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**ASSESSMENT OF THE CAUSES AND EFFECTS OF  
PRICE ESCALATION OF FEDERAL ROAD CONTRACTS IN ETHIOPIA**

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PRICE ESCALATION OF FEDERAL ROAD CONTRACTS IN ETHIOPIA**

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## DECLARATION

I declare that this thesis entitled "**ASSESSMENT OF THE CAUSES AND EFFECTS OF PRICE ESCALATION OF FEDERAL ROAD CONTRACTS IN ETHIOPIA**" is my original work. This thesis has not been presented for any other university and is not concurrently submitted in candidature of any other degree, and that all sources of material used for the thesis have been duly acknowledged.

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## Abstract

It is a mere understood fact that road network expansion is essential for a country's economic growth and sectors development through enabling provision of road accesses to a number of regions within a country or several international destinations. This is believed to generate and flourish business transaction locally and globally thereby further promoting the economy of the country. In addition to manpower and machinery cost of road projects, construction materials price such as cement, reinforcement steel bar, bitumen, fuel, etc take the lion's share of the overall total cost of a road construction projects. The ever increasing cost of these construction inputs supplemented with market inflation and other unforeseen national and international factors are hypothetically believed to have strongly contributed to road construction project contracts price inflation.

There has been considerable road project price escalation in Ethiopia over the past years that was believed by most stakeholders to have impacted the overall Road Sector Development Program (RSDP) of the country. Road project prices especially over the recent years have been increasing at an alarming rate that the escalation has been neither linearly compatible with the increasing market indicators nor tangibly justified by concerned stakeholders or researchers.

Due to the fact, there is a speculation created among the stakeholders whether the planned government's budget allocations are sufficient enough to cover anticipated sector programs as a result of periodical high tender price offers received that frequently exceeds pre-tender engineering estimates. This is presumed to jeopardize the number of road improvement works that can be achieved for the planned budget year.

This research focuses and deals with an in depth assessment of the causes and effects of price escalation of federal road contracts in Ethiopia. As a baseline study, the research went through briefly into the historic study of the trend of price escalation of road contracts in our neighboring east and sub-Saharan African countries to support the final outcome of the assessment.

The objective of this research is to identify the possible root causes and effects of price escalation of federal road contracts in Ethiopia so that an awareness of the causes would be created amongst road clients, consultants, contractors and stakeholders of the road construction industry so that timely remedial measures would be taken to mitigate the resulting problems in due possible time.

Hence to address the problem, a questionnaire was designed and disseminated to contractors, consultants and employers involved in the road construction industry and a supplementary desk study was conducted on price escalation of federal road contracts in Ethiopia to assist the survey study.

Based on the findings of the research using simple statistical approaches, Likert's scale and Kendall coefficient of concordance, it's been possible to conclude that, cost inflation of construction materials, change in foreign exchange rate of imported materials, lack of proper budgetary planning and less emphasis given to planning by clients and financiers, cost of labor, equipment and material and the tendency of the client to stick to list bidder criteria rather than analyzing the bid offer against the engineers estimate are the first top five causes in chronological order that triggered price escalation of road contracts in Ethiopia.

Therefore this research signifies that apart and beyond the stakeholders' responsibility, due proper contract management responsibility by road clients is inevitable to play a major role in the construction industry from realization, conception, and procurement to the implementation and follow up stages of road projects so that it would be possible to minimize the prevalence of price escalation of road construction contracts in Ethiopia.

**Key Words:** Price escalation, Cost estimation, Inflation, Unreliable & Engineers estimate.

## List of Abbreviations

AfDB – African Development Bank

BOQ – Bill of Quantity

CPI – Consumers Price Index

DRC – Democratic Republic of Congo

EC - European calendar

ERA – Ethiopian Roads Authority

EU - European Union

GC – Gregorian calendar

GDP – Gross Domestic Price

GOE – Government fund

IDA – International Development Association

MWUD – Ministry of Works and Urban Development

PCU – Passenger Car Unit

QS – Quantity Surveyor

RSDP – Road Sector Development Program

US – United States

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## **CHAPTER 1 – Introduction**

### **1.1 General**

Project's construction cost has significant role to affect the overall construction industry of a country. According to Leibiing ( 2001), the construction industry has a great impact on the economy of a country. Chitrakar ( 2004) further supplements this idea by reiterating that the construction industry in many countries accounts for 6-9 % of the Gross Domestic Product (GDP) of the country. Ethiopia's percentage of GDP (real growth) and inflation as at 2012 was estimated to be 5% and 33.9% respectively (G. Finance, 2013). Whereas in just two years according to the Heritage foundation, (2014), Ethiopia's percentage of GDP (5 year compound annual growth) and inflation as at 2014 is estimated to be 8.7% and 22.8% respectively. In the opinion of the researcher, the cost contribution of construction projects to the GDP is so significant that proper attention should be given to construction industry in due possible time before the impact to the real growth of the country becomes a great concern.

Therefore it is vital to keep track of and understand the relationship between these market indicators and the construction industry in order to assess their impact on the cost of construction projects within the industry in order to give early remedial measures to stakeholders. This is also believed to enable clients review, monitor and evaluate properly their pre-tender project estimates easily, taking into account the prevailing market cost fluctuations for labor, equipment, construction materials before floating their tenders.

Most of our federal road projects acquire fund from organizations like IDA, EU, ADB, etc which follows a strict policy, procedure, and evaluation criterion to allocate budget for their execution, monitoring and evaluation of progress performance. Hence, it is very crucial to make use of project funds effectively and wisely in accordance to the plan and priority requirement set by clients and financiers. This would only be achieved when projects are awarded and completed within their anticipated engineer's estimates.

## **1.2 Background of the Study**

My experience internationally and locally with Ethiopian Roads Authority as highway engineer gave me the opportunity to get involved in preparation of cost break down for construction project during tendering and project execution period. Ever since then I was able to observe a continuous rise in market price of construction materials, machinery and labor. Although common to our neighboring east African countries, over the last five years, I especially have been able to witness unsteady, inarticulate and accelerated escalation of road construction price in the country.

The above phenomenon in my opinion has negatively influenced the planning, programming and tendering process of road projects by road clients like Ethiopian Roads Authority (ERA). In other words, funding of their road projects are presumed to be highly challenged from funding agencies like GOE, IDA, EU and AfDB as a result of possible lack of additional fund to cover for the budget deficits created as a result of price escalation of road contracts being encountered periodically. Therefore, most of the time, contracts significantly deviate from engineer's estimate in that the most stakeholders presume that road clients are biased as to whether to retender or cancel their bids due to over exaggerated project price offer by contractors.

Generally, our re-current road construction cost per km for new contracts is ever escalating and is beyond the general truth of expectations for reasons not clearly defined or understood so far. Therefore, it is inevitable to know where the root cause for such price escalation of road contracts lies to address the problem with the construction industry.

## **1.3 Statement of the Problem**

Construction price escalation of road projects over the past years is believed to have caused considerable budget constraints on road sector development of the country. The uncontrolled rise of these cost have negatively influenced budgetary planning of road construction programs by client and donors in that adhering to the strict policies of the funding agencies

like International banks and donors has been so challenging. Therefore it has been a great challenge to the government to secure and plan budget for new projects according and in proportion to past historical records of engineering estimate as result of the unsteady and inconsistent periodical project price escalation. Therefore, this situation is highly influencing the road construction industry thereby the striving economic development of the country.

Furthermore, according to stakeholders within the construction industry, high bid offers by contractors at tendering stage are being exhibited showing wide discrepancy from the engineers estimate. As a result, the research presupposes that this scenario would strongly affect the fare procurement process of the client, thereby budget allocation program of the government.

Therefore, the research would work towards addressing these pressing challenges facing clients, funding organizations, contractors, consultants and stakeholders, by pin pointing the possible root causes of road construction price escalation and recommend relevant remedial measures that should be taken in due time to curve this problem ones and for all.

#### **1.4 Significance of the Study**

The study is presumed to identify the possible root causes of road construction price escalation in Ethiopia so that awareness will be created amongst road clients, consultants, contractors and stakeholders in mitigating problems which may arise in the area of road project financing, planning and procurement stage. This would enable road funds to be appropriately and proportionately to be allocated according to devised government's program.

As a result, this will create fair competition platform to all road contractors, consultants and stakeholders taking part in the developmental endeavor of the country. It would also help to bring about proper planning, monitoring and evaluation of road projects in terms of priority setting, road coverage and budget allocation by road clients like such as Ethiopian Roads Authority (ERA). Furthermore, this would as well allow the existence of fare, sound and coherent relationship with international funding agencies.

## 1.5 Objective of the Study

The objective of this research is to identify the possible root causes and effects of federal road contracts price escalation in Ethiopia. Based on the findings of this research, conclusion and recommendations will be given to improve and mitigate possible problems which may rise in the field of planning, programming, budgeting and procurement process of federal road contracts. Table 1.1 shows the question and answer approach of the research.

**Table 1.1: THE QUESTION AND ANSWER APPROACH**

NO.	Question	Answer
1	Why has the research been established?	Road Clients are facing construction price escalation of contracts in Ethiopia.
2	What does the research try to achieve?	To identify the possible root causes and effects of price escalation and mitigate problems facing clients with regard to planning, programming and
3	Who will benefit from or be affected by this research?	Road clients, contractors, consultants and stake holders in the construction industry.

## 1.6 Scope and Limitations of the Study

All relevant techniques as enumerated under section 1.1 to 1.6 are used to arrive at the research findings and give due conclusions and recommendations. However, due to budget limitation, the East and Sub-Saharan African data exploration is only confined to survey from literature review, interview and personal contact with international consulting branch offices in Addis Ababa and through email contact with former colleagues operating in Uganda, Kenya and South Sudan.

## 1.7 Overview of the Research Process and Study

This thesis constitutes of five chapters and a brief description of the content of each chapter is discussed here under as follows:

**Chapter I:** This part briefly discusses the research overview, purpose and initiation of the research, how the research process is carried out, scope and limitation of the research as well as the main objective that triggered the development this research.

**Chapter II:** In the literature review part, a general project cost definition and its impact on project implementation, cost estimating inputs, pre contract cost management, Payment system and contract administration, contractor's cost control and monitoring procedure, factors affecting the accuracy of construction cost, cause of cost inflation at tender stage, cost escalation factor classifications, major gaps identified in the Ethiopian construction industry, contract works under ERA, pricing in construction, an overview on contract procurement and implementation of Road sector in the Sub-Saharan African countries are briefly discussed.

**Chapter III:** This part covers the research methodology consisting of the overall research strategy, the research design, the analysis of the data and writing up of the research paper.

**Chapter IV:** This chapter contains the discussion and analysis part comprising of causes and effect of road project price escalation in Ethiopia. It also summarizes the relationship between project price escalation and its rate of occurrences.

**Chapter V:** This part mainly deals with the final output research conclusion and recommendations. It is a section believed to benefit clients, consultants, contractors and stakeholders by serving as a guideline for future road construction endeavors.

## CHAPTER 2 – LITERATURE REVIEW

### 2.1 Project Cost, Cost Estimation and Project pricing

Project cost can be defined as the total economic cost of production and is made up of variable costs, which vary according to the quantity of a good produced and includes inputs such as labor, equipment and raw materials, plus fixed costs according to Wikipedia, the free encyclopedia definition.

In general, the reliability of project cost estimates at every stage in the development process of a country is necessary for responsible Project management. Unreliable project cost estimate results in severe problems of programming, budgeting and planning process that results in an ultimate budgetary decisions which impairs an effective allocation of budgets.

As defined by Project Management Body of Knowledge (PMBOK), Cost estimation is the interactive process of developing an approximation of the monetary resources needed to complete project activities.

According to Brook (2004), the role of the contractor's estimator is vital to the success of an organization. The estimator is responsible for predicting the most economic costs for construction in a way that is both clear and consistent.

There is a distinct difference between cost estimating and pricing. A cost estimate is the cost of the resources required to complete the project work. Pricing, however, includes a profit margin. In other words, a contracting company performing projects for his client may do a cost estimate to see how much the project is going to cost to complete the project. Then, with this cost information, a profit will be added into the project work (Africon, 2008).

According to PDPM (2007), there are two categories of project cost estimates. Project planning cost estimate which is used for project justification, analysis of alternatives, approval and for programming while Project design cost estimate are used to summarize

the cost of a project contract item of work and will be part of the construction contract for the project.

In this literature review, much emphasis is given to the second type of cost estimate which is Project design cost estimate. A project Estimator should thoroughly estimate the costs for all resources that will be associated with the project in order to come up with a realistic total project design cost estimate that will be quoted in a bid offer during tendering.

A successful project manager must be able to plan, predict, budget, and control the costs of a project. Costs associated with projects are not just the costs of goods procured to complete the project. The cost of the labor may be one of the biggest expenses of a project. The project manager must rely on time estimates to predict the cost of the labor to complete the project work. In addition, the cost of the equipment and materials needed to complete the project work must be factored into the project expenses.

Besides to the most economic direct activity cost estimation, similarly the additional cost to be incurred by contractors could also include additional over head costs, costs of extension of various bonds such as performance bond and bank guarantee, operational and maintenance cost of facilities (Dinku & Kahssay, 2003).

It has been increasingly recognized that one of the major difficulties encountered in the implementation of cost estimation in developing countries is lack of proper project preparation (Africon, 2008). Inadequate and poor preparation of projects has often caused the final construction cost of the project to be much higher than estimated cost to complete the project.

Similarly, cost estimation for road projects have been usually undertaken the same way for a number of years in Ethiopia. Following bid advertisement and purchasing of bid document, contractors a head of going into direct pricing of their project, should familiarize themselves with the prevalent ground situations to investigate possible scenarios that may implicate their cost breakdowns.

According to stakeholders with in the construction industry, albeit the general facts and procedures of project pricing approach, it has been a common phenomenon to encounter a high deviation in project price quotations at tendering stages between contractors and pre-tender engineers cost estimate.

Hence the research presupposes that this situation would compel road clients to retender or suspend bid offers totally as a result of an imbalance which may be possibly caused within the budgetary program held by clients and financiers.

## 2.2 Tender Evaluation of Construction Projects

Controlling construction tender evaluation is vital and should be given due attention by clients as it is part of the contract process that may lead to undesired price escalation of projects as a result of corrupt procurement procedures. Therefore, it is important to have a brief overview of the standard proceedings of the procurement process to support the objective of this research.

According to SIGMA (2011), the evaluation of tenders is the stage in the procurement process during which a contracting authority identifies which one of the tenders meeting the set of requirements is the best one on the basis of the pre-announced award criteria, either the lowest-priced or the most economically advantageous tender. The qualified tenderer whose tender has been determined to be either the lowest-priced or the most economically advantageous, as the case may be, is awarded the contract.

The evaluation process will therefore comprise two stages. The contracting authority will first evaluate the selection stage information to ensure that the economic operators are suitably qualified and, then move straight on to the evaluation of the tenders received from suitably qualified economic tenderers.

The evaluation of tenders must be carried out by a suitably competent evaluation panel and in accordance with the general law and Treaty principles of **equal treatment, non-discrimination, and transparency**. The confidentiality of the information acquired by those involved in the evaluation process must be preserved (SIGMA, 2011).

### 2.2.1 What key principles govern the process of evaluation of tenders?

**Non-discrimination:** This Treaty principle means that any discrimination with regard to tenderers on the basis of nationality is forbidden and tenderers from other member states must not be discriminated against in favor of domestic tenderers (SIGMA, 2011).

**Equal treatment:** This general law principle means that all tenders submitted within the set deadline are to be treated equally. They must be evaluated on the basis of the same terms, conditions and requirements set in the tender documents and by applying the same pre-announced award criteria (SIGMA, 2011).

**Transparency:** This general law principle means that detailed written records must be kept (normally in the form of reports and minutes of the meetings held) of all actions of the evaluation panel. All decisions taken must be sufficiently justified and documented. In this way, any discriminatory behavior can be prevented and if not prevented, then monitored (SIGMA, 2011).

**Confidentiality:** Apart from any public tender opening, the process of evaluation of tenders must be conducted in camera and must be confidential. During the process of evaluation, the tenders should remain in the premises of the contracting authority and should be kept in a safe place under lock and key (SIGMA, 2011).

### 2.2.2 How does an evaluation panel evaluate tenders?

The evaluation panel must make sure that the tenders received are complete and that they comply with all of the requirements set by the contracting authority in the tender documents. The evaluation panel can then apply the pre-announced award criteria (either the lowest-price criterion or the Most Economically Advantageous Tender [MEAT] criterion) to evaluate the tenders (SIGMA, 2011).

The evaluation panel will usually carry out the following activities:

- **Formal compliance check**
- **Technical and substantive compliance check**
- **Choice of the best tender on the basis of the pre-announced award criteria**
- **Recommendation for the award of the contract**

**Formal compliance check:** The formal compliance check consists of establishing which tenders are compliant with the procedural requirements and formalities set by the contracting authority in the tender documents. These procedural requirements could include, for example, the submission of tenders in the specified language, with the correct number of copies and including all documents requested. (SIGMA, 2011).

**Technical and substantive compliance check:** The technical and substantive compliance check consists of identifying the tenders that are compliant with the specifications of the contract conditions and other fundamental substantive requirements (for example, the currency used)

**Non-compliance with fundamental requirements:** non compliance with fundamental procedural requirements, specifications and other fundamental substantive requirements must, as a general rule, result in the rejection of the non-compliant tenders. It is against the principle of equal treatment to accept tenders that do not comply with such requirements (SIGMA, 2011).

The reasons for rejecting a tender for non-compliance with specifications and other substantive requirements must be clearly and exhaustively explained and documented in the evaluation report.

**Non compliance with non fundamental requirements:** Generally speaking, non compliance with non-fundamental procedural requirements and specifications and other non-fundamental substantive requirements would not constitute a reason for the rejection of a tender, but it would lead instead to a request for clarification (SIGMA, 2011).

The evaluation panel may, at its discretion and at any time during the process of evaluation of tenders, ask tenderers for clarifications of their tenders:

- When the tender contains inconsistent or contradictory information about the specific aspect of the tender
- When the tender is not clear when describing what it is offering
- When the tender contains minor mistakes or omissions
- When the tender is non-compliant with the non-fundamental formal and/or substantive requirements set in the tender documents

### **2.2.3 The Tender Clarification Process**

#### **2.2.3.1 Choice of the best tender on the basis of the lowest price**

If the award criterion is the lowest price, the tenders submitted by qualified tenderers that:

- meet the set procedural requirements and formalities
- meet the set specifications and other substantive requirements

are compared on the basis of the tendered prices.

Some important issues to keep in mind before comparing tendered prices are:

- a) Tendered prices must include all price elements in accordance with the requirements set in the tender documents.
- b) Any arithmetical error must be corrected and recorded.
- c) Any discount must be applied.
- d) Tenders that appear to be abnormally low must be duly investigated.

### **2.2.3.2 Choice of the best tender on the basis of the MEAT criterion**

If the award criterion is the Most Economically Advantageous Tender (MEAT), tenders submitted by qualified and selected tenderers that meet the set procedural requirements & formalities and meet the set mandatory specifications and other set mandatory substantive requirements satisfies the under listed formalities will be evaluated by applying the pre-announced specific criteria and their relative weighting. If a more detailed evaluation methodology was disclosed in the tender documents, this methodology must be followed (SIGMA, 2011).

#### **Some important points to keep in mind:**

- a) The pre-announced criteria and weightings, any pre-announced sub-criteria and weightings, as well as any pre-announced evaluation methodology can't be changed or waived during the process of evaluation of tenders. Any criteria and methodology must be applied as they stand.
- b) To obtain a meaningful evaluation, the members of the evaluation panel must take a consistent approach when scoring the tenders, and the same scoring rationale must be used.
- c) Before evaluating and scoring the financial aspects of the tenders, the evaluation panel must:
  - make sure that all costs are included;
  - correct any arithmetical errors;
  - apply any discount;
  - investigate any tender that appears to be abnormally low

Evaluation grids/matrices should be used to score the tenders. For the purpose of transparency, these grids/matrices must then be attached to the evaluation report.

### **2.2.3.3 Moderation meeting of the evaluation panel**

A moderation meeting is normally held once all members of the evaluation panel have completed their independent review and scoring of the tenders, if that approach is being adopted.

At the moderation meeting the panel members would consider the scores and comments allocated by each member of the evaluation panel in order to establish the ranking of the evaluated tenders and to agree on the recommendation of the award to be included in the evaluation report (SIGMA, 2011).

In the event of significant differences in the scores given by members of the evaluation panel, a mechanism should be agreed in advance to deal with this issue. Such a mechanism, which must be in line with national legislation, might include, for example, the request for clarifications from tenderers or the engagement of expert advice. In that case, more than one moderation meeting would have to be held.

### **2.2.3.4 Recommendation to award the contract**

The evaluation panel normally has the mandate to issue only a recommendation to the contracting authority regarding the award of the contract, and not to make the final award decision. This arrangement depends, however, on the provisions of national legislation. The recommendation to award the contract is generally contained in the evaluation report

#### **Information that should be contained in the evaluation report**

In broad terms, the evaluation report must confirm who the member of the panel are, describe the contract which is the subject to the evaluation process, confirm the recommendation of the panel and name the proposed tendered and those tenderers who have been unsuccessful. The report should summaries in a clear way the activities carried out by the evaluation panel during the process of evaluation of tenders and provide a clear and detailed analysis of those activities

and their results. There should be a clear justification for any recommendation made (SIGMA, 2011).

