, continuous training, conference, and workshops on the price adjustment construction clause can diminish the price adjustment challenges in public building projects.

The researcher strongly suggests that the concerned body especially the regulatory body should work to reduce the challenges of price adjustment practice since this office has the power to regulate cost on construction projects.

The third aim of the research was to evaluate the influence of improper price adjustment clause implementation in public building projects. Based on the data collected from the questionnaire survey, focused group discussion, and case study.

The study concludes that not applying the price adjustment clauses properly in public building construction particularly in the Arsi zone has an impact on the project, society, and the construction sector hence, setting a kind of blueprint is important to prune its effect on a construction project.

The result of this research identifies the major impacts of relative importance index 0.91, 0.89, 0.86, 0.86 values of misapplication of the price adjustment clause. Among these impacts project financing problems, additional project cost, project delay, and termination of the project are the leading impacts.

From the result discussed in section 3 earlier, the result listed above is faced in Arsi Zone the focused group discussion confirmed that the project financing problem became a very serious issue while the projected financed earlier by NGO's who are follows every progress of the project. In the middle, if price escalation has occurred, they are refusing to compensate the

adjusted price except for the agreed project cost and asks for the pre-invested birr in three-fold dollars from the Ethiopian government.

From the discussion, it would be more advisable to include the issue of the price adjustment clause by bringing up the national rate adjustment as part of the contract document to reduce its impact.

The fourth objective of the research was to set mitigation measures for improper implementation of price adjustment clause in public building projects in the previous objectives one, objective two, and objective three it was covered the cause of price escalation, challenges faced in price adjustment practice and what impacts should the two objectives impose regarding on improper implementation of this clause hence, this study's primary goal is to set the mitigation measure for improper implementation of PAC for public building projects be concluded.

The result of this study sets the main mitigation measures for improper implementation of price adjustment clause with RII values of 0.75, 0.70, 0.68, 0.67, 0.67, 0.64 & 0.63 this statistical analysis of relative important index shows the problem so severe and needs quick mitigation mechanisms.

The analysis resulted in good decision making at write time, the special condition of contract must be drafted by experienced professional, early material supply commitment, the use of combination index, value engineering, paying full advance and avoiding late commencement of the site agreed to be mitigation measure for improper implementation of the clause.

The other result of this research also revealed that focused group discussion held at the wereda level, assures one of the client-side supervisor engineers forwards his idea that the project committee at wereda levels are not quick and positive to make a binding decision when problems arise at project side. Two of the consulting engineers strongly comment that there is no need for project committee and technical committee decision during project execution rather than the case should be discussed and solved by stakeholders and the regulatory body engineer decision.

It would be preferable to work together to overcome the poor implementation of the price adjustment clause with corresponding stakes, and assigning the right person to the right position can solve the problem.

5.2. Recommendations

5.2.1. Recommendation for practice

The author strongly advises that the most important issue currently confronting Ethiopian construction projects is the inappropriate enforcement of price adjustment clauses. From the main finding result of each objective:

5.2.1.1. Expected from contractors

- Improve their ability to predict price fluctuation and propose a fair coefficient for adjustable elements.
- Correct planning and scheduling should be submitted and utilized by contractors.
- Good financial management should be flourished.

5.2.1.2. Expected from consultants

- ✓ Prepare a contract document that can handle the price adjustment without any Contradiction in both GCC and SCC.
- ✓ Develop program-wide contingencies and risk management protocol
- ✓ Consider locally available materials in design
- ✓ Controlling the work as per the Master schedule set

5.2.1.3. Expected from clients

- ❖ Incorporate price adjustment clauses in their contract documents.
- ❖ Minimization of internal administrative problems concerning the project.
- ❖ Reducing payment delays.

5.2.1.4. Expected from the regulatory body

- Evaluate in-depth and correct while contract documents allowing price adjustment are gate approved
- Enforce the practicability of price adjustment as per the signed contract if the price, fluctuation is encountered
- Investigate regularly on the application of price adjustment formula and give feedback to the government to look for improvement.
- Evaluate and take any corrective measures if any as per the monthly progress report submitted by the consultant concerning price fluctuation and price adjustment cases.

5.2.1.5. Expected from financial institutions

The financial institutions which are donating finance for the executions of the public projects are expected to contribute to price adjustment in the way that:

- Financial institutions are expected to hire their Engineering professionals to escape from financial crises concerning the document preparation gap and challenge of price adjustment practice.
- These institutions should sign a kind of commitment with the client to not handle such a case during the execution of projects.
- Expected to follow the project progress closely and share the problems encountered concerning price adjustment with responsibility.

