

Study on Cost Overrun and Cost Escalation Factors for Residential Project

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Abstract: *The construction projects can be delayed for a large number of reasons. Delay has significant effect on completion cost and time of construction project. Delays can be minimized when their causes are identified to reduce escalation and overrun. Knowing the cause of any particular delay in a construction project would help avoiding the same. Although various studies have been undertaken to identify the factors affecting the causes of delays, the studies need to focus on specific geographical area, country or region. The construction industry is major industry and contribute in economic growth and provide employment to the nation. Hence the high expenses associated with labor and materials may fluctuate periodically, to varying degrees, over the duration of the project. Therefore, the majority of contractors experience significant financial losses during that period, as a result of the abrupt increase in global raw material prices or currency exchange rates, while operating under a lump sum or fixed-price agreement. Here in this paper we are going to examine different established and conventional techniques employed in calculating Cost Escalation in the construction sector. This study presents innovative ideas and methodologies that can be applied in India to address the issue of cost escalation. The aim is to eliminate the existing errors, complexity, and ambiguities associated with the current ways. The offered approaches have been thoroughly examined, supported by illustrative examples and global data that confirms their legitimacy.*

Keywords: Escalation, Overrun, Planned Budget, Lump Sum etc

I. INTRODUCTION

Cost Overrun & Escalation is the provision in the cost estimate for increases in the cost of equipment, material, labor, etc., due to continuing price changes over the time. It is used to estimate the future cost of a project or to bring historical costs to the present. It is a risk that can account for a substantial part of construction cost, especially in long term projects where the variability and uncertainty is greater. Therefore, there is a need to assess the risk of cost escalation in construction program. The aim of our study is to identify the root causes/factors to calculate cost overrun & escalation by conventional methods (mathematical model R.I.I) which are obtained by the literature review study.

II. METHODOLOGY

To study the cost escalation we prepare questioner and collected the data to know causes and delay in construction project. The identified delays in numerous study studies have revealed the actual conditions of the sites, which may facilitate the development of a well-prepared questionnaire. The Likert scale is employed to scale the ranks provided by each respondent. A Likert scale, also known as a psychometric scale, is frequently used in research that use questionnaires. The most prevalent method for scaling responses in survey research is sometimes referred to as the rating scale. A Likert item is a statement that the respondent evaluates by assigning a quantitative value on a subjective or objective dimension. The scores of the surveyed delays were arranged in ascending order according to their relevance level. The questions are classified based on their level of significance, ranging from 1 (not significant) to 5 (very significant), according to this scale. A greater score indicates a strong agreement or a highly significant value, whereas a lower value indicates a lack of significance.

These are categorized as follows for the current study

The questionnaire ranking of cost overrun and escalation are done accordingly through Relative Importance Index.

Table-1 Questionnaire distributed and Response Received

Respondents	Questionnaire Distribute	Questionnaire Response Received	Response percentage
Owner	5	2	40
Project Manager	9	6	66.67
Project Engineer	21	13	61.90
Junior Engineer	16	10	62.50
Contractor	18	15	83.33
Total	69	46	62.88

Questionnaire Preparation

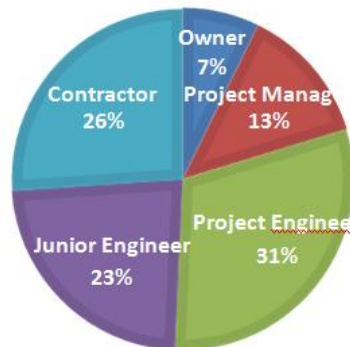
The Likert scale adopted for the study and the value with categorization according to the effect of the question or the delay scale given in the following table

Table-2 Questionare Category

Sr. No	Category	Value
1	Very Low	1
2	Low	2
3	Medium	3
4	High	4
5	Very High	5

QUESTIONER COLLECTION FROM RESPONDENT

■ Owner ■ Project Manager ■ Project Engineer ■ Junior Engineer ■ Contractor



Graph – 1 Questioner Collection from Different Respondent The filled sample questionnaire format is given below: Weightage for R.I.I Client/owner related factors

- Additional things included in the Work Order.
- Process of making decisions.
- Contract award delay.
- There is a delay in the process of finalising and transferring the site.
- The essence of cash flow.
- Payment for completed job has been delayed.