### **Recommendation or obligation to cancel the tender process**

There are a number of situations where the evaluation panel may not make a recommendation for the award of a contract. National legislation may also specify grounds for mandatory cancellation. Examples of these situations include:

- No tenders have been received at all;
- None of the tenders received has been found to be compliant;
- All admissible tenders exceed the budget available;
- None of the tenderers (when using the open procedure) satisfies the set selection criteria
- The circumstances of the contract have been fundamentally altered;
- Irregularities occurred during the process of evaluation of tenders.

In this case, the evaluation process recommends, in the evaluation report, the cancellation of the tender process or sets out the mandatory grounds for cancellation. It will then be up to the contracting authority to decide, on the basis of the circumstances of the case and the applicable national legislation, how to proceed (for example, by entering into a negotiated procedure or re-advertising the tender process) (SIGMA, 2011).

### **Award approval**

It is the chairperson of the evaluation panel who normally issues the evaluation report to the contracting authority for approval. It is often the case that the evaluation report is provided to the authorized officer who is responsible for:

- Verifying that the process of evaluation of tenders was conducted properly and asking for any additional clarification or evidence;
- Ensuring that the recommendation of the award is sound and correct; and
- Making the final award decision or making the final recommendation.

It is of utmost importance for the authorized officer of the contracting authority to be knowledgeable about the rules governing the process of evaluation of tenders and more generally about the applicable public procurement rules.

### **Contract award**

Once the award approval has been given, the contracting authority notifies the successful tenderer in writing that its tender has been accepted for the contract award.

### **Mandatory standstill period**

The contracting authority must notify all tenderers and candidates of the contract award decision before it concludes the contract with the winning tenderer. This notification is followed by the 'mandatory standstill period'. The mandatory standstill period means that a minimum number of calendar days (which, in very broad terms, may be either 10 or 15) must elapse between the written communication of the contract award decision to all tenderers and, where relevant, to candidates and the contract conclusion.

### **Contract conclusion**

Once the mandatory standstill period has expired, and provided that no complaint has been received, and depending on national legislation, the contracting authority may proceed with the conclusion of the contract, using the contract template and contract conditions that were included in the tender documents and accepted by the successful tenderer with its tender. The contracting authority must also remember, where relevant, to publish a contract award notice within 48 days of the contract award (SIGMA, 2011).

## **2.3 Cost Estimating Inputs**

It is vital for a contractor to understand thoroughly the prime construction cost inputs parameters and market indicators of project costs before going into tendering a project in order to avoid uneconomical and unrealistic tender offers. Neglecting, not paying attention or bypassing the importance of these prime construction cost inputs is believed to bring about price escalation of road construction projects.

According to Heldman (2002), cost estimating relies on several project components from the Initiation and Planning process. This process relies on various data as briefly discussed here under.

### 2.3.1 Using Historical Information

According to Heldman (2002), historical information is proven information and can come from several places as shown here under:

- **Project files:** Past projects within the performing organization can be used as a reference to predict costs and time. However, caution must be taken to confirm that the records referenced are accurate, somewhat current, and reflective of what was actually experienced in the historical project.
- **Commercial cost-estimating databases:** These databases provide estimates of what the project should cost based on the variables of the project, resources, and other conditions.
- **Team members:** Team members may have specific experience with the project costs or estimates. Recollections may be useful, but are highly unreliable when compared to documented results.

### 2.3.2 Relying on the Resource Requirements

The general output of resource planning serves as a key input to cost estimating. Project's activity break down arrives at a specific unit rates depending on resources requirement. These resources include skills of the labor, the ability or quality of materials and the function of equipment (Heldman, 2002).

### 2.3.2.1 Calculating Resource Rates

The estimator or quantity surveyor has to know how much each resource costs. The cost should be in some unit of time or measure, such as cost per hour, cost per metric ton, or cost per item, etc. If the rates of the resources are not known, the rates themselves may also have to be estimated (Heldman, 2002).

There are four categories of cost in projects according to:

**Direct costs:** These costs are attributed directly to the project work activities and cannot be shared among projects.

**Variable costs:** These costs vary depending on the conditions applied in the project (supply and demand of materials).

**Fixed costs:** These costs remain constant throughout the project (the cost of a piece of rented equipment for the project, the cost of a consultant brought onto the project, and so on).

**Indirect costs:** These are costs associated with supporting staffs, utilities, head office costs, etc

### 2.3.3 Estimating Activity Durations

Estimate of the duration of the activities, which predict the length of the project, are essential for decisions on financing the project (Heldman, 2002). The length of the activities will help the performing organization calculate what the total cost of the project will be, including the finance charges.

The future value of the monies the project will earn may need to be measured against the present value to determine if the project is worth financing.

$$PV = FV / (1 + R)^n; \text{-----[EQ.2.2.1]}$$

PV = Present Value, FV = Future Value, R = interest rate, and n = number of time periods.

### 2.3.4 Long term worth of product's cost

Another aspect the project manager and management may have to determine is the long-term worth of a product in regard to tax deductions.

There are three approaches to deduct the product's cost:

**Straight-line depreciation:** allows the organization to write the same amount each year.

The formula for straight-line depreciation is Purchase Value(P) minus Salvage Value(S) divided by Number of Years(N) in Use.

$$R_2 = 1 / N$$

$$D_n = (P - S) * R_2 = \frac{P - S}{N} \text{-----[EQ.2.2.2]}$$

**Double-declining balance:** is considered accelerated depreciation. This method allows the organization to double the percentage written off in the first year.

$$B_n = BV_o(1 - \alpha)^n \text{-----[EQ.2.2.3]}$$

Declining multiplier  $\alpha$ , range between 1.25 to 2 (double declining balance) decided by the life of the asset.

$$\therefore \alpha = \frac{1.25 - 2.0}{N} \text{-----[EQ.2.2.4]}$$

**Sum of the years depreciation:** It works by writing out the number of years the equipment is in production and adding each year to the year before.

$$SOYD = \frac{N(N-1)}{2} \text{-----[EQ.2.2.5]}$$

$$\therefore D_n = \frac{N - (n-1)}{2} * (P - S)$$

## 2.4 Pre-contract cost management

### 2.4.1 Introduction

Cost management is the process, which is necessary to ensure that the planned development of a design and procurement of a project is such that the price for its construction provides value for money (VFM) and is within the limits anticipated by the client (Potts, 2008).

According to Heldman (2002), Cost management is more than just calculating the cost of the overall project. It also consists of creating a budget (identifying the cost of individual elements of work) and the time-scaling of the overall project expenditure.

According to Brook (2004), the two main benefits of cost planning are:

1. To ensure tenders received do not exceed the budget. This is achieved by making design decisions early with advice from the cost team. Changes made early in the design process can be accommodated without too much effect on other elements.
2. To collect cost information from a number of constructions, at various stages of development, thus improving the quality of cost data for future projects.

Construction is a major capital expenditure, which clients do not commence until they are certain that there is a benefit out of the expenditure. This benefit may be for society in the case of public projects, with justification based on a cost–benefit analysis, or purely based on financial considerations in the case of private projects (Brook, 2004).

According to Potts (2008), most clients are working within tight pre-defined budgets, which are often part of a larger overall scheme. If the budget is exceeded or the quality is not met the scheme could fail. Pre-contract estimating sets the original budget – forecasting the likely expenditure to the client. This budget should be used positively to ensure that the design stays within the scope of the original scheme. (Potts, 2008).

As its name implies the *Project Cost Management* knowledge area (see Figure 2.1) centers around costs and budgets. The processes that make up this knowledge area are as follows: Resource Planning, Cost Estimating, Cost Budgeting, and Cost Control (Heldman, 2002).

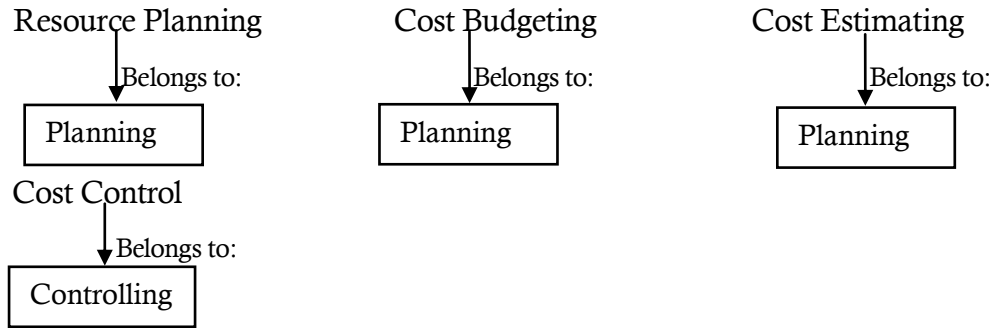


Figure 2.1 Project Cost Management (Heldman, 2002)

Most of the federal road projects in Ethiopia are financed by the Government and International financiers such as the World Bank, and African Development Bank that have strong monitoring and evaluation criterions. Therefore, it is mandatory for both the client and contractors in the construction industry to understand the procedure through which pre contract project cost management should be dealt with as well as to how these funds are being allocated and managed in order to be able meet the procurement guide lines set by the financiers. Following is a brief overview of the financing pattern of the Road Sector Development Plan, RSDP over a period from 1997 to 2011 G.C.

**Financing pattern of RSDP over the period of 1997 - 2011**

The contribution of finance to the implementation of the RSDP 1997 to 2011 G.C shows that 71% came from internal sources (the Government, the Road Fund and the Community). The remaining 29% has been pooled from the international community. Specifically, the share of the Government of Ethiopia is the highest (57%), followed by Road Fund (12.4%), the IDA (10%) and EU (8%). The overall disbursement over 14 years of RSDP is about Birr 79,846.2 million (USD 4,696.8 million). Table 2.1 gives a breakdown of the RSDP disbursements by financier (RSDP, Addis Ababa, 2011).

As per the 14 year assessment of the RSDP analysis, it showed that the flow of capital from each financier during the RSDP implementation contributed by GOE, the Road Fund and communities were growing at the **fastest rate** in recent years ( RSDP, Addis Ababa, 2011).

Table 2.1 : Disbursement of Fund by Financiers (1997 – 2011) (RSDP, Addis Ababa, 2011)  
Disbursement in million ETB

Financier	Disbursement during RSDP I ( 5yrs)	Disbursement during RSDP II (5 Years)	Disbursement during RSDP III (3yrs)	Disbursement during RSDP IV (1yr)	Overall Disbursement during 14 years	% age contribution
GOE	3,455.5	8,669.5	20,354.8	12,925.7	45,405.5	57
Road Fund	978.2	2,555.8	5,030.1	1,337.2	9,901.3	12.4
Community	0.0	884.8	683.5	0.0	1,568.4	2
World Bank	1,432.9	3,135.3	2,544.2	842.3	7,954.6	10.0
European Union	678.1	1,049.7	3,485.0	1,484.6	6,697.5	8
African Development Bank	506.4	517.8	496.4	243.2	1,763.7	2
China			1,252.7	1,904.8	3,157.5	4
Japan	164.9	380.0	307.1	214.3	1,066.3	1
OFID	0.3	293.3	213.6	16.3	523.5	1
Germany	27.7	302.6	67.0	44.6	441.9	1
BADEA	0.0	59.9	175.2	120.7	355.8	0.4
United Kingdom	23.2	135.1	58.6	160.0	376.8	0.5
Nordic Development Fund	14.8	63.9	97.2	17.7	193.6	0.2
Saudi Fund for Development	0.0	39.3	123.2	118.5	280.9	0.4

Kuwait Fund			49.9	61.0	110.9	0.1
Ireland	2.6	20.9	19.3	0.0	42.8	0.1
Sweden	0.0	5.0		0.0	5.0	0
<b>TOTAL</b>	<b>7,284.6</b>	<b>18,113.0</b>	<b>34,957.8</b>	<b>19,490.9</b>	<b>79,846.2</b>	<b>100</b>

*Sector budget support is included under the disbursement*

According to the table, over the period of 14 years of RSDP Implementations, a total of 79.8 billion Eth Birr has been disbursed by the government, local and international financiers.

There is a significant budget demand escalation for road construction from RSDP I to RSDP III. This shows that a significant amount of government budget for road construction program is being spent at faster rate of escalation each year in that relevant sound planning is crucial to enable the client allocate the amount of budgets proportionately according to the need of the socio-economical development of the country.

#### **2.4.2 Tools and Techniques used in project cost estimation:**

According to PMBOK, fourth edition section 7.1, the followings are common tools and techniques to be adopted in project cost estimation.

**Expert Judgment:** use of knowledge gained from past project management experience. Expert judgment, in conjunction with objective estimation techniques, provides valuable information about the organizational environment and information from prior comparable projects.

**Analogous Estimating:** use of the metrics from a previous, similar project as the basis of estimation for the current project. Analogous estimating takes the actual cost of previous, similar projects as a baseline and then adjusts for known differences (such as size, complexity, scope, duration, etc.).

**Parametric Estimating:** use of a statistical relationship between historical data and other variables to calculate an estimate for activity parameters, such as scope, cost, budget, and duration. Used correctly, this technique can produce high levels of accuracy.

**Bottom-Up Estimating:** estimating all individual work packages/activities with the greatest level of detail, summarizing higher-level estimates with the combination of the individual estimates. The accuracy of bottom-up estimating is optimized when individual work packages/activities are defined in detail.

**Three-Point Estimates:** use of three estimates to determine a range for an activity's cost: the best-case estimate, the most likely estimate, and the worst-case estimate.

**Reserve Analysis:** determination of contingency reserves to account for cost uncertainty.

**Project Management Estimating Software** use of project management cost estimating software applications, computerized spreadsheets, simulation, and statistical tools. Such tools can allow for rapid consideration of multiple cost estimate alternatives.

**Vendor Bid Analysis:** determination of what the project should cost based on a review of vendor bids/proposals. This technique may be used in conjunction with other cost estimation techniques to ensure that cost estimates are comprehensive. Whereas the execution of appropriate cost estimation techniques certainly contributes to the accuracy of cost estimates, other project management knowledge areas also play an important role in cost estimation accuracy. For example: Quality Management, Communications Management, Scope Management, Human Resource Management, Risk Management, Procurements management and time management.

### 2.4.3 Cost Estimating on Civil Engineering Projects

According to Potts (2008), cost management should be carried out in such a way that there should be a clear and defined route from feasibility stage through to the placement of a contract, so that the client will have the opportunity whether to proceed with the contract or not. The preparation of the first estimate would be based on a variety of techniques, for example, historical data or approximate quantities.

Major projects often have substantial elements that are unique and for which there is no relevant historic data. In these cases it is necessary to analyze the project in as many individual work sections as can be identified, if possible to prepare indicative quantities and consider the resources necessary to carry out the work (Potts, 2008).

Other matters that have an effect on cost and need to be addressed include location of project and access, especially with regard to heavy and large loads, availability of labor, off-site construction, temporary works. It will also be necessary to consider allowances for design development, allowances for consultants' fees and client's costs, land-acquisition costs and general contingencies (Potts, 2008).

When the client has accepted the first estimate and instructs that the project proceed to the next stage, then this becomes the first cost plan against which further design developments and changes are monitored (Potts, 2008).

The first step in cost planning is to advise a client of a budget at the inception of a project. Once preliminary drawings have been produced, a cost plan can be produced. The contractor is in a position of having detailed knowledge of current prices for all the resources used in construction while, the client has a benefit of rates submitted in priced bill of quantities from a broad selection of contractors. However the rates do not necessarily reflect the actual cost of individual item of works.

The final cost of construction may be different from the forecast, for many reasons, namely:

1. The extent of repairs in a maintenance contract can be difficult to foresee;
2. The effect of competition in the market;
3. The amount and quality of historical data available;
4. The amount of design information available;
5. The performance of the design team;
6. The nature of the workplace in terms of weather, ground conditions, resource prices and other uncertainties;

7. Changes introduced by the client;
8. The estimator's skill and method used.

When developing a cost estimate, clients need to consider the following factors.

1. Land acquisition including legal fees;
2. Client's own organization costs allocated to the project;
3. Site investigation cost;
4. Enabling works, decontamination;
5. Insurances;
6. policy covering both the client and the contractor
7. Consultants' fees including design;
8. Construction costs (typically account for between 70% and 80% of the project sum)
9. Value added tax (VAT) (currently charged at 15%);
10. Contingency and risks (covers for the unknown and may be between 10%)

There are five types cost estimating of civil engineering projects methods, (Keith Potts, 2008).

1. Single rate approximate method
2. Multiple rate approximate method
3. Approximate
4. Analytical
5. Operational

#### **2.4.3.1 Single rate-Approximate Estimating**

##### **A) Unit of Accommodation Method**

This method is commonly used by national bodies such as the education and health services at the inception stage of construction. If a client has an amount of money to spend (a budget) then it would be possible to consider the likely number of functional units which can be provided (Brook, 2004).

From experience, it might be found that the cost of providing a gravel road for a kilometer is 1,200,000 Birr. Using this figure an expenditure of 12 million Birr would provide a total of 6 kilometers of roads. On the other hand if the number of units is known, a budget cost can be calculated.

Providing there are recent comparable data available, the unit method is useful where a simple and quick cost range is needed in the early stages. It is difficult, however, to adjust the costs for specific projects, in different locations, with varying ground conditions and so on (Brook, 2004).

### **B) Floor area method**

The main reason for the popularity of the floor area method is its simplicity. A proposed building is measured at each floor level (between inside faces of external walls); no deductions are made for internal walls, stairs or lift zones. Previous similar building costs are used by dividing the construction cost by the internal floor area.

Adjustments can be made for location and inflation; but specification adjustments are much more difficult to estimate. Subjective judgments are made for size, shape, number of storeys, services, ground conditions and standard of finishes. A separate assessment should be made for external works, demolitions, incoming services and drainage which can be significantly different for similar buildings.

### **C) Building volume method**

There are several methods, which use the volume of a building as costing purpose, but they are not widely used today. In some European countries, architects and engineers are familiar with building costs expressed as cubic meter prices.

#### **2.4.3.2 Multiple-rate approximate estimating**

##### **Elemental cost plans**

A cost plan is prepared from the designer's preliminary drawings. It is a list of the elements of a construction such as substructure, superstructure, major item works and ancillary works floors, each with its share of the total budget cost.

The forecast cost of each element can be calculated in two ways:

1. By measuring the approximate quantity of each element and applying a unit rate;
2. By calculating the proportion of total cost for each element on a similar construction and using this ratio to divide the budget for the proposed construction into its elemental breakdown.

The second method is better shown by example. If a contractor has built some portal-framed factories he will know the costs of each element and can express this information as costs for each unit of floor area.

#### **2.4.3.3 Approximate quantities**

There are many ways in which approximate quantities are used depending on who uses them and for what purpose. Measurements will be concentrated into as few items as possible for grouped work components. A simple example is a hollow block wall measured and priced. The rate will include forming, mortar used, beams and columns, plastering and pointing.

A contractor needs to produce bills of approximate quantities when tendering for work based on drawings and specifications.

The accuracy of this method is related to how far the design has developed. At least the quantities are based on the planned construction and not a previous job and realistic allowances are made for plan shape, height of building, type of ground, quality of finishes etc.

For these reasons it is widely used and being developed with computer systems using database and spreadsheet software to produce standard bills for repetitive construction types. The danger is the cost calculated using approximate quantities can appear to be as accurate as a full bill of quantities based on working drawings. It is more likely to be an underestimate of the cost of construction unless a generous contingency is added for small components, fittings, fixings and design development.

In common with all approximate estimating techniques there are some difficulties which need to be recognized when using approximate method. Some of the difficulties to be faced are:

- The reliability of historical data must always be questioned.
- Preliminaries are usually unique to a particular job and should be calculated whenever there is deviation from an identical scheme.
- Contract conditions can vary markedly between projects; the requirements for bonds, insurances and liquidated damages can be particularly onerous.
- The contingency sum for design development must be estimated for each job.

#### **2.4.3.4 Analytical estimating**

Analytical estimating is a method for determining unit rates by examining individual resources and the amounts needed for each unit of work (Brook, 2004).

This method for pricing bills of quantities is described in the Code of Estimating Practice, in four stages:

1. Establish all-in rates for the individual resources in terms of a rate per hour for labor, a rate per hour for items of plant and the cost per unit of material delivered and unloaded at the site.
2. Select methods and outputs to calculate net unit rates to set against items in the bill of quantities.
3. Add to the net cost project overheads, contingencies, inflation and risk.
4. Summarize resources and prepare reports for management.

According to Potts (2008) unit rates are calculated using the following methods.

- A) Historical rates based on productivity data from similar projects;
- B) Historical rates based on data in standard price books.
- C) Built-up rates from an analysis of labor, materials and construction equipment for each item and cost at current rates.

There are several possible disadvantages of using the unit-rate method for estimating major works. The system does not demand an examination of the programme or the method statement and does not encourage an analysis of the real costs and major costs risks in undertaking the work. Furthermore, the precision and level of detail in pricing each item can give a false sense of confidence in the resulting estimate (Potts, 2008).