5.2.2. Recommendation for further research works

Other authors should continue their research, according to the researcher, to get more information and bridge the knowledge gap. Among the recommendation for further research works:

- ✓ Improper Implementation of Price Adjustment Problems for Public Projects in Ethiopia
- ✓ Evaluating the Application of Price Adjustment for Building Projects Using Regression Analysis
- ✓ Comparing the Implementation of Price Adjustment for Building works in West Arsi Zone and East Shoa Zone

REFERENCES

- Abdulkadir, Mohammed, et al. (2020). Factors Influencing Cost Escalation in Construction Projects of North-Eastern Nigeria: *Journal of Civil and Construction Engineering*, 28–34 pp.
- ADB (2018) Price Adjustment Guidance Note on Procurement, Mandaluyong City, Metro Manila, Philippines, 26pp.
- Ahmad, Molwus et al. (2019). Cost Overruns on Federal Capital Territory Authority Road Construction Projects, Nigeria: *FUTY Journal of the Environment*, 1–14pp
- Alinaitwe, Apolot et al. (2013). *Investigation into the Causes of Delays and Cost Overruns in Uganda's Public Sector Construction Projects*. 26pp
- Alves, Elnaz Safapour et al. (2018). *Engineering, Procurement, and Construction Cost and Schedule Performance Leading Indicators: State-of-the-Art Review: Proceeding of Construction Research Congress*, 148-157pp
- Bakey, Ahmad et al. (2015). Termination Construction Contract and The Relate, *The British University in Dubai*, 62pp.
- Bogdanski, Tombini et al. (2015). *Cost Escalation, Schedule Overruns and Quality Shortfalls on Construction Projects, Zambia: American Journal of Applied Sciences*, 50–51pp
- Cochran (1963) *Sampling Techniques*, 2nd Ed., New York: John Wiley and Son, 581-592pp
- Dadi (2017) *Factors Affecting Cost and Time Performance of Construction Project in Ethiopia, Adama Science and Technology University*, 93pp
- Doloi, H. (2013) *Cost Overruns and Failure in Project Management: Understanding the Roles of Key Stakeholders in Construction Projects*, Australia: *Journal of Construction Engineering and Management*, 267–279pp.
- Earl, J. (2010) *Best Practices for Dealing with Price Volatility in Utah Commercial Construction*, *Brigham Young University*, 109 pp.
- Eisenhardt, K. M. (2014) *Building Theories from Case Study Research*, *Stanford University, publisher Taylor & Francis*, 2015. 14(4), 75-77pp
- Eleyan (2018) *Factors Affecting Cost Escalation in Construction Project in Gaza Strip*, *the Islamic University of Gaza Deanship*, 12pp
- Emiru (2016) *Contract Price Adjustment in Ethiopian Construction Industry Misconceptions and Antidotes*, *Bahirdar University*, 16pp

- ENR (2004) For Fabricator, Steel Price Hike Helped Turn Out The Lights: Interstate Iron Works' Liquidation Puts Big New York Job In Limbo, *Engineering News-Record*, and 26pp.
- Ferede (2017) Claims and Disputes Regulation and Management under the MDB- FIDIC 2006 and PPA 2011 Condition *Addis Ababa Science and Technology University*,82pp.
- Gebeyehu (2017) Review on Price Adjustment Valuation Practices in Ethiopian Federal Road Construction Projects, *Addis Ababa University Addis Ababa Institute of Technology*,106pp.
- Groton, J. P. (1997). Alternative dispute resolution in the construction industry, *Dispute Resolution Journal*, 49-57pp.
- Habibi, Kermanshach et al.(2018).Engineering, Procurement, Construction Cost and Schedule Performance Leading Indicators, Texas at Arlington: *Construction Research Congress*, 378-388pp
- Hailu, Mollaw, et al.(2015). Causes of Price Escalation and Its Impact on Construction Contractors in Ethiopia, *Ethiopian Institute of Architecture Building Construction and City Development*, 85pp.
- Jabbar.A. (2017) Research methodology. In Springer Briefs in *Applied Sciences and Technology*, 94pp
- Jithin, Jebestin et al. (2021). Study and Investigation of Price Variation In Construction Materials across Kerala, India, *International Journal of Intellectual Advancements and Research in Engineering Computations*, 2-11pp
- Kanchana & Sukumaran (2020) A Critical Study on Cost Escalation in Construction Industry, India, *International Journal of Engineering Technologies and Management Research*, 194–197pp
- Kitzinger (1994) The Methodology of Focus Groups : the Importance of Interaction between Research Participants. 16pp
- Koirala and Raj (219) Proceedings of IOE Graduate Conference, 2019-Summer Peer Reviewed. 315–320pp.
- Kothri, C. (2004) Research Methodology, Method and Technique, 401pp.
- Le-Hoai, Lee, Y. D et al. (2008). Delay and Cost Overruns in Large Construction Projects: A Comparison with other Selected Countries, Vietnam, *KSCE Journal of Civil Engineering*, 367–377pp