- Modification in the project's design expenses.
- The organization's level of liquidity.
- Delayed in the process of examining and granting approval for the design. 10. The owner must make provisions for safety considerations.
- Supply of resources.

Architect related factors

- Inaccurate measurements and requirements. 13. Missing details in building plans
- Work to be done was approved late.
- The timeliness of site visits. 16. Lack of proper oversight.
- Missing communication.

Structural engineer related factors.

- Lack of full structural details.
- Changes and variations in layout.
- Engineer provides insufficient oversight.
- Instructions were sent out late.
- The timeliness of site visits.
- Provided incorrect design.

Contractor related factors

- Inadequate site management.
- Inadequate supervision.
- Difficulties with finances.
- Inadequate coordination and communication.
- Labours are improperly managed.
- Insufficient experience.
- Equipment malfunction.
- Equipment and basic materials of superior quality.
- Rework expenses.
- Time and cost estimates that are inaccurate.
- False engineering practices.
- Failure to meet the specifications.
- Collaboration among various contractors.
- Safety provisions are implemented by the contractor.

Labour related factors

- Skilled labour is unavailable.
- Labour scarcity.
- Negligence results in material waste.
- Proficiency in operating equipment.
- Cost of motivation.

External factors

- Unfavourable weather
- Influence on the environment.
- Site characteristics.

- Unnatural occurrence.
- Complexity of the project.
- Accidents and insurance.
- Inaccuracies in contract documents.
- Unloading expenditure.

The cost escalation factors are as below

At first, the method involved sending questionnaires to representatives of different building industry groups in order to look at the answers about the different factors that led to cost overruns and price increases on the job site. This study offers two different ways to list the different reasons for delays. The first method lets you figure out the Relative Importance Index (RII) of each reason of cost overruns and price increases.

Inflation.	Manufacturers raise prices.	Demand, supply.
Protecting the environment	Altering labour practices.	Govt policies.
The cost of transportation.	Changing power sources.	Interest rates.
	Interest, Taxes	Power rate.
	Power rate	Lack of tech.

Method of the Relative Importance Index (RII)

The Relative Importance Index (RII) ranking method was used to figure out how important each delay cause was. RII was used for the research because it was the best fit for the study's goal. It is possible to find the most important delay causes in the construction business by ranking each cause of delay. The RII has been used in many areas to figure out how important one thing is compared to others. To do a relative importance analysis, you can use a weight or a relative importance index. RII helps figure out how much a certain variable affects the prediction of a criterion variable when used by itself or with other predictor variables.

This equation was used to figure out how important each reason was compared to the others. The RII for each factor comes from Desai and Megha's (2013) journal work and is shown below:

$$RII = \frac{\sum W}{(A \times N)}$$

Where,

W= is weight age given to each factor (ranging from 1 to 5)

A= is 5 (the highest weight) and N= is the total number of respondents

For the building business, the delay factor is more important when RII is high. The RII was used to set the order of the reasons. Based on how people ranked the factors in each assessment, it was possible to see how important each factor was to each of the five groups of delays. The general and overall rankings should be based on each cause that all respondents saw. This will give a full picture of the reasons behind building delays in the Indian construction industry. To find the Relative Importance Index (RII) for each cost overrun and escalation cause and rank them in order of importance.

Sample Calculation of R.I.I:

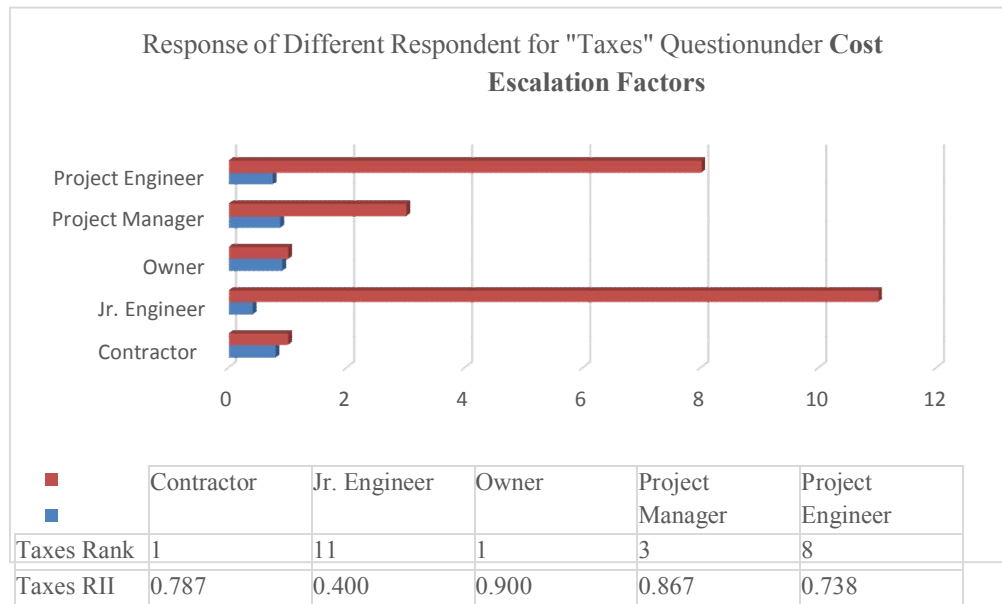
R.I.I of Demand & Supply

$$\text{By Project Manager's} = \frac{(1 \times 1) + (2 \times 0) + (3 \times 1) + (4 \times 4) + (5 \times 1)}{(5 \times 7)} \\ = \frac{1 + 0 + 3 + 16 + 5}{35} = \frac{25}{35} = 0.714$$

The general and total ranking values that were given by the different groups of respondents were compared. The R.I.I. results were compared with each other to get a better idea of how the factors affected the whole picture. The final list of factors was then made based on their severity value of importance. When it comes to meaning, the mean value and relative importance of the factor are both higher when they are higher.

III. RESULT

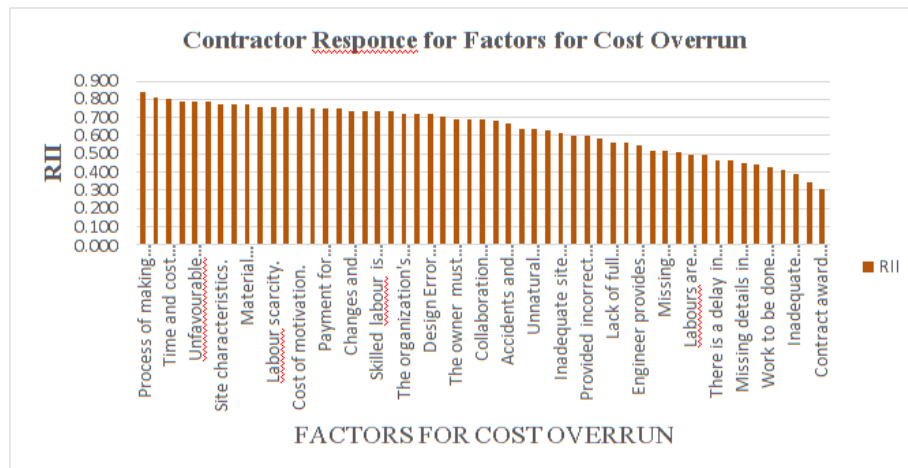
An investigation was carried out to gather information from owners, contractors, junior engineers, senior engineers, and project managers regarding the aspects involved in construction projects. A study is undertaken to determine the significance of each element in relation to cost overrun and escalation. The questionnaire was filled out by representatives and included an analysis of seventy cost overrun drivers categorized into seven broad groupings.