Generally, it is not recommended that the data from standard price books are used in the estimating of major civil engineering works, either at tender or when variations are required. The reason for this is due to the possible differences in ground conditions, method statements, temporary works, availability of construction equipment, location of the project and the time of year in which the work is executed etc. Each project should be considered on its own merits and the cost estimate based on first principles using the operational method (Potts, 2008).

Analytical pricing of bills of quantities is more than just applying resources to items of work to produce a unit rate. The constituents of a rate are inserted in the bill; and totaled for each page, each section, and carried to the summary, so that the contractor has a complete picture of the resource costs at the final review meeting.

The benefits of analytical pricing of bills of quantities are:

- A) The total cost of labor is needed to calculate the cost of insurances, transport of operatives, small tools and equipment, and workforce levels.
- B) The breakdown of resource costs is needed to calculate the allowance for firm price tenders.
- C) Labor and plant totals for elements of the work are used to calculate activity durations for the tender programme.

- D) A breakdown of prices is needed in each trade to make comparisons between direct work and labor-only sub-contracts.
- E) The costs of resources are needed to calculate the cost commitment cashflow.

#### **2.4.3.5 Operational estimating**

Operational estimating is a form of analytical estimating where all the resources needed for part of the construction are considered together.

Operational estimating, which is the recommended method for estimating civil engineering works, requires the estimator to build up the cost of the operation based on first principles, that is, the total cost of the construction equipment, labor and permanent/temporary materials.

This method of estimating links well with the planning process as it embraces the total anticipated time that the construction equipment and labor gang are involved in the operation including all idle time (Potts,2008).

The following examples show some of the many other situations where work is priced as whole packages:

- Excavation including trimming, consolidation and disposal;
- Placing concrete in floor slabs including fabric reinforcement, membranes, isolation joints and trowelling;
- Formwork to complex structures including a unique design, hired-in forms and false work;
- Drain runs including excavation, earthwork support, bedding, pipework and backfill;
- Repairs which often involve more than one trade or a multi-skilled operative;
- Roof trusses including the use of a crane, a suitable gang of operatives and temporary works.

The term 'operational estimating' is often applied to methods that rely on a forecast of anticipated durations of activities, and a resource leveling exercise.

The estimator must start with an appraisal of the details on the drawings, the extent of the work described in the specification and bill, and a study of the site conditions. Next, the sequence of work will be found by considering the restraints brought about by site layout, client's requirements, the design, time of year, and temporary works.

The critical operation at each stage of the construction can then be plotted and the rest of the activities sketched in. Labor and plant schedules can be drawn up for direct work, specialist sub-contractors will be asked for their advice about their work. It may be necessary to change the programme if there are any unwanted peaks and troughs in the resources needed on site. The estimator will then have a list of resources for each operation from which to calculate costs. This approach will often produce a cost based on a particular method for carrying out the work. (Potts,2008).

The advantages of operational estimating are:

- Activities are examined to select those methods that are practicable.
- Outputs are based on a programme, which includes holiday breaks, time of year, idle time, facilities available on site etc., giving a more realistic guide to the time needed for labour and plant.
- Alterations and repair work are usually measured as global items which can be overpriced if all the possible trades are examined separately.
- In a competitive market, the estimator may only look at the labor and plant needed for the core item of work; such as the brickwork in a manhole assuming the bricklayer can fix the cover while finishing the brickwork and the excavator can dig the pit when it digs the pipe trench.

## 2.5 Pricing in construction

The construction industry in most countries of the world is one of extreme competitiveness, with high risks and low margins of profit when compared with other areas of the economy. Consequently, pricing is one of the most important aspects of marketing in construction.

However, in contrast to other industries, transactions and contracting in construction are conducted through the competitive bidding process, so that pricing mostly takes place in the bidding process (Mochtar & Arditi, 2000).

Although, this research focuses its more attention on the price inflation of federal road contracts in Ethiopia, rather than the cost estimating and pricing, it is considered worth to raise the issue in brief for the sake of the totality of this research.

Basically there are two types of pricing. These are Cost based and Market based pricing.

Currently, the pricing approach used in construction is cost-based where the pricing involves estimating the project cost, then applying a profit Margin.

Market based pricing is a variation of purely cost based pricing where a profit margin is included based on additional market information.

The cost optimization process in market based pricing involves adjusting the estimated costs to the price range allowed by the market. In this type of pricing detailed project cost estimating tasks are performed independently of market data collection. A decision is then made whether to bid or not, based on whether the company can achieve cost levels that are within the market price range (Mochtar & Arditi, 2000).

Once a decision to bid is made, the risk policy of the company is decided. The company could skim or penetrate the market. Skimming involves pricing the bid offer relatively higher than the market would allow, based on the belief that the company enjoys competitive advantage over the other bidders in terms of delivering the owner's most important requirements and providing the owner with best value.

Skimming aims to maximize a company's profit. On the other hand, penetration is the opposite of skimming. Penetration involves keeping the profit margin deliberately and consistently lower than the market standard in order to outbid competitors already entrenched in a particular sector of the industry. This policy aims at penetrating a sector for the sake of securing a foothold in that sector, even though it is known that the project will generate minimal profit or maybe a small loss (Mochtar & Arditi, 2000).

## 2.6 Payment System and Contract administration

Payment systems can be classified in a variety of ways and any classification is unlikely to be exhaustive. Contract strategies can be broadly categorized as either price-based or cost-based (Potts, 2008).

1. Price-based – lump-sum or re-measurement with prices being submitted by the contractor in their bid, or
2. Cost-based – cost-reimbursable or target-cost, the actual costs incurred by the contractor are reimbursed together with a fee to cover overheads and profit.

A key consideration in the choice of payment system is the allocation of the risk to the parties. Fig.2.1 Relationships between types of payment system the degree of risk associated.

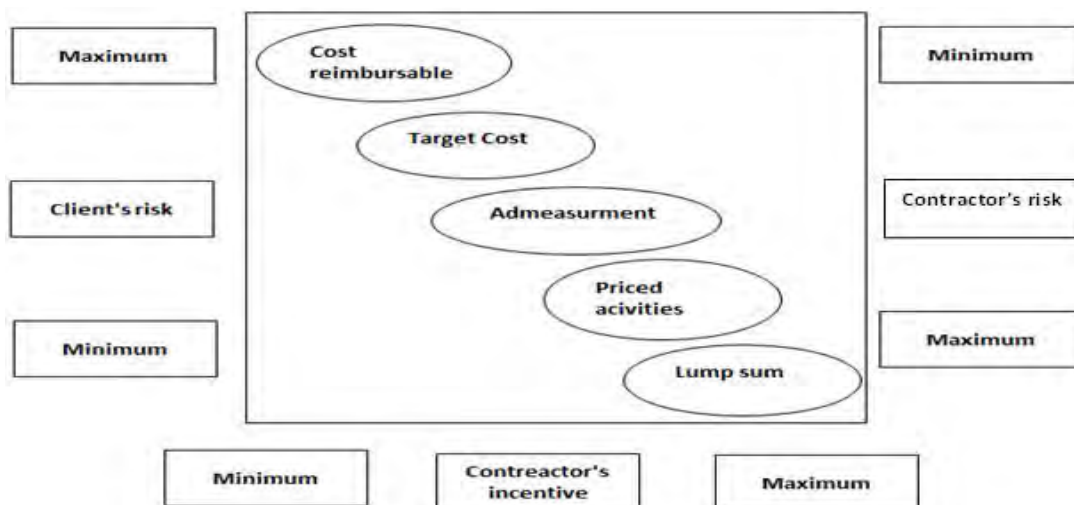


Fig.2.1 Relationships between types of payment system (Ridout, 1982)

### **2.6.1 Price-based, lump-sum plan and specification**

Under the lump-sum system contractors are required to estimate the quantities and subsequently calculate the tender sum based on the client's design drawings and specification. The design should therefore be completed prior to tender with little or no changes to the design anticipated after tender (Potts, 2008).

Lump-sum contracts should thus provide a client with maximum price certainty before construction commences. The payment to the contractor can either be on fixed installments or linked to the progress of the works. Schedule of rates may be used under this system to facilitate valuation of variations.

The schedule seldom attempts to be comprehensive and if the rates are not made part of the tender can be unreliable. Seeley , (2001) further identified the following difficulties which are likely to arise when using this system:

1. Effectively comparing and evaluating tenders when each contractor prepare their own analysis;
2. Accurately evaluating monthly payments;
3. Accurately valuing variations;
4. Maintaining proper management of contract

### **2.6.2 Price-based, bills of quantities (BOQ)**

When a Bill of Quantity is used it usually forms one of the contract documents and the client carries the risk of errors. In contrast, where the contractor computes the quantities, the contractor takes the risk of errors in the quantities (Potts, 2008).

In the civil engineering work sector the Bill of Quantity is further prepared based on one of the two methods of measurement, the Method of Measurement for Highway Works and for other civil engineering works (Potts, 2008).

Due to the unforeseen nature of the ground conditions, the Bill of Quantity were based on estimated quantities with the whole work subject to re-measurement based on the finalized drawings or in the case of excavation of rock-agreed site levels.

## 2.7 Contractors' cost-control and monitoring procedures

Cost management is very much more than simply maintaining records of expenditure and issuing cost reports. Management means control, so cost management means understanding how and why costs occur and promptly taking the necessary response in light of all the relevant information. Keeping a project within budget depends on the application of an efficient and effective system of cost control.

From the information generated it should be possible not only to identify past trends but also forecast the likely consequence of future decisions including final out-turn cost, that is, the final account (Potts, 2008).

Bennett, (2003) identifies that there are three purposes of a contractors' cost-control system:

1. To provide a means of comparing actual with budgeted expenses and thus draw attention, in a timely manner, to operations that is deviating from the project budget;
2. To develop a database of productivity and cost-performance data for use in estimating the costs of subsequent projects;
3. To generate data for valuing variations and changes to the contract and potential claims for additional payments.

Two related outcomes are expected from the periodic monitoring of costs:

1. Identification of any work items whose actual costs are exceeding their budgeted costs, with subsequent actions to try to bring those costs into conformance with the budget;
2. Estimating the total cost of the project at completion, based on the cost record so far and expectations of the cost to complete unfinished items.

### 2.7.1 Developing a cost-control system

According to Potts, (2008) it was pointed out that, the type and complexity of any cost-control system will be determined by the resources available to operate the system and the use made of the system by the relevant management personnel.

Pilcher, (1994) considers that a wide variety of issues need to be considered when developing a contractor's cost-control system, namely the size of company, the type of work –building or civil engineering and the different contractual arrangements.

Harris and McCaffer, (2006) recommend that cost control should be exercised before the costs are committed. They point out that most cost-control systems have an inordinately long response time.

Research found that traditionally contractors' quantity surveyors (QS) only monitored costs rather than control costs which made their role reactive rather than proactive, (Cornick and Osbon's ,1994).

198 Management of the post-contract stage concluded that, an effective cost-control system should contain the following characteristics (Cornick and Osbon's ,1994).:

- A budget for the project set with a contingency figure to be used at the discretion of the responsible manager; costs should be forecast before decisions are made to allow for the consideration of all possible courses of action;
- The cost-recording system should be cost-effective to operate;
- Actual costs should be compared with forecasted costs at appropriate periods to ensure conformity with the budget and to allow for corrective action if necessary and if possible;
- Actual costs should be subject to variance analysis to determine reasons for any deviation from the budget;
- The cost implications of time and quality should be incorporated into the decision-making process.

There are two ready-made types of contractor's cost-control systems:

1. Monthly review of the project;
2. A more detailed analysis of the sections within the project in order to identify those sections of the works which are underperforming.

## **2.8 Causes of Cost inflation at Tender stage**

Cost increase or inflation is a major problem in both developed and developing countries according to (Angelo and Reina,2002).

The causes of cost inflation in construction projects are different. Some are not only hard to predict but also difficult to manage (Morris and Hough, 1999). Inflationary pressures, increases in material prices and workmen's wages, difficulties in obtaining construction materials, construction delays, deficiencies in cost estimates prepared by public agencies and unexpected sub soil conditions were the most important sources for cost overruns according to study conducted in Turkey by Arditi, et al, (1985).

According to study conducted in Mozambique 2011 on cost increase in Road construction industry, there is a general acceptance that the tender documentation provided in the road sector is largely inaccurate and sometimes confusing. The Consultants interviewed largely agreed with this criticism and sight the absence of clear requirements in the terms of reference for Consultancy proposals for design in the road sector.

Furthermore, the consequences of poor pre tender services include the absence of identified, tested and quantified material sources leading to claims for delay, additional haul distances and often redesign. The resulting tender documents effectively pass the risk factors inherent in a project where insufficient pre tender investigation has been done onto the bidders and this risk is inevitably transformed into increased prices.

According to interview of contractors in Mozambique, delays in procurement and payment, inadequate pre tender investigations and resulting inaccurate tender documentation as the prime cause of increases in costs and high assessment of risk.

Factors influencing construction time and cost inflation for high-rise projects in Indonesia, and major factors influencing the cost according to Kaming, et al, (1997) were material cost increase due to inflation, inaccurate material estimating and the degree of project complexity.

In other words, Mansfield, et. Al. (1994), reiterated that cost inflation is attributed to problems in finance and payment arrangements, poor contract management, material shortages, changes in site conditions, design changes, mistakes and discrepancies in contract documents, mistakes during constructions, price fluctuations, inaccurate estimating, delays, additional work, shortening of contract periods, and fraudulent practices and kickbacks.

According to Robert F. Cox, (2007), project owners identified five reasons for project cost escalation: these reasons were, incomplete drawings, poor pre-planning process, escalating cost of materials, lack of timely decisions and excessive change orders.

The following are the factors that change the cost of the construction projects through time according to Project Management User's Guide, (2005),: poor project management, design changes, unexpected ground conditions, inflation, shortages of materials, change in exchange rates, inappropriate contractors, funding problems and force majeure.

## **2.9 Factors affecting accuracy of cost estimate**

The success or failure of a project is dependent on the accuracy of several estimates done throughout the course of the project (Dozzi and Abou Rizk, 1994). Therefore, the preparation of a cost estimate of the project is one of the most difficult tasks in project management because it must be done before the work is accomplished (Oberlender, 1993).

Pre-tender cost estimating is simply the final costing of the work carried out by a consultant (i.e., quantity surveyor or engineer) on behalf of a client (Odusami and Onukwube, 2008) before tenders are received. It sits somewhere between cost planning and post-contract cost control, provides an indication of the probable construction cost prior to contract-awarding

and involves collecting, analyzing and summarizing all available data related to the construction of the project (Holm et al., 2005).

Thus, for a contractor to secure a job, his cost estimate must be as accurate and competitive as possible (Marjuki, 2006). Inadequate estimating invariably leads to misallocation of scarce resources (Flyvbjerg, Holm and Buhl, 2002).

An estimate can be accurate, low or high. An accurate estimate generally results in the most economical project cost, while either an underestimation or an overestimation often leads to greater actual expenditures. Inaccuracy in the estimate of a project may arise from two sources: bias associated with the project itself and bias associated with the estimating techniques used and the operating environment (Aibinu and Pasco, 2008).

Accurate estimation of construction costs is heavily dependent on the availability of quality historical cost data and the level of professional expertise, among other things. The limited information available at the early stages of a construction project may mean the quantity surveyor must make assumptions about the design details of a project, which may not eventually as project design, planning and construction evolve (Liu and Zhu, 2007).

Identification of these low visibility factors is very important for improving the overall performance of the construction industry. Thus one of the purposes of this paper is to identify the root cause or factors essential in affecting the accuracy of pre-tender cost estimate in Ethiopia which ultimately lead to price escalation of road contracts.

There are two types of factors, control factors and idiosyncratic factors, influence and contribute to the cost of a project. Control factors are the factors that can be controlled by estimators to improve the performance of estimation, while idiosyncratic factors influence cost estimation but are outside the control of the estimators and include market conditions, project complexity, weather, contract size, site constraints, resource availability, type of procurement system and contract work type (Liu and Zhu, 2007).

According to Journal of Construction in Developing Countries, Mohammed and Abdel Hadi, (2013), an exploratory study of factors affecting the accuracy of pre-tender cost estimates was conducted to determine the relative level of influence of each factor. The ranking of 64 factors revealed that the **ten most influential factors** affecting cost estimate accuracy are as follows:

**a) Material (prices/availability/supply/quality/imports)**

Material prices obviously differ on the basis of time as well as from market to market. Some of the availability of specific materials for project use might be insufficient or even out of stock. In this case one will be forced to utilize imported items for tender preparation which might inflate the overall cost of the project. In other words, if we have scarce specialized suppliers of a given material, the risk of getting high tender cost as a result is also apparent.

**b) Borders closure and blockade**

Cost of materials to be used for tendering purpose is dependent upon the access to the type of supply. A contractor can get delivered different construction items through road, air or sea transport available. Sometimes even at the time of bidding an item that was used to get delivered through air could be accessed only through sea transport as a result of blockade due to certain circumstances. This kind of situations can end up with high and unexpected material cost.

**c) Project team's experience in the type of construction**

The estimator must have prior knowledge of site conditions to produce an accurate estimate. Contractors are selected on the basis of price, experience in undertaking particular types of construction project and their reputation or track record in producing high quality work within budget and on time.

According to Yates et al, (2003), in contracts where the Engineer's estimate is at least 15% greater than the contractor's bid amount there is a strong likelihood of cost rise/overruns. Therefore, these projects need to be carefully tracked and documented.

There are cases where the prime contractor and sub-contractors go into bankruptcy during the construction period. This can lead to significant delays and extra costs arising as the project owner has to re-tender the remaining work to be undertaken by another contractor.

**d) Experience and skill level of the consultant**

This result indicates that to produce an accurate estimate, those involved in the estimating process must have the relevant professional knowledge and skills. The accuracy of a cost estimate is highly dependent on the level of estimator experience. Having an experienced estimator is critical for producing high-quality and reliable cost estimates. Dysert (2003) emphasized that if an estimator were more professional, budget and other related problems could be greatly reduced.

**e) Having clear and detailed drawings and specifications**

To have a good estimate of a project, the estimator should be well conversant of the detailed drawing and specifications and adhere to specifications. If the drawings lack detail and the specification is not clear, the ultimate result of the tender estimate would be incorrect.

**f) Quality of information flow**

Cost estimates for construction work are produced at a specific point in time and the prices used therein are relevant only for that time and for short near future. This is because prices for items supplied and work undertaken are continually subject to market forces.

**g) Completeness of cost information**

The cost information to be used for pricing should be complete. To estimate the price of concrete, the estimator should gather all information related to labor, material and equipment to be incorporated in the making of the concrete to price the concrete.

**h) Accuracy and reliability of cost information**

Most studies that compare actual cost at completion and estimated costs at the beginning of bid award of construction projects explain what they call “forecasting errors” in technical terms, such as imperfect techniques, inadequate data, honest mistakes, inherent problems in predicting the future, lack of experience on the part of forecasters, etc. [Wachs, 1990].

**i) Currency exchange fluctuation**

The change in foreign exchange rate is particularly relevant if materials or other elements of the construction project are being purchased from foreign countries. If the foreign exchange rates change beyond the expected level; then the cost of the project may increase which automatically leads to cost overrun.

Adamson (1996) defines inflation as the rate of increase in general price level in an economy. Generally, inflation is the term used when paper money loses value, or the buying power of money becomes less.

Inflation can act to increase the construction costs. If the rate of inflation increases above the predicted level during the construction period, then the original cost estimate will be exceeded. Obviously any factor that delays a construction project will expose the project to the risk of further inflationary cost increases.

Due to the nature of the process and the rate of return for work undertaken on construction projects, the effects of inflation can cause loss of profit to contractors and higher cost overrun to project owners.

**j) Clear contract conditions**

Conditions in the contract directly or indirectly related to the overall cost of the project should be explicitly expressed in the contract so that the estimator will have clear contract condition to work on the pricing. The unit measure of each and every activities, the type of

pricing and price adjustment method to be used are crucial to avoid incorrect and ambiguous pricing of the project.

There are several factors that affect the accuracy of pre tender cost estimate today in Ethiopian road construction industry. Most of which are believed to lie on the initial stage of tender preparation and lack of accurate detailed design.

Various studies have focused on identifying these factors that affect the accuracy of pre tender cost estimate out of which, Gunner and Skitmore (1999) have identified 12 factors affecting the accuracy. These are construction function, type of contract, conditions of contract, contract sum, price intensity, contract period, number of bidders, good/bad years, procurement basis, project sector (public, private or joint), number of priced items and number of drawings.

Ling and Boo (2001), using data from 42 projects in Singapore, found similar results when they compared five variables against Gunner and Skitmore's work. Skitmore and Picken (2000) studied the effects of four independent variables (building type, project size, sector and year) on estimating accuracy and tested these variables against 217 projects from a quantity surveyor based in the United State of America (USA). They found that bias existed in project size and year and consistency errors existed in project type, size and year.