- Memon, Rahman et al. (2014). Factors Affecting Construction Cost Performance in Project Management Projects: Case of MARA large projects: *International Journal of Civil Engineering and Built Environment*, 2289–6317pp
- Mirshekarlou (2012) A Taxonomy for Causes of Changes in Construction, *Middle East Technical University*, 164pp
- Mohammed Ercan (2017) A study on the Price Escalation System in Public Construction Contract in Turkey, 168pp
- Mossa, M. G. (2013) Assessment of Price Escalation and Adjustment Problems on Federal Road Construction Projects, *Addis Ababa University*, 117p.
- Muleyl, S. & Purushottam Dange (2018) The study on Evaluation of Cost Escalation in Infrastructure Projects & It's Provisions, India: *International Research Journal of Engineering and Technology (IRJET)*, 2176–2180pp
- Mulugeta (2018) Assessment of Conditions of Contract Problems in Ethiopian Construction Industry, *DSpace Institution*, 164pp
- Muya, (2014) Cost Escalation, Schedule Overruns and Quality Shortfalls on Construction Projects: The Case of Zambia, *International Journal of Construction Management*, 53–68pp.
- Nega (2008) Causes and Effects of Cost Overrun on Public Building Construction Projects in Ethiopia, *Adis Abeba University*, 105pp
- Omoregie & Radford (2006). Infrastructure Delays and Cost Escalation: Causes and Effects In Nigeria: *Proceeding Of Sixth International Postgraduate Research Conference Netherlands, Delft University Of Technology*, 79–93pp
- Oyieyo, Rambo et al. (2020). Ranking The Prevalence Of Construction Cost Overrun Risk Factors In Completion Of Public-Private Partnership Projects, *International Journal of Research in Business and Social Science* (2147- 4478), 9(5), 351–356pp
- Pearl.R. (1997) Impacts of Absence of price Adjustment Clause on Construction, *California: Journal of Construction Engineering*, 40–45pp
- Prianka. N and Seneviratne (201 5) Costs and Benefits of the Price Adjustment Clause in FIDIC MDB, 20pp

- Rameezdeen, Hamdo et al. (2018). Financing Contractors In Developing Countries: Impact Of Mobilization Advance Payment, Department Of Building Economics, University Of Moratuwa, Sri Lanka In Association With Research Institute For The Built And Human Environment, University Of Sanford, U. In Resource Allocation And Economic Policy 363-373pp
- Razek, Bassioni et al. (2009). Causes of Delays in Building Construction Projects, Egypt: *Journal of Construction Engineering and Management*, 831–841pp
- Tuyishime, P. (2020) Factors Affecting Time and Cost Performance of Construction Projects in Rwanda. *A Case Study of High-rise Building Projects in Kigali*, 119pp.
- Van der Schans (2005) Increasing Material Prices Gouge Construction Industry, Construction Executive (26-29pp.
- Wang, Dulaimi et al. (2004). Risk Management Framework for Construction Projects In Developing Countries, *Construction Management and Economics Journal*, 22(3), 237–252pp
- Wanjari, S. P. & Dobariya, G. (2016) Identifying Factors Causing Cost Overrun Of The Construction Projects In India: *Sadhana - Academy Proceedings in Engineering Sciences*, 41(6), 679–693p
- Yigezu's (2008) Study on the Effects of Unpredictable Price Fluctuation on the Capacity of Construction Contractors. *Addis Ababa University*, 116pp
- Yousif, Nasradin et al. (2020). Price Adjustments in the Construction Industry for publicly funded projects, Sudanese: *FES Journal of Engineering Science*, 6-8pp
- Zegeye (2019) Assessment of Challenges and Best Practices of Price Adjustment on Federal Road Construction Projects, *Addis Ababa Science And Technology University*, 130pp

APPENDIXES-A- QUESTIONNAIRE

Part one: Organizational and Personal profile of Respondent

1.1. Type of your organization

☐ Consulting firm, please specify your grade_____ ☐ Contractor, please specify your grade_____ ☐ Client (project owner) _____

Other (Please specify) _____

1.2. Years since establishment:

☐ <5 years ☐ 5-10 years ☐ 10-15 years ☐ 15-20 years ☐ >20years

1.3. Organization's area of specialization:

☐ Building ☐ Highway ☐ Water Works ☐ All infrastructure

Other (Please specify) _____

1.4. Your work experience in Building construction projects works:

☐ <5 years ☐ 5-10 years ☐ >10 years

1.5. What is your Educational background

☐ Civil Engineer ☐ COTM ☐ Surveying ☐ Construction Technology Other (Please specify) _____