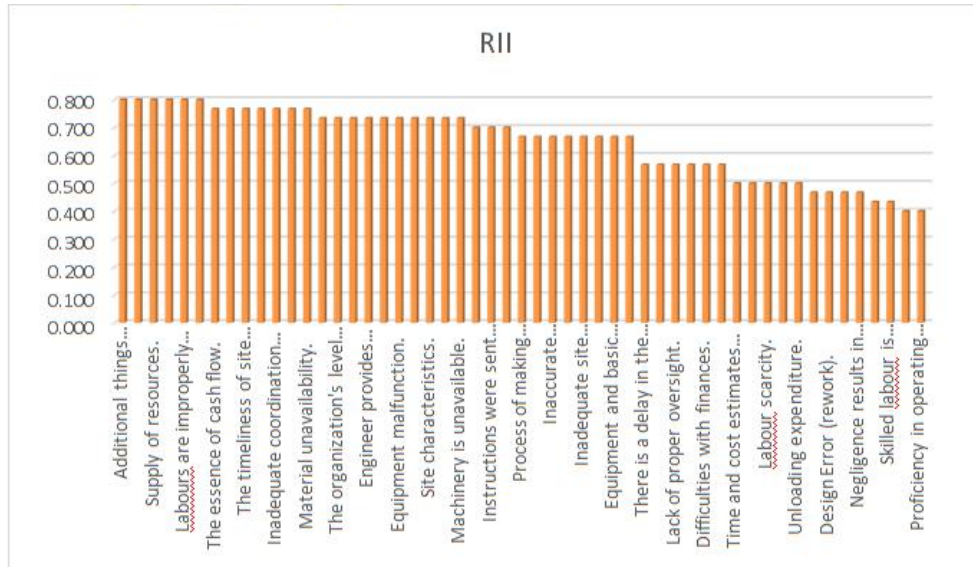
Graph – 2 Typical Response for The Question by Different Respondent

The above chart clear that, every respondent having different views on same question as per their knowledge, responsibility, views & their work condition. In the graph Process of Making decision is rank 1 for Contractor point of views while owner having 50 ranks for same question. This is because contractor need a fast decision to complete the work, but owner point of views decision is afterward, but what to requirement is the priorities.

In above graph contractor & owner said Taxes is the major factor of Cost escalation, while Jr. Engineer having 11 ranks for same question.