By reviewing 67 construction projects around the world, Trost and Oberlender (2003) identified 11 orthogonal factors that contribute to the accuracy of early stage estimate out of which, the five most important are process design, team experience and cost information, time allowed to prepare estimates, site requirements and bidding and labor climate.

Elhag, Boussabaine and Ballal (2005) stated that the technological and project design, the contractor's expertise and management ability and the client's desired level of construction sophistication play important roles in determining the cost of a project. According to them, most of the significant factors affecting project costs are qualitative, such as client priorities (e.g., completion time, procurement methods, market conditions, etc.).

Enshassi, Mohamed and Madi (2007) examined cost estimating practices in contracting companies operating in the Gaza Strip. Their study revealed that the most important factors affecting contractors' cost estimates are the financial.

## 2.10 Cost Escalation Factor Classification

According to S. Shane, (2009), a better understanding of the cost escalation factors is achieved through understanding the forces driving each factor or where the factor originates. With this understanding it is possible to design strategies for dealing with these cost escalation factors.

The factors that affect the estimate in each project development phase are by nature internal and external. Factors that contribute to cost escalation and are controllable by the agency/owner are internal, while factors existing outside the direct control of the agency/owner are classified as external.

**Table 2.2** Cost Escalation Factors by Cause and Development Phase

Internal	External
Bias	Local concerns and requirements
Delivery/procurement approach	Effects of inflation
Project schedule changes	Scope changes
Engineering and construction complexities	Scope creep
Scope changes	Market conditions
Scope creep	Unforeseen events
Poor estimating	Unforeseen conditions
Inconsistent application of contingencies	
Faulty execution	
Ambiguous contract provisions	
Contract document conflicts	

### 2.10.1 Internal

Internal factors are cost escalation factors that can be directly controlled by the project's sponsoring agency/owner:

1. **Bias:** is the demonstrated systematic tendency to be overoptimistic about key project parameters. It is often viewed as the purposeful underestimation of project costs to ensure a project remains in the construction program.
2. **Delivery/procurement approach** effects the division of risk between the agency/owner and the constructors, and when risk is shifted to a party who is unable to control a specific risk, project cost will likely increase.
3. **Project schedule changes**, particularly extensions, caused by budget constraints or design challenges can cause unanticipated increases in inflation cost effects even when the rate of inflation is accurately predicted.
4. **Engineering and construction complexities** caused by the project's location or purpose can make early design work very challenging and lead to internal coordination problems and project component errors. Internal coordination problems can include conflicts or problems between the various disciplines involved in the planning and design of a project.
5. **Scope changes**, which should be controllable by the agent/owner management, can result in underestimation of project costs.
6. **Scope creep** is the tendency for the accumulation of many minor scope changes to increase project costs. While individual scope changes may have only minimal cost impacts, the accumulation of these minor changes, which are often not essential to the intended function of the facility, can result in a significant cost increase over time.

7. **Poor estimating** can lead to project cost underestimation. Estimate documentation must be in a form that can be understood, checked, verified, and corrected. The foundation of a good estimate is the formats, procedures, and processes used to arrive at the cost.
8. **Inconsistent application of contingencies** causes confusion as to exactly what is included in the line items of an estimate and what is covered by contingency amounts. Contingency funds are typically meant to cover a variety of possible events and problems that are not specifically identified or to account for a lack of project definition during the preparation of early planning or programming estimates.
9. **Ambiguous contract provisions** dilute responsibility and cause misunderstanding between an owner and project design and construction contractors.

### 2.10.2 External

External cost escalation factors are those factors over which the agency/owner has little or no direct control over their impact. However, the agency/owner needs to consider them when estimating project costs. During the planning and design phase of project development external factors such as local government concerns and requirements, fluctuations in the rate of inflation, scope change, scope creep, and market conditions can lead to underestimation of project costs.

1. **Local concerns and requirements** typically include mitigation of project impacts on the surrounding community as well as negotiated scope changes or additions.
2. **Effects of inflation** is a key factor in the underestimation of costs for many projects. The time value of money can adversely affect projects when 1) project estimates are not communicated in year-of-construction costs, 2) project completion is delayed and therefore the cost is subject to inflation over a longer duration than anticipated, and/or 3) the rate of inflation is greater than anticipated in the estimate.

3. **Scope changes, which are not controllable by the owner**, can lead to underestimation of project cost escalation.
4. **Scope creep** is similar to changes in scope; however, this is the effect of the accumulation of multiple minor scope changes.
5. **Market conditions or changes in the macro environment** can affect the costs of a project, particularly large projects. Often only large contractors or groups of contractors can work or even obtain bonding for a large project. The size of the project affects competition for a project and the number of bids that an agency/owner receives for the work.
6. **Unforeseen events are unanticipated and typically not controllable by a project owner**; these could be occurrences such as floods, hurricanes, tornadoes, or other weather related incidents. Typically these are called “acts of God.” These acts can bring construction to a standstill and have been known to destroy work creating the need for extensive rework or repair. Events controlled by third parties that are also unforeseen include terrorism, strikes, and changes in financial or commodity markets. These actions can have devastating results on projects and on project costs Akinci and Fischer (1998) and Arditi et al. (1985).
7. **Unforeseen conditions are notorious for causing cost overruns**. Unknown soil conditions can effect excavation, compaction, and structure foundations. Contaminated soils may be present. Utilities are often present that are not described or described incorrectly on the drawings.  
  
There are a multitude of problems that are simply unknown during the planning and design phases and which can increase project cost when they become apparent during construction, Akinci and Fischer (1998); Arditi et al. (1985).
8. **Contract document conflicts** lead to errors and confusion while bidding and later during project execution they cause change orders and rework □ Callahan 1998; Chang 2002; Harbuck 2004.

## **2.11 Overview of Road sectors in the Sub-Saharan African countries**

### **2.11.1 East African Functional Road Classification Standards**

In Kenya roads are classified into five functional classifications based on their functional characteristics. For design purposes roads are classified into seven classes upon which typical road cross sections are defined which in turn are classified based on AADT or DHV of ten years time passenger car units.

In Tanzania there are three functional classes and five design classes of road. The division into road design cases is partly governed by design traffic in the design year and the functional classification of road. Further geometric road cross sections parameters and road reserve width are specified for each road design classes.

On the other hand there are five functional classes and seven design classes of roads in Uganda. The division into road design classes is governed by the design speeds in levels, rolling and mountainous terrains as well as capacity in passenger car per unit (PCU) per day. Further other geometric design parameters including cross section dimensions are specified for each design classes.

In other words, road classification in Ethiopia is governed by design traffic in the design year and the functional classification of road. Accordingly, there are five functional classes and seven design classes of road.

This shows that road functional classification in Ethiopia is closely similar to road classification in sub Saharan countries whereby examining the inter relationship of pre tender cost estimate to identify the real factors causing project price escalation at tender stage is important.

### **2.11.2 Engineer's estimate and contracted price of Neighboring countries**

According to report from World Bank on road sector development of Sub Saharan African countries Africon (2008), a set of indicators was constructed to perform comparative assessments of the contract procurement and implementation processes in the road sector across 13 countries in Sub- Saharan Africa: Congo, Democratic Republic of Congo (DRC), Ethiopia, Ghana, Kenya, Malawi, Mauritania, Mozambique, Madagascar, Nigeria, Tanzania, Uganda, and Zambia. A new specialized dataset is generated for 109 road and bridge works contracts and 76 supervision consultancy contracts between 1999 and 2007 in 22 projects financed by the World Bank (Alexeeva, 2008).

A number of the road works contract values exceed their engineer's estimates by a large margin of 30 percent and above. The highest difference between the engineer's estimates and the contracted price is observed in Mozambique at 99.3 percent; it has also the highest average of 46.5 percent in comparison with other reviewed countries. On average, the contracts are 24.8 percent higher than their engineer's estimates in Uganda, and around 22 percent in Ethiopia, Nigeria, and the Democratic Republic of Congo (DRC). Only the contract values in Ghana are consistently lower than their estimated costs by 9.2 percent on average. This may be a result of fierce competition, which is traditionally observed in Ghana ( Alexeeva, 2008)

The difference between the engineer's estimates and the contracted values varies significantly across and within the countries. Some differences could be attributable to the quality of the engineer's cost estimates that may have substantial shortcomings, (Alexeeva, 2008).

The road sector contracting of the Bank-financed projects in the reviewed countries is characterized by a limited number of firms dominating large-scale road works contracts. The market is split between the African firms and mainly the Chinese and European contractors. The largest contracts are generally awarded to the international contractors, in particular those from China.

### 2.11.3 Project cost estimate for African and Foreign contractors

The African firms outperform the Chinese and European contractors in a number of indicators related to the procurement process but underperform in the implementation. For the African firms, the pattern shows a narrower average range between the contract values and their engineer's estimates, a shorter period to evaluate the bids and sign the contracts, and a higher level of competition. However, they lag behind on the indicators related to the implementation process incurring higher cost overruns and longer delays. (Alexeeva, 2008)

The African firms have a cost advantage over the Chinese and European firms. They are in a tight competition with the Chinese firms whose cost to implement road works of similar nature is almost the same. The average cost of road works carried out by the European contractors is considerably higher. (Alexeeva, 2008)

Contract cost increase during implementation is considerably higher in some of the countries in the sample. The highest cost overruns are observed in Nigeria, where the contracts increased their original value by 39.7 percent on average during implementation. The average cost overruns in Ghana are 34 percent, where one contract increased its value by 86 percent. The cost increases for Mozambique and Tanzania are around 18 percent,(Alexeeva, 2008)

According to study of unit costs of infra structure projects on sub Saharan countries by Africon (2008), sampled for 115 road projects, including 25 contracts to build new paved roads, 45 to rehabilitate paved roads, 8 to maintain paved roads, and 37 to re-gravel unpaved roads. The resulting unit costs for road construction and maintenance are summarized in Table 2.3. There is strong evidence of a scale effect, with projects involving less than 50 kilometers of road costing significantly more than larger projects, particularly where new construction is concerned,(Africon, 2008).

**Table 2.3** The unit cost of construction and maintenance in 2006, (Africon 2008)

Type	Unit	Lowest	Medium	Highest
Construction (paved) <50km	US\$/Km	349,523	401,646	612,929
Construction (paved) >50km	US\$/Km	209,427	290,639	344,135
Rehabilitation (paved) <50km	US\$/Km	220,186	352,621	505,323
Rehabilitation(paved) >50km	US\$/Km	194,679	299,512	457,714
Periodic maintenance(paved)	US\$/Km	81,854	158,009	235,157
Re-graveling	US\$/Km	12,835	15,625	19,490

Research has shown that project costs are consistently underestimated. In one study by Flyvbjerg et al. (2002), it was found that this underestimation occurs in 9 out of 10 transportation infrastructure projects around the world. Flyvbjerg et al. (2002) has preformed numerous studies on the cost of mega projects and risk, particularly from the prospective of urban policy and planning.

The data of Flyvbjerg et al. (2002) indicate that worldwide transportation construction costs are on average 28% higher than their estimated cost. Bridge projects follow at 33.8% being underestimated and then road projects with an average cost escalation of 20.4%. Transportation projects on a whole are found to experience average cost escalation of 27.6%. Underestimation or inaccurate cost estimation appears to be found throughout the world, though North America fares better than Europe.

In addition, Flyvbjerg et al. (2002) conclude that there is no indication that estimating practices have improved over the past 70 years, the time period from which his sample was taken. Table 2.4 shows inaccuracy of worldwide transportation project cost estimates.

**Table 2.4 Inaccuracy of Transportation Project Cost Estimates, (Flyvbjerg et al. 2002)**

Project type	All projects		Europe		North America	
	Number	Average cost	Number	Average cost	Number	Average cost
	of cases	escalation	of cases	escalation	of cases	escalation
		%		%		%
Rail	58	44.7	23	34.2	19	40.8
Bridge	33	33.8	15	43.4	18	25.7
Road	167	20.4	143	22.4	24	8.4
All projects	258	27.6	181	28.7	61	23.6

#### 2.11.4 Supervision costs

There is a wide range of average cost of supervision per kilometer of similar road works across the countries according to the report. The cost to supervise a kilometer of an inter-urban road of the rehabilitation and reconstruction works is US\$15,422 in Ghana, and US\$28,153 in Kenya. In Nigeria, the average cost of supervision of an urban road is US\$38,024, (Alexeeva, 2008).

In General, construction cost of road projects has been rising similarly even during construction phase that most contracts are completed exceeding their previously agreed contract some. Bid prices for road projects have also been exhibited to exceed engineers estimate by a significant margin for most sub Saharan countries.

Furthermore according to (FWC BENEf, 2009), the overall increase in prices contracted over the 2000-2010 period relative to the 2000 project for the rehabilitation of the Pemba to Montepuez Road is indicated at 365%.

From 6 projects examined in detail the real increase in prices has been 216% with input cost inflation accounting for 139% and outstripping US\$CPI by 113%.

The analysis applied to the six selected projects failed to identify a definitive time related increase in the unexplained portion of the price structures but found such unexplained portions to vary between projects from 10% to 30% while results in three of the six projects indicated that these had been under priced at tender/contract stage.

## **2.12 Major Gaps identified in the Ethiopian construction industry**

In the Ethiopian construction industry, most stakeholders agree on the idea that few projects are completed within their anticipated contract time and cost as a result of added extra variation orders, unrealistic or underestimated project cost that leads to cost overrun, price adjustment formula that don't properly cater market inflation on construction materials and miscellaneous factors.

According to a preliminary findings of road construction cost study conducted by World Bank, Markland & Mladenovic, (2013), it has been found that there is a general lack of capacity problem of Road clients as well as both consultants and contractors in which it is mainly manifested in the planning, design and procurement stage.

The specific problems associated with each stage are as shown below.

- **Planning stage**
  - The number of projects being handled against professionals
  - Time allocation for design and construction
  - Initial project and scope definition
- **Design stage**
  - Inadequate design (different issues: lack of investigation, poor surveying, site accessibility...)
  - Lack of capacity for design review of the clients

- **Procurement stage**

- Inconsistencies of tender documents for similar project types
- Cost estimation capacity of local contractors in the industry

A sample of data constituting 64-procurement data of projects has been collected from ERA as shown here under.

- 21 new construction
- 4 rehabilitation works
- 45 upgrading works

### 2.12.1 Unit rate for road construction costs in Ethiopia for the last 5 years.

According to Markland & Mladenovic (2013), it has been able to understand the incremental trend of road construction cost in the Ethiopian construction peninsula. Accordingly, the unit rate for road construction cost (nominal) has been found to double more than what has been anticipated in the last five years. Likewise, an increasing trend of original contract unit costs per Km of ETB 3.9 million per km in 2006 has jumped to ETB 9.9 million per km in 2011. On an average, there has been an increment of 1.36 million every year. There are few exceptional cases as Addis-Adama Toll Road (65 km with 6 lanes) which was directly contracted out to CCCC at ETB 105 million per km.

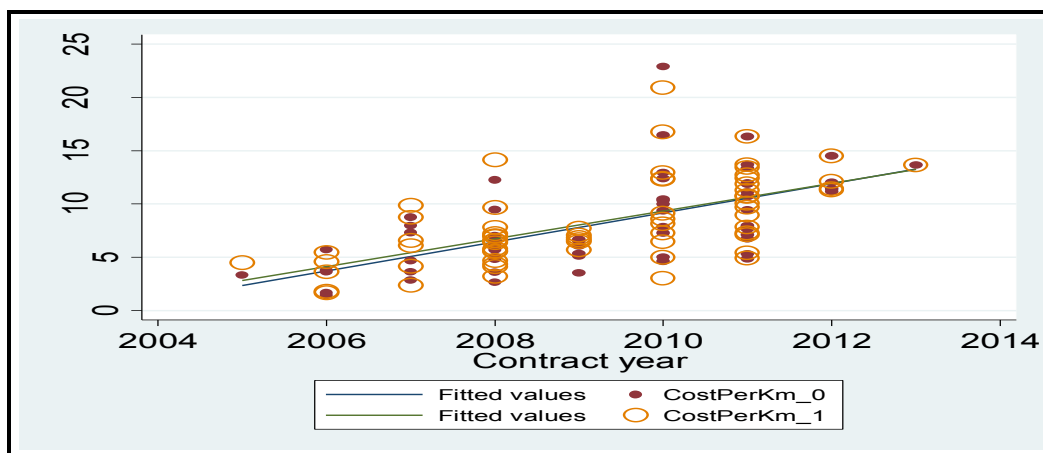


Figure 2.3 Unit rate of road construction cost per km

### 2.12.2 Road construction cost increases in new construction works.

There has been a significant cost increases in recent new construction works according to the draft world bank study, Markland & Mladenovic, (2013). On an average there is an increase of ETB 2 million per km every year. Compared with a more moderate increase of ETB1.2 million in upgrading works, there is steeper cost increase trend of local financed projects which is about 1.5 million per Km per year. However, there is a slight modest increase of GOE projects, which is about ETB1.3 million per km but with greater variation.

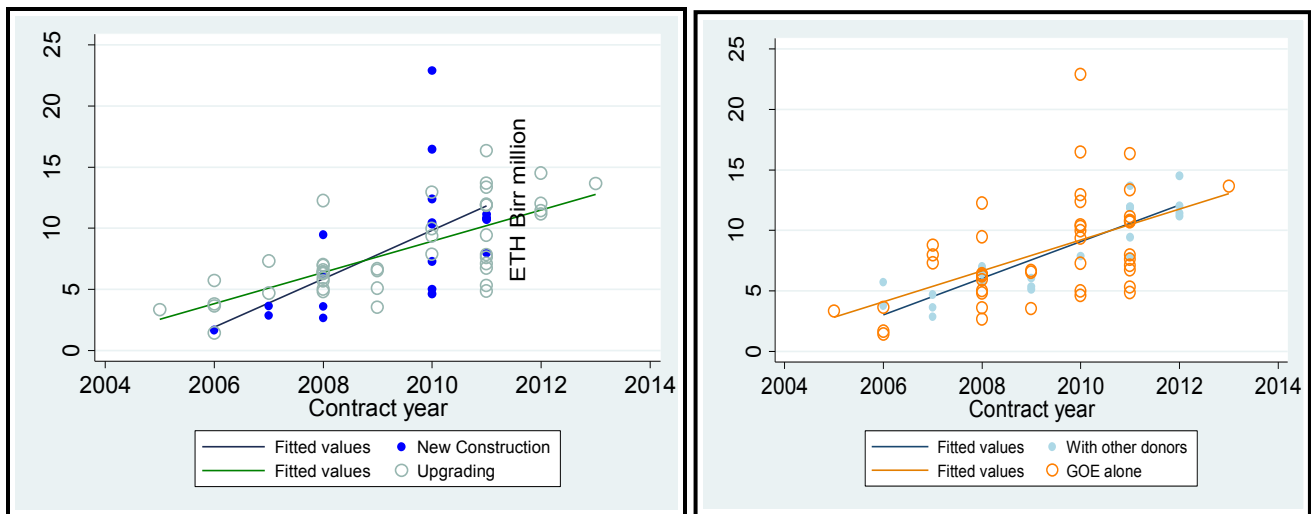


Figure 2.4 Cost increase in new and upgrading construction

### 2.12.3 Inflation and exchange rate depreciation effects on Project cost.

In accordance to Bureau of statistics information, there has been high exchange rate encountered on domestic prices in Ethiopia. As a result, domestic prices of commodities `doubled for the period of 2006-11. Similarly, average inflation rate for the year has been 26% per year, exchange rate depreciated by 75% in the same period while the average depreciation has been 15% per year. This has been a major problem that has greatly impacted the construction cost of the project to escalate beyond the margin of limit anticipated by stakeholders (Markland & Mladenovic, 2013). Figure 2.5 shows Inflation and exchange rate depreciation effect on the construction.

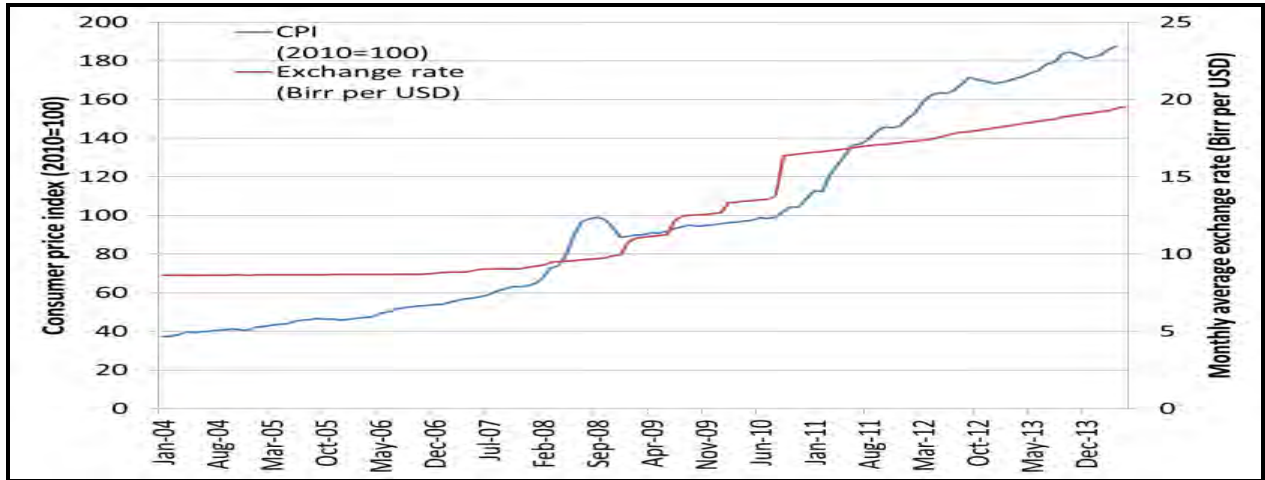


Figure 2.5 Inflation and exchange rate depreciation effect on construction

### 2.12.4 Major material, fuel and bitumen prices influence on construction costs

From 2006 to 2011, major input prices of road construction projects tend to increase per annum accordingly, (Markland & Mladenovic, 2013):

- 9.8% for cement
- 22.1% for fuel
- 11.3% for steel
- 15.7% for bitumen
- 5.2% for equipment

This price changes are far below domestic price changes however they are more or less consistent with exchange rate depreciation.