1.6. Your work Experience in different positions?

☐ <5 years ☐ 5-10 years ☐ >10 years

1.5. What is your position in organization?

☐ Project manager ☐ Supervisor ☐ Consultant ☐ site Engineer ☐ Resident Engineer

☐ Surveyor other please specify_____

1.7. Your participation in contract administration, construction supervision, and project management:

☐ <5 years ☐ 5-10 years ☐ >10 years

Part Two: Causing factors for price escalation

Please express your opinion on the rate of occurrence (frequency of occurrence) based on the representative numbers listed below by marking (✓) under each preference

0=Never, 1=Seldom, 2=Sometimes, 3=Often, 4=Always

S. N	Factors causing price escalation	Rate of Occurrence				
		0	1	2	3	4
1	Change order/scope changes					
2	Lack of schedule-oriented supervision					
3	Inflation (Market Volatility)					
4	Improper planning					
5	Change in costs of material, labor, and equipment					
6	Contract document gap in handling price adjustment					
7	Political Interference					
8	Fluctuating in the money exchange rate					
9	Bidders poor understanding of the work they are bidding					
10	Financial difficulties on the part of the Contractor					
11	Changes in Drawings & Specifications					
12	Delayed or non-payment of IPCs					
13	Lack of qualified manpower					
14	poor managerial skills					
15	Bad Weather (Floods or Heavy rains)					
16	Poor sub-contractor performance					
17	Inadequate review					
18	Inadequate scheduling					
19	Material procurement					
20	Equipment unavailability					
21	Staffing problems					
22	Poor coordination on site					
23	Schedule mismanagement					
24	Material fabrication delay					

25	Financial difficulties on the part of the Client					
26	Different site conditions					
27	Suspension of works					
28	Client's Financial processes					
29	Transportation delays					
30	Underestimation of productivity					
31	poor site organization of the contractor					
32	luck of access road to the site					
33	right of way problems					
34	luck of contractor to execute the work with full capacity					
35	manpower controlling problems of as per bid document					
36	Equipment's controlling problems of as per bid document					
37	machinery controlling problems of as per bid document					
38	Long-chain approval system of payment					
39	providing extension time without persuasive reason					
40	luck of strong monitoring and taking correction measure of a regulatory body					

Part Three: challenges to properly implementing price adjustment clauses in public construction projects.

Please express your opinion on the rate of occurrence (frequency of occurrence) based on the representative numbers listed below by marking

0= Never, 1= Sometimes, 2= Usually, 3= Frequently and 4= Most Frequently.

Part Four- Impacts of Improper implementation of price adjustment clauses in public construction projects.

Please express your opinion on the rate of occurrence (frequency of occurrence) based on the representative numbers listed below by marking

1- No Impact, 2- Low Impact, 3-Moderate Impact, 4- High Impact, 5-Very High Impact

S.N	Impacts of misapplication of price adjustment clauses	1	2	3	4	5
1	Project Delay					
2	Reduced Numbers of Bidders					
3	Additional Project Costs					
4	Dispute Among Parties					
5	Termination of project					
6	project financing problem					
7	Loss of Profit					
8	Claim					
9	Loss of project Service					
10	poor project quality					

Part five - Mitigation Measures for Improper Price Adjustment Clause Implementation

representative numbers listed below by marking

0 -Unimportant, 2 – Important 1- Less important, 3 – Very important, 4 – Extremely important

s.N	Mitigation Measures for Improper Price Adjustment Clause Implemen	0	1	2	3	4
1	Reducing payment delays					
2	Good decision making at the right time					
3	Paying full Advance payment to commence the construction of the main work					
4	Special conditions must be drafted by experienced professionals to minimize contradictions and ambiguities with general condition					
5	Early Material Supply Commitments					
6	Regular cost monitoring throughout the project					
7	The use combination of index formula and price difference adjustment based on the nature of the items is better.					
8	Early Material Supply Commitments					
9	Bulk Material Purchases and Supplier Partnerships					
10	Delay the Construction Project					
11	National Construction Price Indexes					
12	Value Engineering for Substitute Materials					
13	Bid Contingencies					
14	Contract Allowances					

Part-6- General Questions

1. How do you rate the fairness of compensation secured to price fluctuation through the formula method of price adjustment, which is current practiced by PPA 2011 local condition of contract?

☐ Extremely fair ☐ Very fair ☐ Fair ☐ Satisfactory ☐ Unfair

If unfair, what are the points you recommend to improve?

_____ please add any supporting comments

2. Current practice shows that the PPA 2011 form of contract is used to administer price escalation in public building projects in Arsi Zone. How do you rate the suitability of the FPPA 2011 form of contract to administer price adjustment in the Ethiopian public building construction sector?