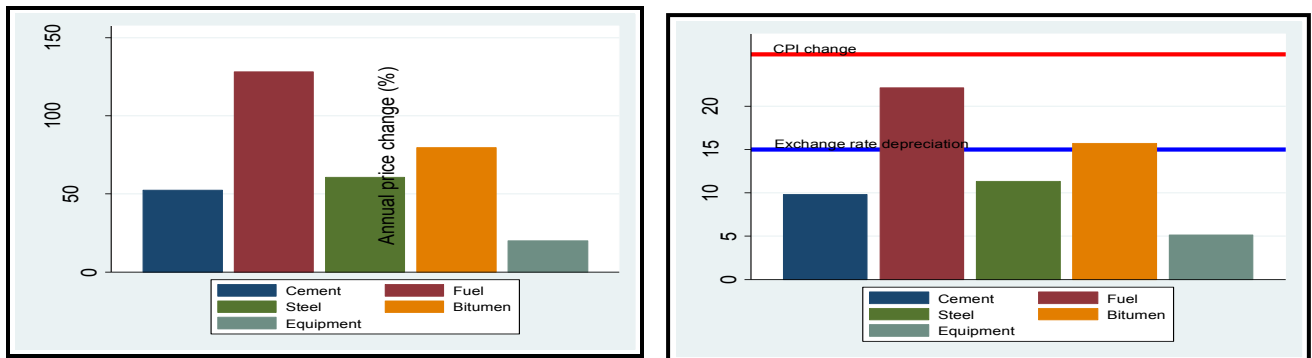


Figure 2.6 Price change during project period and annual price change

2.12.5 Rise of construction cost of roads with time per road type.

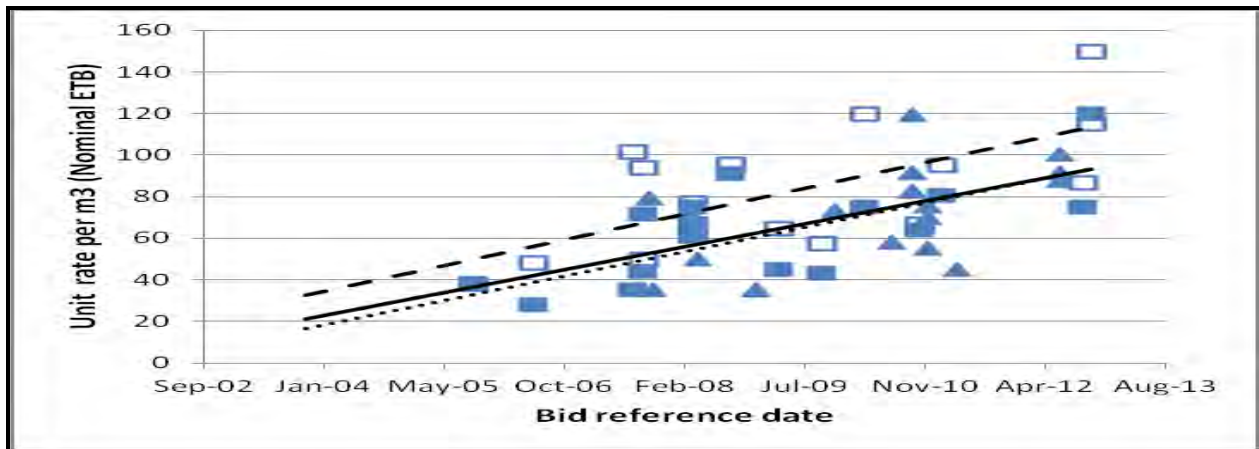


Figure 2.7 Cost of AC contracts per km against contract signing date.

———— New construction    - - - -    Upgrading

Activity cost/ Km	2006	2009	2012
AC Road - New	1.7mill	3.4mill	4.9mill
AC Road – Upgrd.	3.6mill	4.2mill	4.9mill

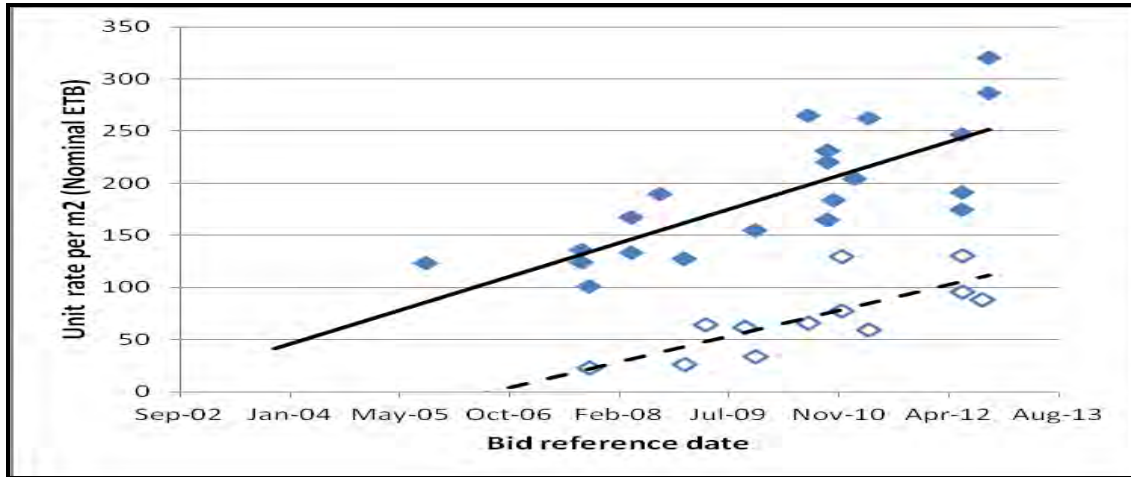
Activity cost/m <sup>3</sup>	2004	2009	2012
Cut to fill	20	44	75
Borrow to fill	30	60	118



———— Cut to fill    - - - -    Borrow to fill    .....    Cut and Borrow to fill

Figure 2.8 Unit rates of earthwork with time

Activity cost/m <sup>2</sup>	2008	2009	2012
Asphalt concrete	145	170	250
Double S.Treatment	35	50	110



—— Asphalt concrete— - - - Double surface treatment

Figure 2.9 Unit rates of AC and ST with time against Bid reference date.

**2.12.6 Contract works under ERA and Contractor’s tender price (1996/97 -2006/2007)**

In Ethiopia, it is presupposed that an increased range in tender prices from Contractors is due to the market volatility as a result of inflation, bank interest rate and the rise of construction materials. The general market indicator according to bureau of statistics reveals that currently inflation in Ethiopia is estimated to be at 7.9% as at November 2013 which is lower than the average of 20.46 from July 2006 until 2013 (Millennium Development Goal, Addis Ababa, 2008).

Construction input costs for both labor and materials have continued to rise. Day rates for private skilled and unskilled construction workers showed rapid increases since the last ten year. Meanwhile, government investment in Road construction since 1996/97 is believed to have brought about a substantial price increases in infrastructure related material prices.

Over the ten years duration of ERA's contract works, growth in private participation sectors had been rapid. A growth of 105.7 million in 1996/97 to Birr 2.69 billion in 2007/2008 which is an average growth rate of 245 percent per annum has been recorded. (Millennium Development Goal, Addis Ababa, 2008)

The participation of international contractors showed a steady rise from Birr 57.2 million (31 percent of the construction expenditure) in 1996/97 to Birr 2.026 billion (about 58 percent of the total construction expenditure) in 2006/2007.(Millennium Development Goal, Addis Ababa, 2008)

According to the facts observed, the participation of local and international contractors kept on rising. However, as any one might have expected that this phenomenon would play a role in creating fair competition platform in the construction industry whereby road construction cost is brought down to a normal level, however, there is an opinion that the rise in road construction cost is contrary to the expectation.

Table 2.5 shows how the governments road construction budget allocation has significantly increased the national road network density from 1997 to 2011 Millennium Development Goal, Addis Ababa, (2008)

**Table 2.5** Growth of the Classified Road Network and Change in Road Density (2001 – 2011).

Year	Road network in km					Growth Rate (%)	Road Density /1000 pop.	Road density /1000sq. km
	Asphalt	Gravel	Rural	Woreda	Total			
2001	3,924	12,467	16,480		32,871	4.2	0.50	29.88
2002	4,053	12,564	16,680		33,297	1.3	0.49	30.27
2003	4,362	12,340	17,154		33,856	1.7	0.49	30.78
2004	4,635	13,905	17,956		36,496	7.8	0.51	33.18
2005	4,972	13,640	18,406		37,018	1.4	0.51	33.60
2006	5,002	14,311	20,164		39,477	6.6	0.53	35.89
2007	5,452	14,628	22,349		42,429	7.5	0.55	38.60
2008	6,066	14,363	23,930		44,359	4.5	0.56	40.30
2009	6,938	14,234	25,640		46,812	5.5	0.57	42.60
2010	7,476	14,373	26,944		48,793	4.2	0.58	44.39
2011	8,295	14,136	30,712	854	53,997	10.7	0.66	49.09

Following, the persistent increase of road density in Ethiopia, the rise in unit price and costs of projects constituted a critical challenge by the Ethiopian construction sector for decades.

Within the period of ten years time 1996/97 – 2006/2007, unit cost of construction for paved roads had risen from 3million per km in 1996/97 to 5.33 million per km in 2006/2007 which is about 77.7 percent increment.(Millennium Development Goal, Addis Ababa, 2008)

Unit cost of rehabilitation of paved roads increased by 43 percent from 2 million per km in 1996/97 to 4.65 million per km in 2006/2007. Unit cost of gravel road periodic maintenance had risen from Birr 220,000 per km in 1996/97 to Birr 385,000 per km in 2004/05 but dropped to Birr 328,000 per km in 2006/07.(Millennium Development Goal, Addis Ababa, 2008)

In general, increase in unit price over the period 1996/97 to 2001/2002 had been comparatively smaller to that of the later years of RSDP - 2003 to 2011.

According to a study by Alexeeva, (2008) quoted earlier, a number of the road works contract values exceed their engineer's estimates by a large margin of 30 percent and above. On average, the contracts are 24.8 percent higher than their engineer's estimates in Uganda, and around 22 percent in Ethiopia, Nigeria, and the Democratic Republic of Congo (DRC).

This discrepancy and periodical escalation of cost margin of road construction could be attributed to poor design review by clients, poor engineers estimate by consultants, and uncontrolled market construction material price increase or high profit margin by the contractors.

## 2.13 Summary of the literature Review

Price increase or escalation is a major problem of the construction industry in both developed and developing countries according to most of the researchers.

The causes of cost escalation in construction projects are different and sometimes difficult to manage. There are two types of causes of price escalation envisaged, internal cause which can be controlled by the estimator and external in which the estimator does not take control of and governed globally.

According to the review, project owners identified five reasons for project cost escalation: these reasons were, incomplete drawings, poor pre-planning process, escalating cost of materials, lack of timely decisions and excessive change orders.

Furthermore, cost escalation is attributed to problems in finance and payment arrangements, poor contract management, material shortages, changes in site conditions, design changes, mistakes and discrepancies in contract documents, mistakes during constructions, price fluctuations, inaccurate estimating, delays, additional work, shortening of contract periods, and fraudulent practices and kickbacks.

## **CHAPTER 3 The Research Design and Methodology**

### **1.1 The Study Approach**

In identifying the possible causes and effects of price escalation of federal road contracts in Ethiopia, one needs to deal with the identification of the possible causes and effects of price escalation of federal road project bid offers at tender stage in Ethiopia. Therefore, in so doing, the research would need to consider different aspects of the problem such as documentation, justified cost proofs, suitable cost estimation methods, causes of price escalation etc. In each of the above concepts, there are different variables that need to be determined for frequency and degree of occurrence to support the hypothesis, the causes and effects of price escalation of federal road projects at tender stage in Ethiopia.

### **3.2 The Research Type**

The research is a practical problem developed from an observation of road project cost documents at procurement and tender stage, supplemented by research questionnaires designed to assess the causes and effects of price escalation of federal road contracts in Ethiopia.

The research is applied and exploratory in its nature because the research was initiated from practical problems and aims to find out whether there exists price escalation of federal road projects at tender stage in Ethiopia.

It is also descriptive in that it aims at describing the possible root causes and effects of price escalation of federal road projects at tender stage in Ethiopia and identifies the variables for the cause of the occurrence.

### **3.2 The study scope and limitation**

Price escalation of federal road contracts in Ethiopia has been a major growing challenge to road clients (ERA) over the last decade as explained in the previous section. Therefore, to address the matter, the research found it appropriate to target populations from stakeholders in the Ethiopian construction industry that is contractors, consultants and employer.

Since the assessment of the cause and effects of price escalation of federal road contracts in Ethiopia is a topic that has not been well covered by earlier researchers, unavailability of adequate documented information related to the subject matter has created inconveniency and has made it difficult for the researcher to construct ideas easily based on the objective of this thesis. As a result, this research could be considered as a milestone for further similar future studies.

The major limitations of the study were lack of willingness of professionals in the construction industry to provide cost information and the amount of considerable time laps it took to complete and return the questionnaires by the respondent. Furthermore, a series of motivational briefings and clarifications of the questionnaires had to be conducted by the researcher to the respondents in order to enable them complete and return the questionnaires in time. These and other similar related problems were some of the limiting factors that has impeded the work of the research.

### 3.3 Data Source and Collection

The data collection approach adopted for conducting this research includes basic documents, respondents and archival documents. Besides desk study as the primary data source for this research, the research was conducted by disseminating two types of questionnaires “open ended” and “closed ended” to a large number of contracting and consulting companies that undertake public work.

Clients (project owners), contractors and consultants were among the target groups included under the frame work of the questionnaire. Contract documents, Tender documents, correspondence letters, Bid documents, Civil engineering journals, Internet sources, as well as reviewing related archival documents on road construction works were the main source of archival documents used to supplement the findings of this research.

Data collection part of the research is the most challenging and hectic part of the research where delay in meeting deadline with respondents and vague & unclear responses have been encountered. This and similar problems made the research stressful for the period of data collection.

The questionnaires were carefully designed with intent of acquiring high response rate from respondents. The answers of the structured part of the questionnaire were based on Likert's-scale of five ordinal measures of agreement towards each statement (from 1 to 5) as shown in the following sections.

The two reasons given why this simple scale approach is adopted are:

- To provide simplicity for the respondent to answer, and
- To make evaluation of collected data easier

Likert's-scale helps to know respondents' feelings or attitudes about an opinion. The respondents must indicate how closely their feelings match with the question or statement on a rating scale.

Identifying the variables of the cause of price escalation of federal road projects at tender stage in Ethiopia is the foremost task envisaged in the research. Respondents are then asked about their agreement on these variables in affecting road price escalation of federal road projects at tender stage in Ethiopia. Accordingly the respondents would choose one of the following based on their outlook.

- |                        |                     |
|------------------------|---------------------|
| 1- I strongly disagree | 4- I agree          |
| 2- I don't agree       | 5- I strongly agree |
| 3- Neutral             |                     |

After expressing their agreement and/or disagreement on the variables of price escalation of federal road projects at tender stage in Ethiopia, respondents are asked about the chances of occurrences of these variables based on the following choices.

- |  |   |
|--|---|
| 1- Not at all = 0% probability to happen | 3- Likely = 26% - 50%                   |
| 2- Unlikely = 0% - 25%                   | 4- Almost certain = 51% - 99%           |
|  | 5- Certain = 100% probability to happen |

After identifying the chances of occurrence of price escalation of federal road projects at tender stage in Ethiopia, variables respondents were asked about the impacts of each causes of cost rise based on the following choices.

- |                         |                         |
|-------------------------|-------------------------|
| 1 - No significance     | 4- High significance    |
| 2- Minor significance   | 5- Extreme significance |
| 3- Average significance |                         |

Upon the completion of data gathering on causes of price escalation of federal road projects at tender stage in Ethiopia, the responsible parties from stakeholders in the industry has to be identified for price escalation of federal road projects at tender stage in Ethiopia; the questionnaires are then prepared in such a way that detailed information can be gathered in a systematically prepared matrix table.

### 3.4 The Research Population

The research samples will be gathered from stakeholders in the construction industry constituting of clients, contractors and consultants selected based on their direct involvement in to planning, procurement, tender document preparation and exposure to road construction activities. Project owners are selected from the Federal Road construction project owners (ERA). The selection of Consultants was based on their class category. For the purpose of the research consultants with class I category were selected. Lists were taken from (ERA) office and the research samples were selected randomly from the list. General contractors of Grade-GC1 are selected from (ERA) office and the research samples were selected randomly from the list.

Sample size for the research study is calculated using the following formula,

$$n = (Z)^2 * P*(1-P) / (E)^2 \text{-----[Eq.3.1]}$$

Where; n - Necessary Sample Size, Z - Z-score from Z-score table, P - proportion of the population with price escalation of federal road project cases/ bids offers exceeding 30% of engineers estimate and E- Margin of error (Confidence Interval).

With confidence level 95%, marginal error + or – 5% and proportion of the population to be 0.220 which is the most forgiving number ensuring that the sample will be large enough and the sample size is found to be 137. The variables were determined on the basis of the time available for conducting the research work, available fund for the study (project), and the reliability of the respondents.

In order to get a thorough representation of the sample size, the dissemination of the questionnaires was conducted to both consultants and contractors of class I category encompassing of experience and reputational diversities within the construction industry.

Accordingly, the respondents of the research from the survey comprised a total of 18 from project owners, 14 from consulting offices, and 27 from contractors totaling to 59 in number.

### 3.5 Research Instruments

The survey instrument for this research is developed in such a way that the data collection approach is adopted for conducting this research from both primary and secondary sources. Questionnaire and desk study provide the primary data for this thesis while the secondary data sources include renowned civil engineering journals on project procurement and construction management, internet sources, and related archival documents on tendering and cost estimation of projects. These different methods of data collection system have been used in order that the data or information obtained from one would supplement the other source where information gaps have been exhibited and enforcement of evidences is required.

### 3.6 Method of Analysis

Both descriptive and inferential statistics are employed in the data analysis. In the analysis the “Mean Score” method is taken as a tool to establish the relative importance of the causes of price escalation of federal road projects at tender stage in Ethiopia. In accordance to Likert’s scale of five ordinal measures of agreement towards each statement (1, 2, 3, 4 and 5), the mean score is calculated for each factor that is used to determine the relative ranking.

The mean score (MS) for each variables of cost overrun is computed by using the following formula;

$$MS = \frac{\sum (f \times S)}{N} \text{-----[Eq.3.2]}$$

Where: MS – Mean Score

f – Frequency of responses for each score

S – Scores given to each factor (from 1 to 5)

N – Total number of responses concerning each factor

Ranks of variables based on cumulative mean score as perceived by different parties should be tested for correlation. The purpose of a correlation test is to verify whether there is a great deal of difference in ranking between groups of respondents and as well in order to be able avoid from being deceived by chance of occurrences and significance as ranked by groups.

Therefore, this research uses Kendall coefficient of concordance (W) to show the degree of agreement between the different parties involved in the survey: contractors, clients and consultants.

The Kendall coefficient of concordance (W) is used to measure the community of ranks for m observers as shown here under.

$$W = \frac{12 * S}{m^2 * (n^2 - n)} \text{ -----[Eq.3.3]}$$

Where S is the sum of squares of deviations of the rankings, that is:

$$S = \sum_{i=1}^N (R_i - R_{mean})^2 \text{ -----[Eq.3.4]}$$

m is the number of groups of respondents, n is the number of variables being ranked, Ri is the sum of ranks for i<sup>th</sup> variable and R mean is mean of sum of the ranks.

W ranges between 0 and 1, when W=1 indicates a perfect agreement among the three respondent groups; but if the ranking by various groups differ very much, the sum of ranking (Ri) will be more or less equal for each of the factors and hence the value of S becomes small and so does that of W.

The hypothesis (HR) in the analysis is: ‘*There is an agreement in the ranking of causes of road price escalation of federal road projects at tender stage in Ethiopia among employers, consultants and contractors.*’ and the null hypothesis (HO) is: ‘*There is no agreement in the ranking of cause of price escalation of federal road projects at tender stage in Ethiopia among employers, consultants and contractors.*’

The significance level (P) of the hypothesis (confidence level of more than 95%) is checked using CHIDIST, which returns the one-tailed probability of the chi-squared distribution. The  $\chi^2$  distribution is associated with a  $\chi^2$  test. Using the  $\chi^2$  test to compare observed and expected values. By comparing the observed results with the expected ones, it can be decided whether the original hypothesis is valid or not.