☐ Excellent ☐ Good ☐ Very Good ☐ Satisfactory ☐ Poor

What points do you recommend to improve in this form of contract (if any)?

4. Having to consider the current market situation and price adjustment method practiced by Arsi Zone, which of the contracting parties accept the major risk of price fluctuation?

☐ Arsi Zone ☐ Contractors ☐ Both parties share the risk equally

Please add supporting comments/data _____

5. In the context of the Ethiopian construction industry, one of the drawbacks of using the formula method is the unavailability of reliable locally generated indices. How formula method of price adjustment can be an exercise to secure fair compensation?

a) Establish local price indices and revise it periodically b) Use foreign price indices and apply currency correction to balanced inflations Other (Please specify)

6. While you supervise public building projects in your zone/in your woreda have you faced price fluctuation and issue price adjustment? If you do so how do differentiate

and list the Causing factors to price escalation_____

A. What is the main reason that makes you not provide the price adjustment?

7. From your experience in offering project, consulting, supervising, executing, and regulating public building projects how do you overcome problems of price escalation

A. What are the impacts encountered because of misused price adjustment clauses?_____

B. What do think are the mitigation measures to solve such misuse price adjustment clauses?_____

8. How do you suggest that contractors, consultants, clients, and regulatory bodies should do, to reduce the challenges of price adjustment and mitigate the adverse effect of price fluctuation on Arsi Zone public building projects?

i. Contractors:

☐ Increasing supply of materials and machinery

☐ Improve their ability to predict price fluctuation and propose fair coefficients“ for Adjustable elements

☐ Correct planning and scheduling should be submitted and utilized by contractors

☐ Good decision-making at the right time and good financial management should be Flourished.

☐ Obey favorable rules and propose improvements needed on available price adjustment Method

Others/please specify_____

ii. Consultants:

☐ Prepare contract document which can handle the price adjustment without any Contradiction in both in GCC and SCC

☐ Reducing payment delays,

☐

Develop program-wide contingencies and risk management protocol

- ☐ Controlling the work as per the Master schedule set
- ☐ Consider locally available materials in design
- ☐ Develop an accurate estimate of the number of works and unit prices at the tender stage

Others, please specify _____

iii. Clients:

- ☐ Paying full Advance payment to commence the construction of the main work
- ☐ Incorporate price adjustment clauses in their contract documents
- ☐ Minimization of internal administrative problems concerning project
- ☐ Develop their price database always ask for firm prices
- ☐ Reducing payment delays Others/please specify _____

iv. Regulatory bodies:

- ☐ Evaluate in-depth and correct while contract documents allowing price adjustment are Gate approved.
- ☐ Develop a strong and reliable price database
- ☐ Enforce the practicability of price adjustment as per the signed contract if the price
- ☐ Fluctuation is encountered
- ☐ Always control and regulate the market regularly review rules and regulations monitor the application of existing rules
- ☐ Investigate regularly on the application of price adjustment formula and give feedback to the government to look for improvement.
- ☐ Evaluate and take any corrective measures if any as per the monthly progress report submitted by the consultant others, please specify _____

Thank You!!

APPENDIXES-B-SUPPORTIVE DOCUMENTS FOR CASE STUDY

የናስ ይክአሎ ሀደራ ጠቅላላ ሥራ ተቋራጭ
YONAS YIKEALO HADERA G/CONTRACTOR

Mobil 0911-86 28 48 0911-63 13 91

ቀን 08/05/2010
ቁጥር 446608/10

ለጎሎልቻ ወረዳ ፕሮጀክት ኮሚቴ
ጫንጮ

ጉዳዩ:- በፕሮጀክት ግንባታው ላይ የገጠመንን ችግር ይመለከታል፡፡

ድርጅታችን ከወረዳው በውል የወሰደውን የፕብሊክ ስርቪስ እና የሰው ኃይል ጽ/ቤት ሕንጻ በመገንባት ላይ ያለ መሆኑ ይታወቃል፡፡ ይሁን እንጂ በተፈጠረው የውጭ ምንዛሪ መጨመር ምክንያት የግንባታ ግብአቶች ዋጋ እየጨመሩ መሆናቸውን እና ድርጅታችንም ሊከፈለው የሚገባውን 30% የቅድመ ክፍያ በወቅቱ ወረዳው ከነበረበት የበጀት እጥረት የተነሳ 13.54% ያህሉ ብቻ የተከፈለው ከመሆኑ ጋር ተዳምሮ የገንዘብ እጥረት ሊገጥመን እንደሚችል አስቀድመን በመገመት በቀን 06/02/2010 በደብዳቤ ቁጥር 446605/10 ለወረዳው አስተዳደር ጽ/ቤት እና ለወረዳው ፕብሊክ ስርቪስ ቢሮ በጻፍነው ደብዳቤ የሚመለከተው አካል ለችግሩ አስቀድሞ መፍትሄ አንዲያመቻችልን ስንል መጠየቃችን ይታወቃል፡፡