The Syntax for CHIDIST (P) in Excel spread sheet is; CHIDIST(x, degrees \_ freedom) where; x - is the value at which you want to evaluate the distribution and Degrees \_freedom is the number of degrees of freedom i.e. (n-1).

$$\chi^2 = m * (n-1) * W \text{ -----[Eq.3.5]}$$

### 3.7 Writing of the Research

The research has four major stages. These are the research proposal, the literature review part, the research methodology and analysis, and the final research writing. The research proposal writing has already been undertaken. The literature review part has taken the longest period of the research in which various documents were gathered and tested against the research objectives to take relevant information pertinent to the basic objectives of the research.

Finally all the notes taken down were linked to produce a document; the differences in perceptions between authors being noted down. The final research part was written after analyzing all primary and other support documents to test the actual existing situation of the construction industry towards the research objectives. Finally, the conclusions and recommendations part was written. The final research writing was classified into the following five major parts for final presentation.

Chapter I: Introduction

Chapter II: Literature Review

Chapter III: The Research Design and Methodology

Chapter IV: Data Analysis and Discussion

Chapter V: Conclusions and Recommendations

## **CHAPTER 4 Data Analysis and Discussion**

### **4.1 Introduction**

This part of the research deals with the analysis and discussion of the data compiled from the questionnaire and desk study. It includes the identification of the existence, extent and main causes of price escalation of federal road projects at tender stage in Ethiopia, rate of occurrences of the variables and the impact of the variables on planning and budgeting by road clients. Finally, the effects of the Price escalation on the various stakeholders, the construction industry and the national economy will be discussed.

The procedure used in analyzing the results was aimed at establishing the relative importance of the various factors that are responsible for price escalation of federal road projects at tender stage in Ethiopia and their respective effects on the stakeholders, the construction industry and the national economy. The questionnaire were intended to give each respondent an opportunity to identify the factor that was likely to cause price escalation of federal road projects at tender stage in Ethiopia with the respondent's response "I strongly disagree", "I disagree", "I agree", etc as well as the frequency of occurrence of the variables and their impact on the planning and budgeting of the government. For each variables of price escalation of federal road projects at tender stage in Ethiopia, the percentages of respondents' response were ranked for the analysis purpose. On the basis of the ranking of the variables by the various groups, it was possible to identify the most important factors that influenced price escalation of federal road projects at tender stage in Ethiopia.

From the desk study a variety of bid construction documents of federal road projects from Ethiopian Roads Authority, ERA and documents from the World Bank were surveyed. During the desk study all relevant documents of each project such as tender documents, addendums, contract document, contract amount of the project were thoroughly investigated. These has enabled the research understand the cause of price escalation of federal road projects at tender stage in Ethiopia in order to investigate how the actual contractors cost offer at tender stage increases over time, deviates from the engineers estimate and allocated budget for the project.

## 4.2 Questionnaire Response Rate

Detailed questionnaires were designed and disseminated for the assessment of federal road project cost estimation and price escalation of federal road projects at tender stage in Ethiopia. In line with this purpose, questionnaires were distributed to major stakeholders in the industry such as Contractors, Consultants and Clients. A total of 137 questionnaires were distributed to consultants, contractors and clients out of which, 61 questionnaires were filled and returned.

One questionnaire from consultant and one questionnaire from contractor were rejected due to incompleteness. Hence, out of the 61 questionnaires 59 were found to be suitable for data analysis consisting of 18 (72%) from the Employer, 14 (47%) from consultants and 27 (60%) from contractors. The overall response rate was 59% as shown in table below.

**Table 4.1: Summary of the status, number and percentage of questionnaires distributed and returned.**

Respondents Category	Questionnaires		Percentage	Valid Responses	Percentage Response Rate
	Distributed	Returned			
Employers	37	18	49%	18	49%
Consultants	53	15	35%	14	33%
Contractors	47	28	49%	27	47%
<b>Total</b>	<b>137</b>	<b>61</b>	<b>45%</b>	<b>59</b>	<b>43%</b>

## 4.3 Quality of Respondents

Various experienced professional levels were targeted to fill the questionnaire survey. Out of the total questionnaire disseminated, 76% of professionals were from organizations of more than 15 years of establishment, 20% from organizations of more than 10 -15year of establishment and 4% of them were from were from organizations of more than 5 -10 years of experience.

Furthermore, as shown and summarized under table 4.3 below, respondents from foreign companies accounts for 7% of the overall returned valid survey questionnaire. Out of the foreign company targeted as per the survey questionnaire disseminated, 50% has an experience between 10 -15year of in the Ethiopian construction industry while 50 % has between 5 -10 years of experience.

In regard to educational background, M.Sc. and B.Sc. degree holders' accounts to 63% and 37% of the valid respondents number respectively.

In terms of the respondent's position they hold at the time of the survey in the organization, about 62% were at the top management managerial level while the remaining 36% were at their middle managerial level.

The reliability and accuracy of the survey is believed satisfactorily accurate as 62% of the respondents are from top management level such as ERA-Directors, WB- Procurement Experts, General Managers, Project Managers and Resident Engineers that are directly involved in contract management and 76% of the professionals are from organizations that have more than 15 years of establishment within the construction industry of Ethiopia. Therefore, relevant pertinent knowledge and expert information are believed would be compiled for the analysis in order to draw reliable conclusions and recommendations.

**Table 4.2: Experience of companies in Road Construction Projects**

Year of Experience	Employer	Consultant	Contractor	Sum	%age
<5 Years	-	-	-	-	0%
5-10 years	-	1	1	2	4%
10-15 years	-	3	9	12	20%
>15years	18	10	17	45	76%
<b>Total</b>	<b>18</b>	<b>14</b>	<b>27</b>	<b>59</b>	<b>100%</b>

**Table 4.3: Type or origin of the Respondents' Organization**

Respondents	Respondent	Domestic Origin	Foreign Origin	%age of Domestic	%age of Foreign
Employer	18	18	0	100%	0%
Consultant	14	12	2	86%	14%
Contractor	27	25	2	93%	7%
<b>Total</b>	<b>59</b>	<b>55</b>	<b>4</b>	<b>93%</b>	<b>7%</b>

**Table 4.4: Experience of Foreign Companies in road construction sector in Ethiopia**

Experience	Respondents			
	Consultant	Contractor	Sum	%age
< 5 years	-	-	-	0%
5-10 years	1	1	2	50%
10-15 years	1	1	2	50%
<b>Total</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>100%</b>

**Table 4.5: Educational Background of Respondents**

Respondents	Educational Background				
	B.Sc.	M.Sc.	Total	%age of B.Sc.	%age of M.Sc.
Employer	4	14	18	22%	78%
Consultant	3	11	14	21%	79%
Contractor	18	9	27	67%	33%
<b>Total</b>	<b>44</b>	<b>19</b>	<b>59</b>	<b>37%</b>	<b>63%</b>

**Table 4.6: Respondents Position in their Company**

<b>Respondent Position</b>	<b>Emp.</b>	<b>Cons.</b>	<b>Cont.</b>	<b>Emp. %age</b>	<b>Cons. %age</b>	<b>Cont. %age</b>	<b>Average</b>
Top Management	13	10	12	72%	71%	44%	62%
Middle Management	5	4	15	28%	29%	56%	38%
<b>Total</b>	<b>18</b>	<b>14</b>	<b>27</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

#### **4.4 Existence of Price Escalation of Road Contracts in Ethiopia**

The paramount aim of the research is to check whether or not road price escalation of federal road contracts in Ethiopia is apparent in the context of the Ethiopian road construction industry. On the basis of the data compiled from the desk study, there is tangible periodical price escalation of federal road projects at tender stage in Ethiopia witnessed. According to the literature review part of this research indicates that the percentage of construction projects exhibiting price escalation in Ethiopia is similar as the percentage of projects in sub Saharan countries.

Based on a study conducted on 13 sub Saharan countries, there has been significant cost escalation where a number of the road works contract values exceed their engineer’s estimates by a large margin of 30 percent and above (Alexeeva, 2008). According to the analysis conducted from desk study on document obtained from ERA planning department, there is a viable design review problem which is manifested after contract quantity revision of federal projects as shown in Table 4.7. Similarly the research is able to deduce that client’s capacity problem to make early proper design review of tender documents is believed to pave the way to contract variations and cost overrun of projects in Ethiopia.

**Table 4.7: ERA federal road projects tender cost and percentage change in the contract amount after revision.**

No.	Project	Length (in km)	Financer	Contractor	Contract Amount (in million ETB)		Percentage charge in contract amount
					Orginal	Revised	
1.1	Dedebit-Adiremet	76.6	GOE	SUR	815.4	815.4	1.8
1.2	Sert Village-Werei Ridge	62.5	GOE	SUR	460.3	460.3	0
1.3	Durbete-Shahura	106.5	GOE	SUR	99.6	102	2.4
1.4	Endaselasie-Dedcbi	71	GOE	SATCON	510.7	510.7	0
1.5	Gondar-Debark	100	GOE & IDA	Sinol-Hydro	690.8	743.1	7.6
1.6	Adiremet-Dejena- Dansha	97.6	GOE	HHRBC	962.3	1224.3	27.2
1.7	Adigoshu-1gdi	168	GOE	HHRBC	627.7	849.4	35.3
1.9	Shire-Adiabun	98.1	GOE & IDA	CGGC	428	666.6	55.7
1.1	Shire- Adigoshu	156	GOE	CGGC	616.4	650.4	5.5

No.	Project	Length (in km)	Financer	Contractor	Contract Amount (in million ETB)		Percentage charge in contract amount
					Orginal	Revised	
					912.6	928.9	1.8
1.12	Mayyemri-Shire	68.3	GOE	ERCC	747.4	763.8	2.2
1.13	Kombolcha- Nlekaneselam	179.8	GOE	CGC	360.3	360.3	0
1.14	Mekaneselam- Gindeweyn	139	GOE	CGC	904.2	975.3	7.9
1.15	Maytsemri-Dima	73.2	GOE	Gemshu Beyene	258.7	462.4	78.7
1.16	Dima-Fiyehvulia	86.6	G01,..	Gemshu Beyene	777.1	833.6	7.3
1.17	Sanja-kcrakcr	48	GOE	Tibeb	547	547	0
1.18	Hwusewa-Abala-lrbeti	93.6	GOE	Jiangxi Zhangei	746.3	1094.2	46.6
1.19	Werei Ridge-Adwa	62.7	GOE	Alemayehu Ketema	479.1	594.1	24
1.2	AbiAdi-Hawzen- Firewerii	100.9	GOE	CRTG	874.3	874.3	0
1.21	Mekele-Sert Village	64.3	GOE	Defense	482.7	609.2	26.2
	<b>Sub Total</b>	<b>2027.1</b>			<b>12816.9</b>	<b>14781.5</b>	<b>15.3</b>
	<b>Average</b>	<b>96.5</b>			<b>610.3</b>	<b>703.9</b>	<b>15.3</b>

Percentage change in contract amount is about 15.3% of the contract amount after revision is done. This figure is comparable to an average 22 % deviation in Ethiopia, Nigeria, and the Democratic Republic of Congo (DRC) according to Alexeeva (2008)

#### 4.5 Desk Study and Questionnaire Response on Price Escalation of Federal Road Projects

The research has made use of the survey on the frequency of price escalation of federal road contracts before going into the detail of assessing the existing related causes and aspect of road price escalation of federal road projects at tender stage in Ethiopia.

Likewise as shown in fig. 4.8, the frequency of occurrence of price escalation of federal road projects at tender stage in Ethiopia as surveyed among the stakeholders came into sight. Accordingly, in view of this, 78% of the respondents confirmed that the case is Frequent in the Ethiopian construction industry; while 13% and 7% responded for Most frequent and Rarely least frequent however the remaining 2% objected as being apparent in the industry.

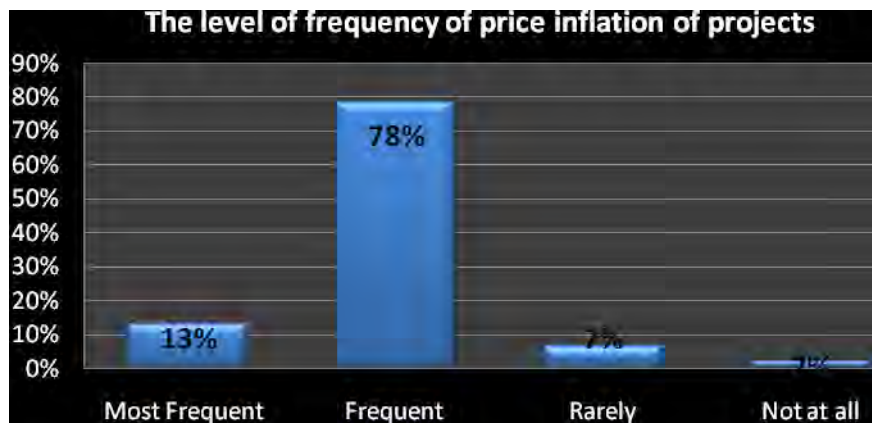


Figure 4.8: Rate of Occurrence of price escalation/inflation of federal road contracts in Ethiopia.

Based on the survey conducted in this research, most respondents agree on the opinion that the prime contributor for the cause price escalation of federal road projects at tender stage in Ethiopia is a general lack of capacity problem of road clients in terms of planning and design area as shown in the following Figure 4.9.

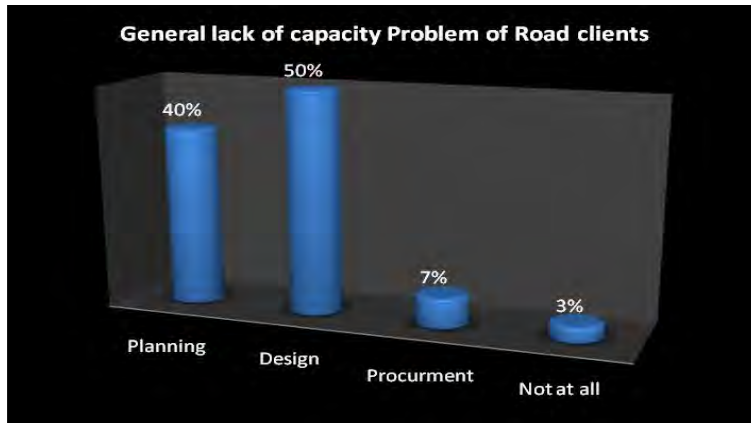


Figure 4.9: The general lack of capacity problem of road clients

Among the various questions posed to the respondents, contractor’s were asked whether which type of project price estimating method they are adopting for tendering a project as this may have its detrimental effect on the price escalation of the subject objective of this research. Out of the 59 valid respondents, 68% responded as they are practicing approximate quantities estimating method while the remaining 32% claimed to use single rate approximating method.

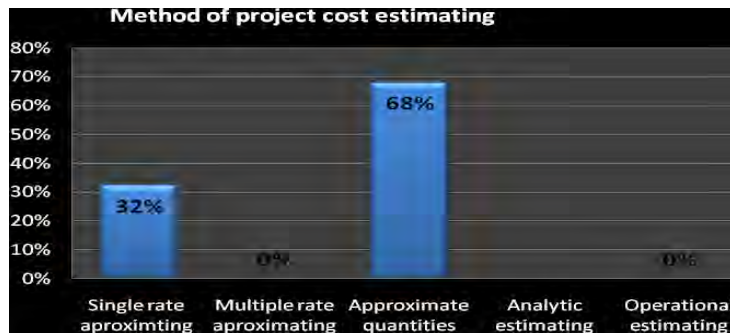


Figure 4.10: Method of Project cost estimating adopted by respondents

With respect to the method of pricing approach surveyed, 76% of the respondents confirm to use cost based approach of pricing, while 24% uses market based price approach of pricing as shown here under.

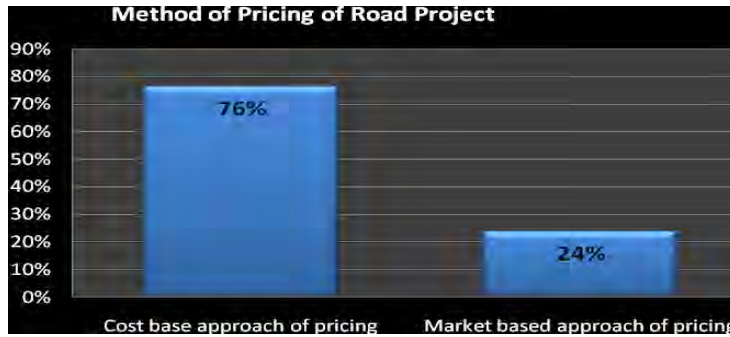


Figure 4.11: Method of Project pricing approach adopted by respondents

However, those respondents practicing market based pricing approach method of pricing of road projects, 70% affirm using skimming method of cost optimization process, while 30% claim to use penetrating method when offering tender price to clients.

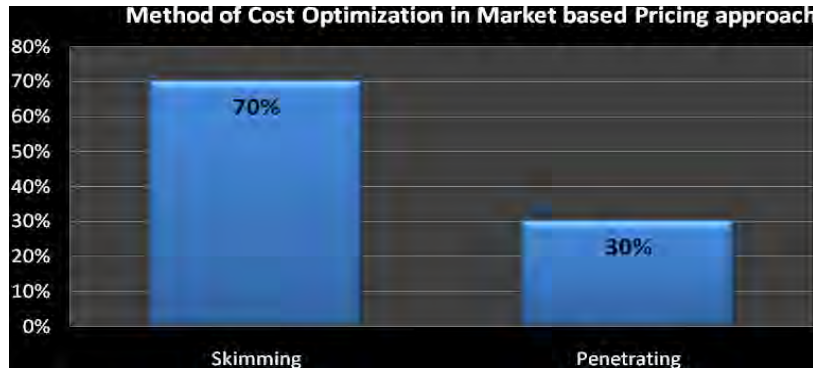


Figure 4.12: Cost optimization method adopted in market based pricing approach

The most common causes of price escalation as per the desk study was found to be uncontrolled market growth on construction materials, global currency fluctuation, exchange rate depreciation or Change in foreign exchange rate of imported construction materials, price fluctuation of construction materials such as cement, reinforcement bar, fuel, and asphalt, Insufficient bidding data concerning the project, Improper planning, design and contract documents preparation, poor design review and engineers estimate by

the client, and high profit margin by the contractors, lack of competent and experienced professionals in the field.

The result of uncontrolled market inflation and construction material fluctuation has forced road clients as far as lacking the power of terminating their old and delayed contracts contractually due to the mere reason that re-bidding cost would make the client disadvantageous and would jeopardize the client's budgetary program as the unexpected likely higher bid offer surprise from the new contracts could interrupt the planned budget program of the client. Aleta Wondo - Daye upgrading project contract is one of the examples of ERA's project, where excessive delay has been marked.

The causes of price escalation of federal road projects at tender stage in Ethiopia based on the questionnaire survey were identified from the respondents' response of each variables of cost inflation. As various researchers have put on their views concerning the probable causes of price escalation of road contracts in the literature review part of this thesis, the Ethiopian road construction industry scenario may have its own particular version of the causes. Therefore, it has been vital for the sake of this research to collect the various respondents' agreement on each particular variables of price escalation of federal road contracts in Ethiopia and its cause based on the occurrence.

For instance, poor design review by clients may occur less frequently but its detrimental effect on the tender bill of quantity of a project out would bring about significant impact in the overall contract cost of the project by contractors. This will jeopardize the whole process of budget planning of the client where most funds are granted by international donors. Similarly, identifying the rate of occurrence solely may not enable the researcher identify the critical causes of project price escalation which is considered to be apparent in the Ethiopian road construction industry.

Therefore to clearly identify the critical causes of price escalation of federal road contracts in Ethiopian construction industry, one has to identify the causes of road project price escalation at tender stage in Ethiopia supplemented with identification of their rate of occurrence and their significance/impact on the final cost of the project.

A number of respondents have given their opinion on the cause of road project price escalation at tender stage in Ethiopian road construction industry. From the questionnaires returned, factors chosen from each respondents are rated based on mean score method (MS) for the three groups of respondents, clients, consultants and contractors under each variables of road project price escalation of federal road contracts.

In this research the variables of tender price escalation having a mean score of  $>2$  is considered to be the most significant cause while a mean score of  $< 2$  means the respondents do not agree that the variable will be a cause price escalation of federal road contracts.