ድርጅታችን አሁን ላይ ከመሬት በታች ያለውን (Sub - Structure) ግንባታ ለማጠናቀቅ ጥቂት ስራዎች ብቻ የሚቀሩት ሲሆን አሁን ላይ ግን ከላይ በጠቀስናቸው ማለትም የግንባታ ግብአት ዋጋ በመጨመሩ፣ ሊከፈለን ከሚገባው 30% የቅድመ ክፍያ ውስጥ 13.54% ያህሉ ብቻ በመክፈሉ፣ ብሎም ከፕሮጀክቱ ትልቅነት ጋር ተዳምሮ ቀጣይ ስራዎችን ለመስራት ከፍተኛ የሆነ የገንዘብ እጥረት ስለገጠመን የወረዳው ፕሮጀክት ኮሚቴ የጠቀስናቸውን ችግሮች ከግምት በማስገባት በዶክመንታችን ላይ የተቀመጠውን ነገር ግን ያልተከፈለንን የቅድመ ክፍያ ቀሪ ብር ማለትም (16.46%) ተከፍሎን ወደቀጣይ ስራዎች መግባት እንድንችል አስፈላጊውን ትብብር ሁሉ እንዲያደርግልን እያልን በተጨማሪም በውላችን ላይ በተቀመጠልን መሰረት የተፈጠረውን ከፍተኛ የሆነ የግንባታ ግብአት የዋጋን ንረት ያገናዘበ የዋጋ ማስተካከያ በሚመለከተው አካል በኩል እንዲዘጋጅልን በአክብሮት እንጠይቃለን፡፡

ግልጻ፤

- ለአርሲ ዞን ስራና ከተማ ለማት ጽ/ቤት
 - ለአርሲ ዞን ኮንስትራክሽን ቢሮ
- አሰላ



ዮናስ ይክአሎ ሀደራ ጠቀላላ በራ ፕጃራጭ YONAS YIKEALO HADERA G/CONTRACTOR

Mobil 0911 - 86 28 48 0911 - 63 13 91

ቀን 06/02/2010
ቁጥር 44605/10

- ለጎሎልቻ ወረዳ ፕብሊክ ሰርቪስ እና የሰው ኃይል ጽ/ቤት
- ለጎሎልቻ ወረዳ አስተዳደር ጽ/ቤት
- ለሳይት ሱፐር ቫይዘር (ሪድዋን ቃሲም)

ጭንጮ

ጉዳዩ:- የአርማታ ብረት (Re-enforcement bar) ዋጋ መጨመርን ይመለከታል፡፡

ከላይ እንደጠቀስነው ከነሐሴ 2009 ዓ.ም ጀምሮ ከፍተኛ የዋጋ ጭማሪ ሲኖረው የአርማታ ብረት ይረጋጋል ተብሎ ቢታሰብም ከ01/02/2010 ዓ.ም ጀምሮ ተግባር ላይ በዋለው የውጭ ምንዛሪ ከፍ ማለት ጋር ተዳምሮ ይበልጥ መጨመሩ የታወቃል፡፡ ድርጅታችንም አሁን ባለው የግዢ ዋጋ ገዝቶ ወደሰራ ሲገባ ለኪሳራ የሚዳርገን ሲሆን በተጨማሪም ሊከፈለን ከሚገባን 30% የቅድመ ክፍያ ውስጥ 13.54% ያህሉ ብቻ ከመከፈሉ ጋር ተዳምሮ ግንባታውን የሚያጓትትብን ስለሆነ በእናንተ በኩል ከወዲሁ የተፈጠረውን የዋጋ ጎረት ታሳቢ ያደረጉ መፍትሄ እንድታስቀምጡልን በአክብሮት እንጠይቃለን፡፡



ከሰላምታ ጋር

ግልባጭ

- ለአርሲ ዞን ስራና ከተማ ልማት ጽ/ቤት
- ለአርሲ ዞን ኮንስትራክሽን ቢሮ
- ለዮናስ ይክአሎ ጠ/ሥራ ተቋራጭ

Agreement

This agreement made the 22th day of June, 2016 between Sude Woreda Administration Office (hereinafter called "the employer"), of the one part and Girma G/silassie B.C (hereinafter called "the contractor"), of the other part:

Where the contractor is desirous that the contractor execute the construction of Sude Woreda Administration G+1 office Building contract identification number S/W/ADM.01/2008 (hereinafter called "the works") and the employer has accepted the bid by the contractor for the execution and completion of such works and the remedying of any defects therein for the contract price of the equivalent of Ethiopian Birr 10,583,681.93 (Ten million five hundred eighty three six hundred eighty one & 93/100).