**Table 4.8 Causes of road project price escalation at tender stage in Ethiopia.**

No	List of Records	Employer		Consultant		Contractor		Average	
		RI	Rank	RI	Rank	RI	Rank	Average RI	Rank
1	Cost Inflation of construction materials	3.61	2	3.79	2	3.54	2	3.64	1
2	Change in foreign exchange rate (for imported materials)	3.56	5	3.47	7	3.37	5	3.46	2
3	Lack of proper budgetary planning and less emphasis given to planning by clients and financiers	3.53	9	3.50	6	3.33	6	3.45	3
4	Cost of labor, equipment and material	3.39	11	3.29	8	3.41	4	3.36	4
5	The tendency of the client to stick to least bidder criteria rather than analyzing the bid offer against the engineers estimate	3.61	2	3.64	4	2.81	18	3.36	5

6	Increase in tax/change in government fiscal/monetary policies	3.56	5	3.86	1	2.81	18	3.41	6
7	Ambiguities or discrepancies of documents (Clause 5.2)	3.50	10	2.94	11	3.33	6	3.26	7
8	Inappropriate or insufficient time given to tender document preparation from clients	3.61	2	3.71	3	2.50	22	3.28	8
9	consultants plan to engage less professionals to work on design and tender document preparations	3.56	5	2.71	13	3.25	10	3.17	9
10	Unclear specifications or changes to specification	3.33	12	2.57	15	3.52	3	3.14	10
11	inaccurate quantity estimate or excess quantity	3.17	13	3.21	9	3.21	11	3.20	11
12	Purposeful cost over/under estimation by contractors to maximize their profit margin	2.72	17	3.21	9	2.89	14	2.94	12
13	Clients appoints inappropriate/inexperienced consultants to prepare bidding specification	1.72	22	1.86	18	3.56	1	2.38	13
14	Insufficient bidding data concerning the project	2.56	18	2.50	16	3.26	9	2.77	14
15	Executive bureaucracy in the client's organization during construction	1.79	21	1.86	18	3.33	6	2.33	15
16	Client's invitation of inappropriate/inexperienced contractor to make tender offer	2.50	19	2.93	12	2.89	14	2.77	16
17	Difficulty in obtaining construction materials in the local market	3.10	14	1.86	18	2.89	14	2.62	17
18	Quantity change made by clients with addendum after the bid is floated	3.06	15	2.43	17	2.85	17	2.78	18

19	changes in actual site data or information during site visit contrary to materials report in the bidding document materials)	3.00	16	1.43	22	3.00	12	2.48	19
20	Testing of samples not provided in the bidding document (Clause 42.1)	1.94	20	1.43	22	2.59	21	1.99	20
21	Encountering of not foreseeable physical obstructions and conditions (Clause 12) not indicated or anticipated in the bidding document excessive change orders	1.71	23	1.50	21	2.70	20	1.97	21
22	Costs associated with provision for special risks (Clause 51.1)	1.44	24	1.14	24	2.19	24	1.59	22

The original records of this analysis documents ranked are annexed to the end of the document.

The values of Kendall coefficient of concordance (W) and the significance level (p) are found out to be 0.893 and 0.000022 respectively. As the coefficient of concordance (W) is more than 0.5 and significance level (P) is less than 0.05, the agreement among the parties is found acceptable with confidence level of more than 95%.

<b>m</b>	<b>n</b>	<b>s</b>	<b>w</b>	<b>X<sup>2</sup></b>	<b>P</b>
3	22	9247.421	0.893471	61.64947	0.000022

According to the analysis, Cost Inflation of construction materials, Change in foreign exchange rate (for imported materials), Lack of proper budgetary planning and less emphasis given to planning by clients and financiers, Cost of labor, equipment and material and The tendency of the client to stick to list bidder criteria rather than analyzing the bid offer against the engineers estimate are the first top five causes in chronological order for price escalation of road projects at tender stage in Ethiopia.

**Table 4.9 Identifying causes of road project price escalation at tender stage in Ethiopia based on Rate of Occurrence.**

No	List of Records	Employer		Consultant		Contractor		Average	
		RI	Rank	RI	Rank	RI	Rank	Average RI	Rank
1	Lack of proper budgetary planning and less emphasis given to planning by clients and financiers	3.63	3	3.64	3	3.70	1	3.66	1
2	Change in foreign exchange rate (for imported materials)	3.61	4	3.64	3	3.52	4	3.59	2
3	Cost Inflation of construction materials	3.56	6	3.64	3	3.26	9	3.49	3
4	Inappropriate or insufficient time given to tender document preparation from clients	3.72	2	3.86	1	2.61	18	3.40	4
5	inaccurate quantity estimate or excess quantity	3.50	9	3.57	6	3.28	8	3.45	5
6	Unclear specifications or changes to specification	3.56	6	2.71	14	3.37	6	3.21	6
7	The tendency of the client to stick to least bidder criteria rather than analyzing the bid offer against the engineers estimate	3.50	9	3.57	6	3.04	13	3.37	7
8	Increase in tax/change in government fiscal/monetary policies	3.61	4	3.57	6	2.59	19	3.26	8
9	Cost of labor, equipment and material	3.11	14	3.43	10	3.30	7	3.28	9
10	changes in actual site data or information during site visit contrary to materials report in the bidding document materials)	3.33	12	1.71	19	3.56	3	2.87	10
11	Insufficient bidding data concerning the project	2.22	20	2.36	17	3.63	2	2.74	11
12	Ambiguities or discrepancies of documents (Clause 5.2)	3.17	13	1.61	21	3.41	5	2.73	12

13	Purposeful cost over/under estimation by contractors to maximize their profit margin	3.06	15	3.50	9	2.96	15	3.17	13
14	Encountering of not foreseeable physical obstructions and conditions (Clause 12) not indicated or anticipated in the bidding document excessive change orders	2.41	18	2.45	15	3.07	11	2.65	14
15	consultants plan to engage less professionals to work on design and tender document preparations	3.44	11	3.14	11	1.68	23	2.76	15
16	Difficulty in obtaining construction materials in the local market	2.50	17	2.43	16	3.04	13	2.66	16
17	Executive bureaucracy in the client's organization during construction	2.14	21	1.71	19	3.26	9	2.37	17
18	Quantity change made by clients with addendum after the bid is floated	2.83	16	2.14	18	2.70	16	2.56	18
19	Client's invitation of inappropriate/inexperienced contractor to make tender offer	2.28	19	2.90	12	2.59	19	2.59	19
20	Costs associated with provision for special risks (Clause 51.1)	1.22	24	1.00	24	2.67	17	1.63	20
21	testing of samples not provided in the bidding document (Clause 42.1)	1.68	22	1.24	23	2.52	21	1.81	21
22	Clients appoints inappropriate/inexperienced consultants to prepare bidding specification	1.61	23	1.31	22	2.26	22	1.73	22

The original records of this analysis documents ranked are annexed to the end of the document.

The values of Kendall coefficient of concordance (W) and the significance level (p) are found out to be 0.9365 and 0.000008 respectively. As the coefficient of concordance (W) is more than 0.5 and significance level (P) is less than 0.05, the agreement among the parties is found acceptable with confidence level of more than 95%.

<b>m</b>	<b>n</b>	<b>s</b>	<b>w</b>	<b>X<sup>2</sup></b>	<b>P</b>
3	22	9694	0.9365	64.624	0.000008

With respect to cause of price inflation of road projects at tender stage based on rate of occurrence, the respondents answer in chronological order as well are Lack of proper budgetary planning and less emphasis given to planning by clients and financiers, Change in foreign exchange rate (for imported materials), Cost Inflation of construction materials, Inappropriate or insufficient time given to tender document preparation from clients inaccurate quantity estimate or excess quantity.

The main causes of road project price escalation at tender stage and the causes based on rate of occurrence of the price escalation are almost the same as per the respondent's response from the questionnaire survey.

**Table 4.10 Identifying of causes of road project price escalation at tender stage in Ethiopia based on Impact.**

No	List of Records	Employer		Consultant		Contractor		Average	
		RI	Rank	RI	Rank	RI	Rank	Average RI	Rank
1	Cost Inflation of construction materials	3.72	4	3.86	1	3.74	1	3.77	1
2	Change in foreign exchange rate (for imported materials)	3.89	3	3.82	4	3.67	3	3.79	2
3	Inappropriate or insufficient time given to tender document preparation from clients	3.93	0	3.79	5	3.33	11	3.68	3
4	Lack of proper budgetary planning and less emphasis given to planning by clients and financiers	3.89	2	3.67	7	3.40	10	3.65	4
5	Unclear specifications or changes to specification	3.67	7	2.86	14	3.59	4	3.37	5
6	inaccurate quantity estimate or excess quantity	3.22	13	3.57	8	3.48	6	3.43	6
7	The tendency of the client to stick to least bidder criteria rather than analyzing the bid offer against the engineers estimate	3.67	7	3.86	1	2.81	19	3.45	7
8	Increase in tax/change in government fiscal/monetary policies	3.67	7	3.85	3	2.89	17	3.47	8
9	Purposeful cost over/under estimation by contractors to maximize their profit margin	2.50	16	3.57	8	3.44	7	3.17	9
10	consultants plan to engage less professionals to work on design and tender document preparations	3.53	11	3.43	10	3.26	13	3.41	10
11	Cost of labor, equipment and material	3.32	12	3.21	11	3.30	12	3.28	11

12	changes in actual site data or information during site visit contrary to materials report in the bidding document materials)	3.68	6	2.43	18	3.11	15	3.07	12
13	Ambiguities or discrepancies of documents (Clause 5.2)	2.65	15	2.00	20	3.41	8	2.69	13
14	Clients appoints inappropriate/inexperienced consultants to prepare bidding specification	1.72	21	1.93	21	3.74	1	2.46	14
15	Insufficient bidding data concerning the project	3.00	14	2.71	16	3.04	16	2.92	15
16	Quantity change made by clients with addendum after the bid is floated	2.39	18	2.86	14	3.19	14	2.81	16
17	Executive bureaucracy in the client's organization during construction	1.79	20	2.14	19	3.41	8	2.45	17
18	Difficulty in obtaining construction materials in the local market	2.44	17	3.00	12	2.74	21	2.73	18
19	Client's invitation of inappropriate/inexperienced contractor to make tender offer	2.39	18	2.50	17	2.81	19	2.57	19
20	Encountering of not foreseeable physical obstructions and conditions (Clause 12) not indicated or anticipated in the bidding document excessive change orders	1.71	22	1.36	22	2.85	18	1.97	20
21	testing of samples not provided in the bidding document (Clause 42.1)	1.17	24	1.21	23	2.67	22	1.68	21
22	Costs associated with provision for special risks (Clause 51.1)	1.33	23	1.00	24	1.96	24	1.43	22

The original records of this analysis documents ranked are annexed to the end of the document.

The values of Kendall coefficient of concordance (W) and the significance level (p) are found out to be 0.97 and 0.00000323 respectively. As the coefficient of concordance (W) is more than 0.5 and significance level (P) is less than 0.05, the agreement among the parties is found acceptable with confidence level of more than 95%.

m	n	s	w	X <sup>2</sup>	P
3	22	10085.02	0.97	67.23	0.00000323

#### 4.6 Tests For Agreements on Causes of Road Project Price Escalation

The main purpose of this thesis is to affirm whether or not road project escalation at tender stage is apparent in the context of the Ethiopian road construction industry. Hence this section of the thesis summarizes the testing of the correlation of the respondents' response as tested using Kendall coefficient to find out the difference in ranking between the three groups of respondents.

The purpose of the hypothesis test is to be certain with the existence of price escalation of federal road contracts in Ethiopia and avoid any delusion of the chance of the occurrences of the variables and to have confidence that there is consensus of opinions among the various respondents.

The Null Hypothesis (H0) is:

*There is no agreement in the ranking of causes of road project price escalation at tender stage in Ethiopia between two groups of respondents.*

The Alternative Hypothesis (HA) is:

*There is an agreement in the ranking of causes of road project price escalation at tender stage in Ethiopia between two groups of respondents.*

Kendall coefficient (W) is calculated using Equation 3.2. A level of significance 95% (P = 0.05) is considered in order to decide whether to accept or reject the null hypothesis in which it would be possible to conform whether or not there is "agreement" between respondents response.

If the calculated value of p is greater than the critical value, H0 is rejected, i.e. there is an evidence of a statistically significant agreement between the groups. If the calculated value of p is less than the critical value, H0 is accepted, i.e. there is no evidence of a statistically significant agreement between the two groups.

Table 4.12: Summary of correlation test on the ranking of causes of project price escalation

Respondents response based on:	$W = \frac{12 \times S}{m^2 \times (n^2 - n)}$	Significance level of p (Appendix B )	Significance for P < 0.05	Reject/don't reject the Null Hypothesis
Cause of price escalation	0.8934	0.000022	significant	reject
Rate of occurrence of price escalation	0.9365	0.000008	significant	reject
Significance of price escalation	0.9743	0.000003	significant	reject

According to Table 4.12, considering a significance level of 95% (P = 0.05), the calculated value of p for all the three group cases are greater than the critical values of p. Therefore, the hypothesis that there is no significant agreement between the respondents is rejected i.e. the null hypothesis is rejected.

It can be deduced that there is strong correlation between the attitudes of the respondents in all the three groups and hence the null hypothesis should be rejected while accepting the alternative hypothesis. This signifies that most of the respondents have the same perception about the causes of price escalation of federal road contracts in Ethiopia.

#### **4.7 Effects of Price Escalation of Road Projects at Tender Stage**

The survey from most respondents affirmed the degree of the severity of the effect of road project price escalation at tender stage. The effect is manifested mostly in the area of budget planning by project owners where scarcity of funding projects as per government's plan would be challenging and impossible as a result of the un-anticipated road project price escalation at tender stage. This would even make the allocation of funds by financiers difficult.

Most of the time clients envisage construction costs of road projects to fall within a certain ranges of engineers' estimate. However, according to the survey, apart deviation of bid offers from engineers estimate at tender stage, the periodical escalation or rise of road project costs for over time is getting higher and higher. This has tremendous draw back on the overall budget planning of the clients thereby the sector development of the country.

Although the degree of the effects of price escalation varies periodically, all the parties involved in the construction industry are believed to be affected by price escalation of road projects. The first victim of price escalation would be the client since tender cost of projects is envisaged to be realized within an allocated fund of the government program. Exceeding the fund would jeopardize the budgeting program by financiers and the project owner.

Road project price escalation at tender stage affects the construction industry as a whole and consequently the national economy of the country apart the parties that are directly involved in the construction of a project.

## CHAPTER 5 Conclusions and Recommendations

### 5.1 Conclusions

In accordance and in line with the analysis result drawn up from the desk study and respondents' responses of the questionnaires regarding on an assessment of the causes and effects of price escalation of federal road projects at tender stage, the research hereby summarizes the following under listed core points as a conclusion to the study of the research.

- I. The research affirmed that about 78% of the respondents answer supports the idea that price escalation of federal road project is apparent and occurs frequently in the Ethiopian construction industry.
- II. There is a general lack of capacity problem of project owners which is manifested in the area of planning and design according to 40% and 50% response from respondents' respectively. This problem is the result of poor design review follow up by the project owners coupled with insufficient time given to consultants to prepare tender documents which ultimately leads to pre-tender cost estimate escalation of road projects.
- III. Based on cost estimating approach of tendering projects, the respondents affirmed that 68% of the respondents to practice approximate quantities estimating method which is commonly used method of cost estimating while the remaining 32% claimed to use single rate approximating method. Therefore, comparably, there seems to be less draw back towards the respondent's cost estimating approach that is believed to impact the price escalation although it is still a fundamental threat.
- IV. The pricing approach used in construction of 76% of the respondents is cost-based where the pricing involves estimating the project cost, then applying a profit Margin, where as the remaining 24% uses market based pricing which includes further a profit margin based on additional market information. These respondents may seem to contribute to the price

escalation in Ethiopia as skimming could result in quoting higher than the market can allow Ethiopia.

- V. According to the research study, bid skimming is practiced by 70% of the respondents. This involves pricing the bid offer relatively higher than the market would allow. This is believed as well to be a factor to trigger price escalation of federal road contracts in Ethiopia.
- VI. The most frequent causes of price escalation of federal road contracts in Ethiopia based on **rate of occurrences**, i.e. with an average mean score ranking of  $\geq 3.5$  in consecutive order are; lack of proper budgetary planning & less emphasis given to planning by clients and financiers, change in foreign exchange rate (for imported materials) and cost inflation of construction materials whereas, insufficient time given to tender document preparation by clients', inaccurate quantity estimate and unclear specifications or changes to specification are comparably some of the less frequent causes of price escalation of federal road contracts in descending order with an average mean score ranking of  $< 3.5$ .
- VII. There is strong correlation on the responses of the three groups of respondents in ranking of the causes of price escalation of federal road contracts in Ethiopia and the rate of occurrences of the variables of price escalation of federal road contracts in Ethiopia.
- VIII. The effect of price escalation of federal road contracts is necessitating the requirement of more funds to get injected into the road development program against the planned budget allocation program of clients' and financiers' . The effect has also transcended as far as clients' losing their contractual power to terminate and replace long overdue and liquidated road contracts with new ones as a result of the danger of facing an escalated project contract cost for the remaining portion of the work.
- IX. Clients are among the stakeholders who are severely affected by price escalation of federal road contracts in Ethiopia. This is because, if the problem persists, ultimately the client will be compelled to look for an additional fund to cater for the budget deficit induced as a result contractor's high bid offer at tender stage.

## 5.2 Recommendations

In respect to this research finding, the following basic recommendations are expected to be exercised by key role players of the construction industry, i.e, Clients, Consultants and Contractors in order to minimize or avoid price escalation of federal road contracts in Ethiopia.

### 5.2.1 Consultants

Consultants are one of the key role players in construction industry, translating the clients' needs and ideas in to plans and drawings and supervise the translation of these plans and drawings into visible and viable physical structures. The following are recommendation given to consultants based on the research findings.

- I. Consultant should take sufficient time to prepare tender documents and deploy competent and experienced professionals in the field in order to avoid committing discrepancy of design documents against the actual field data.
- II. Consultants should provide comprehensive information required for easier interpretation of tender documents review by the client. Specifications should also be standardized as much as possible for ease of understanding by contractor's and ensure adequate and realistic specifications of materials and methods.
- III. Detailed and comprehensive site investigation should be done at the design phase to portray the actual field data to contractors to avoid bias and ambiguity of quantities in tender documents.
- IV. Consultant should consistently keep record of and make proper market price assessment for construction materials.
- V. Consultants should hold themselves responsible for collection of accurate data and optimal solution during design work.

### 5.2.2 Clients/Project Owners

Clients play the major role in the construction industry from realization, conception, and procurement to administration of projects both technically and contractually. Clients proper planning, utilization and management of project funds acquired from local and international financiers is vital for the construction industry thereby the economic development of the country. The following are recommendation given to clients based on the research findings.

- I. Clients should have a well planned schedule to allow consultants enjoy sufficient time for feasibility studies, design and tender document preparation of projects. This helps to bring about clarity of tender documents with which contractors offer bids without any bias of quantity estimates in the tender documents.
- II. Clients should give enough time to review the design and tender documents with the help of their experienced design consultants before reaching into the decision to float the bid to contractors.
- III. Clients should be able to short list reputable professional consultants on the basis of their service in order to assign for feasibility study of projects, design and tender document preparation.
- IV. Clients should give more weighting criteria on financial responsiveness of bids that is adopting engineers estimate method for financial qualification criteria to avoid excessive and over exaggerated bid offers.
- V. Clients should have a firm mechanism by through which corrupt procurement practices that may have the power to manipulate tender results are exposed and avoided from professionals.

- VI. Clients should make proper risk allocation and enforce the rules of the contract.
- VII. Periodical training and incentives to employees of the client should be done.
- VIII. Clients should have a strong accountability system of monitoring project costs.

### **5.2.3 Contractors**

Contractors are the prime constructors of projects from the stakeholders who are directly involved in the construction activity operations. The following are recommendation given to contractors based on the research findings.

- I. Contractors should properly conduct site visit with detailed exploratory material investigation of the project area in order to come up with a realistic tender offer.
- II. Contractors should have a through detailed market price assessment of construction materials locally and globally in order to reflect the real cost inputs on their bill of quantities when tendering a project.
- III. Contractors should deploy competent and experienced estimator or quantity surveyor to fill bid prices of projects activities when tendering a project.
- IV. Contractors should regularly give training and incentives to their employees.

#### 5.2.4 Government

Government plays a significant role in the construction industry, whose ultimate decision in funding construction projects can impact the overall economic development of a country.

The following are recommendation given to government based on the research findings.

- I. Government should create a stable economy by attracting and motivating local companies to specialize in the production of enough construction materials from local market to avoid price fluctuations associated with imported construction materials.
- II. Governments should give periodical capacity building programs for professionals within the construction industry, in the field of project cost estimation and project procurement.
- III. Government should play a vital role on research and development programs of appropriate project cost management tools that will help and enlighten the professionals reduce the internal causes of price escalation in the construction industry.
- IV. Government should enhance the technical skill of domestic consultants within the industry through creating joint venture opportunities that will allow knowledge transfer with foreign consultancy firms.

Furthermore, road clients needs to work hand in hand with the government, financiers and stakeholders in order to bring about all in all a healthy and harmonized procurement platform whereby all stakeholders involved in road project constructions would take into account the notion of thoroughly considering market indicators in conjunction with a realistic project cost estimating and pricing approach in tendering road projects. This would as well facilitate the work of financiers besides enabling the appropriate and proportionate allocation of road funds by clients according to the need and devised government program.