Now this Agreement witnesses as follow:

1. In this agreement, words and expressions shall have the same meaning as are respectively assigned to them in the contract referred to.
2. In consideration of the payments to be made by the employer to the contractor as hereinafter mentioned, the contractor hereby covenants with the employer to execute and complete the works and remedy and defects therein in conformity in all respects with the provision of the contract.
3. The employer hereby covenants to pay the contractor in consideration of the execution and completion of the works and the remedying of the defects therein the contract price or such other sum as many become payable under the provisions of the contract at times and in the manner prescribed by the contract.
4. The contract price or such other sum as may be payable shall be paid in Ethiopian Birr in witness whereof the parties thereto have caused to this agreement to be executed in accordance with the law specified in the special conditions of contract of the day, month and year indicated above.

Signed by _____

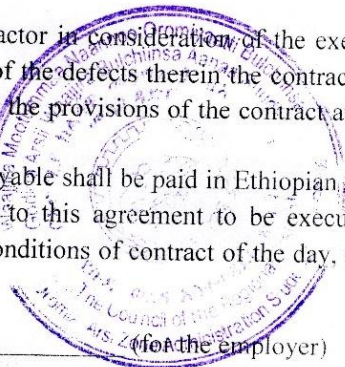
Name _____

Signed by _____

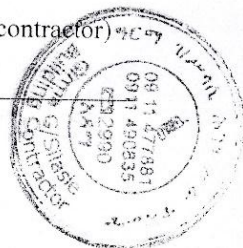
Name _____

Witnesses

1. Muhammedamin
2. Amritu Muhamad
3. Abebech Shiferaw



Girma G/Silassie
G/manager



CERTIFICATE OF PAYMENT NO / 9 /2007

Contract No.-----
Contract Start Date

Site Hand over Date
Commencement Date

Project :Sude Woreda (G+1) Adminstration Office

Employer:- Sude Worda Ad office

Consultant:- Arsi Zone Urban & Housing Dev't Office

Contractor: Dadhi Negasa (GC 5)

Main Contract

Supplementary Contract-1

Supplementary Contract-2

variation order

Sum

15%VAT

Total Sum with 15% VAT

	Amount(Birr)
ct	19,129,900.13
1	
2	
er	
n	19,129,900.13
T	2,869,485.02
T	21,999,385.15

1)As per the attachment the value of work plus material on site Executed to date is

Amount(Birr)
3,241,717.04

Vat 15%

Work excuted with VAT

Deductions

2.Previous Payment with VAT

3.Retention 5% with out VAT

4. Penalty

5. Advance Re-payment 20%

6.Total

7.Total Sum due to contractor with VAT

Amount(Birr)	
186,398.73	
-	
745,594.92	
931,993.65	
contractor with VAT	2,795,980.95

Previous Payment		
NO.	Date	Amount (Birr)
Adva with out vat		3,825,980.03
pay NO.12		
Total Previous Payment		3,825,980.03

We Certify that the contractor is now entitled to the sum of Birr 2,795,980.95

(Two Million Seven Hundred Nity five Thousand Nine Hundred Eight Birr And 95/100 Cents With Vat)

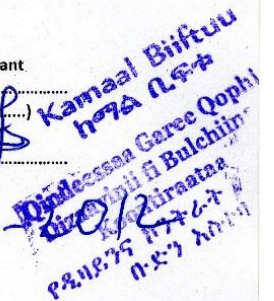
amount of Advance with VAT	3,825,980.03
Amount of adv-repaid	745,594.92
amount of advanceremaining	-

Certified by Site Supervisor

(Date,.....E.C Signature.....)

Approved by Consultant.

(Date.....) Signature.....



REF: 10/BH/4142

11/08/2010

መመሪያ ጊዜ የወጣ ማስታወቂያ

ለ ፍሬውን ኤርገኖ

ባለብት

ከአርሲ ዞን ጤና መምሪያ ጽ/ቤት ጋር በ2008 ዓ.ም ሴኔ ጤና ጣቢያ OR Block
 ግንባታ ለመገንባት ውል መግባታችሁ የሚታወስ ነው። ይሁን እንጂ ከመስሪያ ቤቱ
 ጋር በገቡት ውል መሠረት ግንባታውን ሙሉ በሙሉ በሚፈለገው ጊዜ ውስጥ
 አጠናቀው ማስረከብ ሲገባቸው ስራውን ወደኋላ በማንተት እስከ አሁን ድረስ ማስረከብ
 አልቻላችሁም። በዚህ ምክንያት በተደጋጋሚ በተደረገው ሉፐርቪኝን ሳይት ላይ ምንም
 አይነት የመሻሻል ስራ ካለመሰራቱም በላይ በአሁኑ ጊዜ የግንባታውን ስራ ሙሉ በሙሉ
 አቁማችሁ ከሳይት ላይ መጥፋታችሁ ተረጋግጧል።