### **5.2.5 Future Research Proposal**

In order to enforce further the finding of the thesis and for the sake of the totality of this research, the following core study areas that are believed to replenish further the concept of price escalation of road contracts in the Ethiopian construction industry are proposed for future studies.

- I. Consultants' pre-tender cost estimating and pricing approach of road projects in Ethiopia.
- II. Method of financing, procurement system and contract administration of road projects in Ethiopia.
- III. Assessment of the impact of price escalation of road projects on government and international financing institutions.

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## **APPENDIX A**

### **QUESTIONNAIRE**

**A Survey on Assessment of**  
**the Cause of Federal Road Project Price Escalation at Tender stage in Ethiopia.**

**Dear Sir/Madam,**

The purpose of this survey is to obtain data for the specified research being conducted as a partial fulfillment of M.Sc. Degree in Construction Technology and Management at Addis Ababa University.

The aim of this questionnaire is to obtain professional opinion on issues of the **Cause of Federal Road Construction Project Price Escalation at Tender Stage in Ethiopia**. The study is presumed to identify the possible root causes of construction price escalation of road projects at tendering stage so that an awareness will be created amongst road clients, consultants, contractors and stakeholders in order to give timely profound professional measures and mitigate problems which may arise in the area of road project financing, planning, tendering and implementation so that road budgets would be utilized appropriately, cost effectively and proportionately according to a devised government program.

The information supplied in this completed questionnaire will be used solely for broad research purposes (for academic purpose). All specific company and interview information will be kept confidential at all times. Only generalized analysis of the information contained within this completed questionnaire will be utilized in the research process.

Your response, in this regard therefore is highly valuable and contributory to the outcome of the research. Thank you for your invaluable time and cooperation in advance.

Regards,

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Addis Ababa

**Instruction for completing the questioner**

- Please put “X” mark on the space provided to indicate your response where applicable.
- In case where responses other than marks are required, please write your response in the space provided.
- You may mark more than one as the case may be or use additional paper where the space provided is not enough.

**Part 1: General Information about Respondents**

- 1.1 Organization /Company Name (optional): .....
- 1.2 On what discipline is your company engaged for in the construction sector?
- Contractor                       Consultant
- Employer                       Professional institutions
- Other, specify.....
- 1.3 Type or origin of your organization
- Project Owner/Client    Domestic Contractor    Domestic Consultant    Foreign Contractor
- Foreign Consultant    Financer
- Others (please specify) .....
- 1.4 How long has your organization been involved in road construction sector (Year of establishment):
- < 5 years                       5-10 years                       10-15 years                       >15years
- 1.5 If your company is foreign Consultant or Contractor, how long has your organization been involved in Ethiopian road Construction Sector?
- < 5 years                       5-10 years                       10-15 years                       >15years
- 1.6 Your position in the organization/ title.....
- 1.7 Educational status?
- B.Sc.                       M.Sc.                       Others; please specify.....
- 1.8 Contact addresses (Optional): .....
- Name (optional): .....E-mail: .....Tel: .....

**Part II: General on Project Cost Estimation and Escalation**

- 2.1. In general, project cost/price escalation at tender stage in road construction projects could be described as apparent. How do you level your respond to the statement?
- 1- I Strongly disagree                       3 - Neutral                       5 - I strongly agree

2- I don't agree                       4 - I agree

Other (Please specify) .....

If you agree, what factor may have contributed in your opinion? (Please check all that apply in your point of view)

1-Global currency fluctuation                       6-Government changing policies

2-Lack of competent and experienced professionals in the field

3-Absence of clear and suitable contractual provisions

4-Uncontrolled market growth on construction material

5-Excessive use of on imported construction materials

Other (Please specify) .....

What measures shall be taken to improve the current state of local project cost/price inflation or increase?  
.....  
.....

2.1. How do you level the occurrence of project price escalation in road construction projects?

1-Most Frequent       2-Frequent                       3-Least Frequent       4-No Occurrence

2.2. How do you level the frequency of project price escalation in the construction industry?

1-Very frequent                       2-Frequent                       3-Rarely                       4-Not at all

If your response is Very frequent or frequent, what do you think is the reason?

1-Wrong method of cost estimation                       4-Ambiguity of contract documents

2-Inequitable cost determination by the engineer or employer

3-Contractors attitude towards getting additional payment

If any.....

And what is your recommendation to minimize the problem.....  
.....

2.3. In which stage in your opinion is the general lack of capacity problem of Road clients as well as both consultants and contractors manifested?

1-Planning                       2-Design       3-Procurement                       4-Not at all

If any.....

And what is your recommendation to minimize the problem.....  
.....

2.4. How do you level in your opinion the impact of the problem of road price escalation at tender stage to the construction industry in Ethiopia?

- 1-Most Significant     2-Significant     3-Least Significant     4-Nothing at all

If your answer is 1,2 and 3, please give your respective area of the impact to the problem.....

.....  
.....  
.....  
.....  
.....

**Part III – Specific on Project Cost/Price inflation at tendering stage.**

**A. Questionnaire for Contractors**

3.1. Proper market data collection of price and documentation is critical in cost estimating of road projects. How do you level your agreement regarding data collection and documentation to meet the acceptable standard?

- 1- I Strongly disagree     3 - Neutral     5 - I strongly agree  
 2- I don't agree     4 - I agree Disagree

If you are in disagreement, where do you think the problem arises?

- 1-Lack of Technical and managerial skill     5-Lack of awareness of stakeholders  
 2-Problems attributed to the Contractor capacity  
 3-Lack of conducive environment for practicing  
 4-Lack of competent and experienced professionals,  
Other (Please specify) .....

3.2. What do you recommend to improve the problem in project price escalation in road construction projects?.....

3.3. Does a company, during tendering of a project, impose a strict methodology to handle Project cost?     Yes     No

If yes, would you describe? If there is a written Protocol would you provide a copy?  
.....  
.....

3.4. According to PMBOK tools and techniques used in project cost estimation, which technique do you use in estimating cost of a project at tender stage?

- 1-Analogous estimating     2-Parametric estimating     3-Bottom up estimating
- 4-Three point estimating     5-Reserve analysis estimating     6-Vendor bid analysis
- 7-Project management estimating software

If any other cost estimation tools or techniques.....  
Why? .....

3.5. Most of the time, the final cost of construction may be different from forecast at tendering stage due to many reasons. What could be your answer related to the fact?

- 1-The extent of repairs in a maintenance contract can be difficult to foresee
- 2-The effect of competition in the market
- 3-The amount and quality of historical data available
- 4-The amount of design information available
- 5-Change introduced by the client
- 6-The estimator's skill and method used

Other (Please specify) .....  
Why? .....

3.6. Which method of cost estimating of road construction project do you use at tender stage?

- 1-Single rate approximating method
- 2-Multiple rate approximating method
- 3-Approximating quantities
- 4-Analytic estimating
- 5-Operational estimating

If any other cost estimation methods.....

Why? .....

3.7. Which method of pricing approach for road construction project do you use at tender stage?

1-Cost based approach of pricing

2-Market based approach of pricing

If any other cost estimation methods.....

Why? .....

3.8. What method of cost optimization process in market based pricing for road construction projects do you use at tender stage before submitting your final bid?

1-Skimming

2-Penetrating

If any other cost optimization methods.....

Why? .....

3.9. Which contract strategies are broadly exercised in Ethiopia for payment system method?

1-Price-based – lump-sum or re-measurement

2-Cost-based – cost-reimbursable or target-cost

If any other contract strategies methods.....

Why? .....

3.10. Is inflation or increase in the cost of construction materials a factor for road project cost/price escalation?

1- I Strongly disagree

3 - Neutral

5 - I strongly agree

2- I don't agree

4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

1 - Unlikely 0% - 25%

3 - Almost certain 51% -99%

2 - Likely 26% - 50%

4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

1 - No significance

3 – Average significance

5 – Extremely significance

2 - Minor significance

4 – High significance

3.11. Do you think fluctuations in the cost of labor, equipment and material or any other matter affecting the cost breakdown of activities at tender preparation?

- 1- I Strongly disagree       3 - Neutral       5 - I strongly agree  
 2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance       3 – Average significance       5 – Extremely significance  
 2 - Minor significance       4 – High significance

3.12. Insufficient bidding data concerning the project is expected to be one of the factors that cause price escalation at tender stage? What could be your response?

- 1- I Strongly disagree       3 - Neutral       5 - I strongly agree  
 2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance       3 – Average significance       5 – Extremely significance  
 2 - Minor significance       4 – High significance

3.13. Change in foreign exchange rate (for imported materials) is expected to be one of the factors that cause price escalation at tender stage? What could be your response?

- 1- I Strongly disagree       3 - Neutral       5 - I strongly agree  
 2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance       3 – Average significance       5 – Extremely significance  
 2 - Minor significance       4 – High significance

3.14. Costs associated with provision for special risks which very often include outbreak of war, projectile missile, hostilities, contamination and other such risks would bring about price escalation at tender stage? What is your response?

- 1- I Strongly disagree       3 - Neutral       5 - I strongly agree  
 2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance       3 – Average significance       5 – Extremely significance  
 2 - Minor significance       4 – High significance

3.15. Some contractors agree on the idea that changes in actual site data or information during site visit contrary to materials report in the bidding document is a factor for price escalation at tender stage of a given project? How do you agree?

- 1- I Strongly disagree       3 - Neutral       5 - I strongly agree  
 2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance       3 – Average significance       5 – Extremely significance  
 2 - Minor significance       4 – High significance

3.16. Encountering of not foreseeable physical obstructions and conditions (Clause 12) not indicated or anticipated in the bidding document contributes to price escalation at tender stage. What is your argument related to the fact?

- 1- I Strongly disagree       3 - Neutral       5 - I strongly agree  
 2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance       3 – Average significance       5 – Extremely significance  
 2 - Minor significance       4 – High significance

3.17. Unclear specifications or changes to specification are also believed to be one of the factors for price escalation at tender stage. What is your view on this?

- 1- I Strongly disagree       3 - Neutral       5 - I strongly agree  
 2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance       3 – Average significance       5 – Extremely significance  
 2 - Minor significance       4 – High significance

3.18. Do you think that inaccurate quantity estimate or excess quantity during tender design plays a major role in causing price escalation at tender stage?

- 1- I Strongly disagree       3 - Neutral       5 - I strongly agree  
 2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance       3 – Average significance       5 – Extremely significance  
 2 - Minor significance       4 – High significance

3.19. Quantity change made by clients with addendum after the bid is floated may bring about un anticipated project price escalation at tender stage. What is your response to the fact ?

- 1- I Strongly disagree       3 - Neutral       5 - I strongly agree  
 2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance       3 – Average significance       5 – Extremely significance  
 2 - Minor significance       4 – High significance

3.20. Some contractors suggest that difficulties in obtaining construction materials in the local market has its own influence on impacting price escalation on projects. Do you agree?

- 1- I Strongly disagree       3 - Neutral       5 - I strongly agree  
 2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance       3 – Average significance       5 – Extremely significance  
 2 - Minor significance       4 – High significance

3.21. Ambiguities or discrepancies of documents (Clause 5.2) also can be a factor to cause cost price escalation of projects at tender stage. What is your argument on this statement?

1- I Strongly disagree       3 - Neutral       5 - I strongly agree

2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%

2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

0 - No significance       2 – Average significance       4 – Extremely significance

1 - Minor significance       3 – High significance

3.22. Do you think that cost associated with testing of samples not provided in the bidding document can be a factor to cause price escalation at tender stage?

1- I Strongly disagree       3 - Neutral       5 - I strongly agree

2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

1 - Unlikely 0% - 25%       3 - Almost certain 51% -99%

2 - Likely 26% - 50%       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

1 - No significance       3 – Average significance       5 – Extremely significance

2 - Minor significance       4 – High significance

3.23. Executive bureaucracy in the client's organization is believed by certain contractors to be a factor to cause price escalation at tender stage. How do you agree to the statement?

1- I Strongly disagree       3 - Neutral       5 - I strongly agree

2- I don't agree       4 - I agree Disagree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%                       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%                       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance                       3 – Average significance                       5 – Extremely significance  
 2 - Minor significance                       4 – High significance

3.24. What can you supplement in your view is there as another possible causes other than the above mentioned causes of road project price escalation at tender stage?

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.....  
.....  
.....

**Part III – Specific on Project Cost inflation at tendering stage.**

**B. Questionnaire for Clients**

3.25. It is known that cost estimating relies on several project components. On what basis do you estimate the cost of your project from initiation to planning stage?

1. Historical information  
 2. Resource requirements  
 3. Duration of activities

If Other (Please specify) .....  
.....  
.....

3.26. What type of pre-announced tender ward criteria do you follow to select contractors?

1. Lowest priced tender;

2. The most economical advantageous tender (MEAT Criteria);

If Other (Please specify) .....

.....  
.....

3.27. On what basis of tender principle does an evaluation panel evaluate tenders?

1. Formal compliance check

2. Technical and substantive compliance check

3. Choice of the best tender on the basis of pre-announced award criteria

4. Recommendation of the award of the contract

If Other (Please specify) .....

.....  
.....

3.28. What are the two main benefits of cost planning?

1. To ensure tenders received do not exceed the budget

2. To collect cost information from a number of constructions, at various stages.

3. Other

If Other please specify,

.....  
.....  
.....

3.29. In major road construction projects of Ethiopia, cost/price inflation occurs at projects where both the consultant and contractor are foreign companies. What is your opinion on the statement?

1- I Strongly disagree

3 - Neutral

5 - I strongly agree

2- I don't agree

4 - I agree

If you agree, what is the possible measure to increase the participation of local contractors and consultants .....

.....

3.30. Clients appoints inappropriate/inexperienced consultants to prepare bidding data that ultimately be a factor to cause cost/price inflation of projects at tender stages. What is your argument on this statement?

- 1- I Strongly disagree                       3 - Neutral                       5 - I strongly agree  
 2- I don't agree                       4 - I agree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%                       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%                       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance                       3 – Average significance                       5– Extremely significance  
 2 - Minor significance                       4 – High significance

3.31. Lack of proper budgetary planning and less emphasis given to planning by clients and financiers is a contributory factor leading to cost inflation by contractors at tender stage. How do you react on this statement?

- 1- I Strongly disagree                       3 - Neutral                       5 - I strongly agree  
 2- I don't agree                       4 - I agree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%                       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%                       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance                       3 – Average significance                       5– Extremely significance  
 2 - Minor significance                       4 – High significance

3.32. Client's invitation of inappropriate/inexperienced contractor to make tender offer is a problem attributing to cost inflation at tender stage. How do you react to the statement?

- 1- I Strongly disagree                       3 - Neutral                       5 - I strongly agree  
 2- I don't agree                       4 - I agree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%                       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%                       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance                       3 – Average significance                       5– Extremely significance  
 2 - Minor significance                       4 – High significance

3.33. Purposeful cost over/under estimation by contractors to maximize their profit margin is a factor for cost inflation at tender stage. How do you answer to this statement?

- 1- I Strongly disagree                       3 - Neutral                       5 - I strongly agree  
 2- I don't agree                       4 - I agree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%                       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%                       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance                       3 – Average significance                       5– Extremely significance  
 2 - Minor significance                       4 – High significance

3.34. The tendency of the client to stick to list bidder criteria rather than analyzing the bid offer against the engineers estimate is believed to be one of the main factor that contributed to cost/price inflation at tender stage. How do you view this statement?

- 1- I Strongly disagree                       3 - Neutral                       5 - I strongly agree  
 2- I don't agree                       4 - I agree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%                       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%                       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance                       3 – Average significance                       5– Extremely significance  
 2 - Minor significance                       4 – High significance

3.35. Increase in tax/change in government fiscal/monetary policies is also suggested to be one of the factor's to cause cost inflation at tender stage. Your argument on this statement?

- 1- I Strongly disagree                       3 - Neutral                       5 - I strongly agree  
 2- I don't agree                       4 - I agree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%                       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%                       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance                       3 – Average significance                       5– Extremely significance  
 2 - Minor significance                       4 – High significance

3.36. Clients prefers not to terminate road contracts already running although delayed excessively because the cost of rehiring another contractor with new tender award procedure and time is much greater due to expected momentarily high cost/price inflation of the local market. Your argument on this statement?

- 1- I Strongly disagree                       3 - Neutral                       5 - I strongly agree  
 2- I don't agree                       4 - I agree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%                       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%                       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance                       3 – Average significance                       5– Extremely significance  
 2 - Minor significance                       4 – High significance

### **Part III – Specific on Road Project Cost/Price inflation at tendering stage.**

#### **C. Questionnaire for Consultants**

3.37. Inappropriate or insufficient time given to tender document preparation from client is believed to bring about erroneous tender data to float and cause cost/price inflation of projects at tender stage. Your argument on this statement?

- 1- I Strongly disagree                       3 - Neutral                       5 - I strongly agree  
 2- I don't agree                       4 - I agree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%                       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%                       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance                       3 – Average significance                       5– Extremely significance  
 2 - Minor significance                       4 – High significance

3.38. Some consultants plan to engage less professionals to work on design and tender document preparations from their belief that they would minimize their cost of their assignment but has been a major cause for poor quality of tender which latter on brings about significant discrepancy between their estimate and actual contractor's offer. Your argument on this statement?

- 1- I Strongly disagree                       3 - Neutral                       5 - I strongly agree  
 2- I don't agree                       4 - I agree

If you agree please indicate the chances of occurrences of this factor based on the following choices.

- 1 - Unlikely 0% - 25%                       3 - Almost certain 51% -99%  
 2 - Likely 26% - 50%                       4 - Certain 100% probability to happen

How do you suggest the impact of this variable to affect the cost based on the following choices?

- 1 - No significance                       3 – Average significance                       5– Extremely significance  
 2 - Minor significance                       4 – High significance

3.39. What can you supplement in your view as a professional consultant to be another possible cause of road project cost/price inflation at tender stage other than the above mentioned possible causes?

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Thank you for your collaboration!!

## APPENDIX B

### Ranking of records with respect to the causes of price inflation of road construction projects at tender stage in Ethiopian

No	List of Records	Employer		Consultant		Contractor		Average	
		RI	Rank	RI	Rank	RI	Rank	Average RI	Rank
1	Cost Inflation of construction materials	3.56	6	3.64	3	3.26	9	3.49	6.00
2	Cost of labor, equipment and material	3.11	14	3.43	10	3.30	7	3.28	10.33
3	Insufficient bidding data concerning the project	2.22	20	2.36	17	3.63	2	2.74	13.00
4	Change in foreign exchange rate (for imported materials)	3.61	4	3.64	3	3.52	4	3.59	3.67
5	Costs associated with provision for special risks (Clause 51.1)	1.22	24	1.00	24	2.67	17	1.63	21.67
6	changes in actual site data or information during site visit contrary to materials report in the bidding document materials)	3.33	12	1.71	19	3.56	3	2.87	11.33
7	Encountering of not foreseeable physical obstructions and conditions (Clause 12) not indicated or anticipated in the bidding document excessive change orders	2.41	18	2.45	15	3.07	11	2.65	14.67
8	Unclear specifications or changes to specification	3.56	6	2.71	14	3.37	6	3.21	8.67
9	inaccurate quantity estimate or excess quantity	3.50	9	3.57	6	3.28	8	3.45	7.67
10	Quantity change made by clients with addendum after the bid is floated	2.83	16	2.14	18	2.70	16	2.56	16.67

11	Difficulty in obtaining construction materials in the local market	2.50	17	2.43	16	3.04	13	2.66	15.33
12	Ambiguities or discrepancies of documents (Clause 5.2)	3.17	13	1.61	21	3.41	5	2.73	13.00
13	testing of samples not provided in the bidding document (Clause 42.1)	1.68	22	1.24	23	2.52	21	1.81	22.00
14	Executive bureaucracy in the client's organization during construction	2.14	21	1.71	19	3.26	9	2.37	16.33
15	Clients appoints inappropriate/inexperienced consultants to prepare bidding specification	1.61	23	1.31	22	2.26	22	1.73	22.33
16	Lack of proper budgetary planning and less emphasis given to planning by clients and financiers	3.63	3	3.64	3	3.70	1	3.66	2.33
17	Client's invitation of inappropriate/inexperienced contractor to make tender offer	2.28	19	2.90	12	2.59	19	2.59	16.67
18	Purposeful cost over/under estimation by contractors to maximize their profit margin	3.06	15	3.50	9	2.96	15	3.17	13.00
19	The tendency of the client to stick to list bidder criteria rather than analyzing the bid offer against the engineers estimate	3.50	9	3.57	6	3.04	13	3.37	9.33
20	Increase in tax/change in government fiscal/monetary policies	3.61	4	3.57	6	2.59	19	3.26	9.67

21	Clients prefers not to terminate road contracts already running although delayed excessively because the cost of rehiring another contractor with new tender award procedure and time is much greater due to expected momentarily high cost/price inflation of the local market	3.83	1	3.82	2	3.07	11	3.58	4.67
22	Inappropriate or insufficient time given to tender document preparation from clients	3.72	2	3.86	1	2.61	18	3.40	7.00
23	consultants plan to engage less professionals to work on design and tender document preparations	3.44	11	3.14	11	1.68	23	2.76	15.00