ስለዚህ የግንባታውን ስራ ጥላችሁ የጠፋችሁበትን ምክንያት ከአርሲ ዞን ጤና መምሪያ
 ቀርባችሁ በማስረዳት ይህ ማስታወቂያ ከወጣበት ቀን ጀምሮ በ15 (አስራ አምስት) ቀን
 ውስጥ ሳይት በመግባት የቀሩትን የግንባታ ስራዎች እንድታከናውኑ በጥብቅ እያሳሰብን
 ይህ ሆኖ ባይገኝ መስሪያ ቤቱ አስፈላጊውን እርምጃ የሚወስድ መሆኑን በጥብቅ
 እናሳውቃለን።

ከሠላምታ ጋር



Hasan Hajjii Cirroo
 BSC/MPH
 UH/7 UH/2C
 NG Qajeelicha Eegumsa Fayyaa
 Godina Arsii
 PACHA Haaqee Haaqee Haaqee Haaqee

ግልባጭ

- ለአርሲ ዞን ፕሮጀክት ኮሚቴ
- ለአርሲ ዞን ከተማ ልማትና ቤቶች ጽ/ቤት
- ለአርሲ ዞን ኮንስትራክሽን ጽ/ቤት
- ለአርሲ ዞን ገንዘብና ኢኮኖሚ ልማት ጽ/ቤት ቢሮ

አሰላ



APPENDIXES-C-ANALYSIS RESULTS

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.807	0.808	18

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
40.9180	76.277	8.73364	18

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.273	1.672	3.148	1.475	1.882	0.143	18
Inter-Item Correlations	0.190	-0.189	0.558	0.748	-2.949	0.022	18

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Change order/scope changes	2.1148	0.95041	61
Lack of schedule oriented supervision	2.4426	1.16225	61
Inflation (Market Volatility)	3.1475	1.01384	61
Improper planning	2.6557	0.87341	61
Change in costs of material, labor, and equipment	2.9344	0.92860	61
Contract document gap in handling price adjustment	2.4262	0.99094	61
Political Interference	2.1803	1.08794	61
Fluctuating in money exchange rate	2.2459	1.17836	61
Bidders poor understanding of the work they are bidding	2.1311	1.00789	61
Financial difficulties on the part of the Contractor	2.4098	0.93768	61
Changes in Drawings & Specifications	2.2623	1.04724	61

Respondent Profile Analysis Result

Change in Project Cost	Most frequently	Frequently	Usually	Some Times	Never	Total
Respondent Number	14	16	14	10	7	61
Respondent Percentage	22.95	26.23	22.95	16.39	11.48	100

APPENDIXES-D-FOCUS GROUP DISCUSSION QUESTIONS

Opening:

Research Title: Investigation of Price Adjustment Problems in Ethiopia Construction Projects

(The Case of Arsi Zone Public Building Projects)

Introductory

Public Building construction in Ethiopia is challenged by several problems these problems are mainly related to deficiencies and price fluctuation of the inputs required for the construction when we come across this kind of problem due to different factors the local conditions of the contract are not quite enough to handle the case. The study's primary goal is to investigate price adjustment problems by establishing mitigation measures for Ethiopian construction.

Key Questions during Ending of Discussions

- What is the most important thing we talked about Price Adjustment clauses and their implementations in local conditions of the contract?
- Have we missed anything relevant to my study tell me what to add?
- Please summarize about challenges and impacts of the improper implementation of price adjustment clauses we have discussed adequately?
- What do think about the mitigation measures of price escalation/adjustment problems faced in public building projects?

Focused Group Discussion Questions

Participant profile

Name-----Age-----gender-----

Educational background -----Experience-----

Current position-----

Opinions/Values about the title: -----

1. While you supervise public building projects in your zone/in your woreda have you faced price fluctuation and issue price adjustment? If you do so how do differentiate and list the Causing factors to price escalation?
2. From your experience in offering projects, consulting, supervising, executing, and regulating public building projects how do you overcome Consultant/supervisor, client-related and contractor-related causes of the price?
3. While you administered the public building construction contract, are the price adjustment clauses are set properly to handle the case? If it not?
 - A. What are the clauses set improper in local conditions of the contract?
 - B. What is your opinion about these defective contract clauses regarding this price adjustment?
4. During construction execution of public building in your area, what are the Impacts of improper implementation price adjustment clauses?
5. In your long-run journey have you encountered any action to mitigate the improper implementation of price adjustment clauses in your zone? If not what is expected from you?