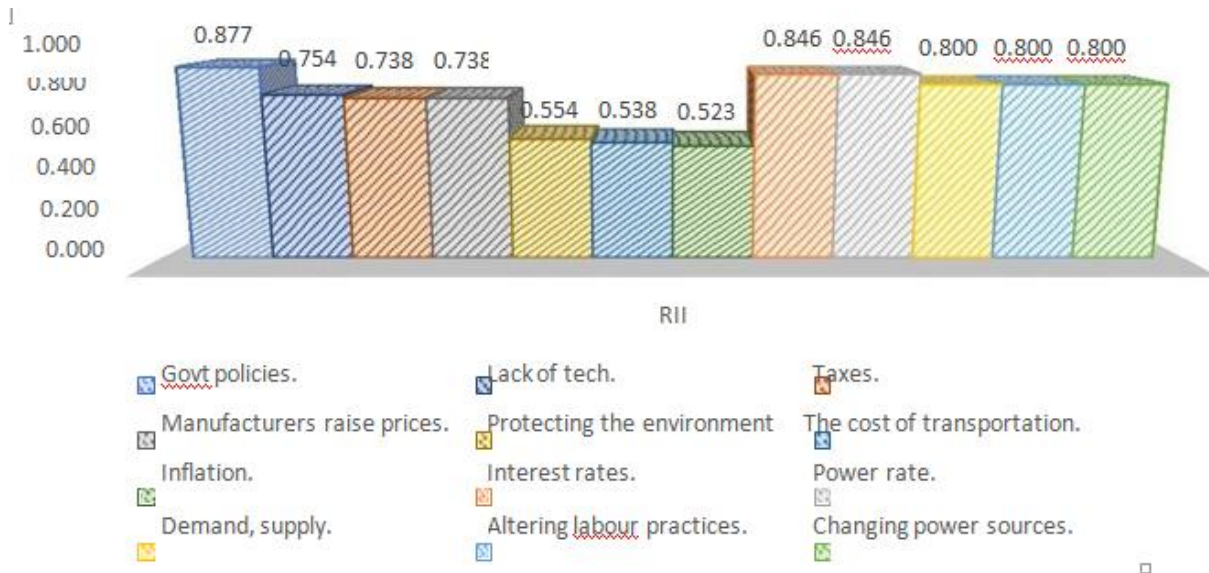


Graph- 3 Typical Response of Contractor for factors for Cost Overrun

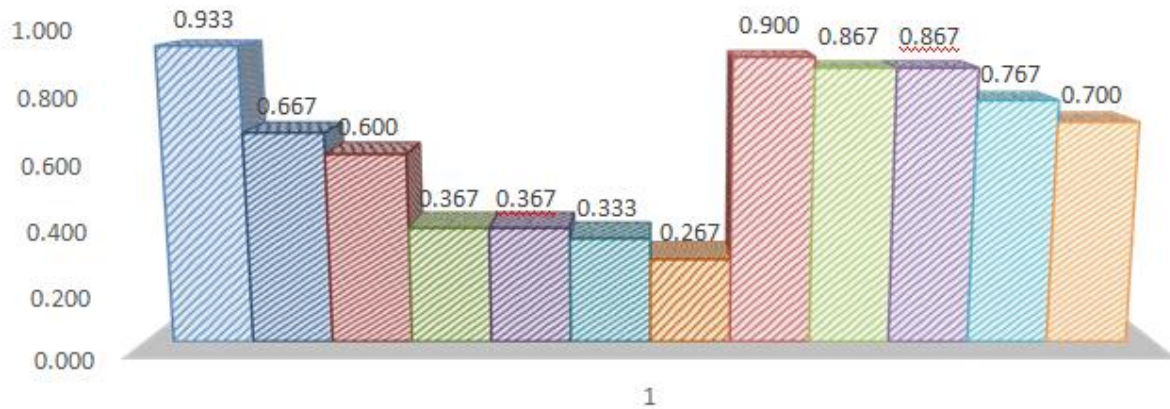


Graph- 4 Typical Response of Project Engineer for factors for Cost Overrun

The above 2 graphs are clearly indicate that, while we asking various questions about the factors which are responsible for cost overrun, the contractor point of views are different and Project Engineer views are different.



Graph-- 5 Typical Response of Project Engineer for factors for Cost Escalation



- Inflation.
- Altering labour practices.
- Protecting the environment
- The cost of transportation.
- Changing power sources.
- Power rate.
- Demand, supply.
- Govt policies.
- Taxes.
- Interest rates.
- Lack of tech.
- Manufacturers raise prices.

Graph-- 6 Typical Response of Project Manager for factors for Cost Escalation

The above 2 graphs are clearly indicate that, while we asking various questions about the factors which are responsible for cost escalation, the Project Manager point of views are different and Project Engineer views are different.

As Project Manager said Cost escalation major factor is Inflation while Project engineer said Government policy is the major reason.

The above graph shows the response of various respondent and their views of factors which is responsible for cost Escalation.

IV. CONCLUSION

This study is an attempt to find the important Cost Overrun & Escalation factors in construction projects. In this chapter the Ranking and Importance of all the Cost Overrun & Escalation factors have been obtained by two main methods. The values of all Relative Importance Index (R.I.I) are shown in tabular and graphical formats. The objective of this study is to improve the assessment and analysis of cost escalation and overrun phenomena in building projects, with the goal of minimizing their impact. The study incorporates data obtained from a Questionnaire Survey, which assists us in making informed decisions during the building phase of any project.

The study provides a crucial list of factors and their rankings that should be avoided to effectively mitigate escalation and overrun in building projects. In ascending order of significance, the study highlights several notable outcomes resulting from escalation and overflow. The factors are as follows for Cost Overrun,

1. Design flaw (revision).
2. Technical failure.
3. The disbursement of payment for the finished task has been postponed.
4. Erroneous dimensions and specifications.
5. Price of incentive.
6. The organization's liquidity level.
7. The examination and approval process for the design is experiencing delays.
8. The approval for the pending tasks was delayed.
9. The punctuality of site visits.
10. Modifications and deviations in the arrangement.

11. The instructions were dispatched belatedly.
12. Lack of sufficient oversight.
13. Lack of sufficient coordination and communication.
14. Revise expenditures.
15. Unsound engineering methodologies.

The following are the primary factors contributing to cost escalation:

1. The concept of demand and supply.
2. The rates at which interest is charged or paid.
3. Government policies.
4. Increase in prices by manufacturers.
5. Taxation.
6. Wage alteration.
7. Additional input of raw materials.
8. Insufficient technological resources.
9. Currency exchange rates.
10. Market volatility.
11. Cost of transportation.

V. SUGGESTIONS FOR REDUCING DELAYS

Effective Execution-- Strategic Planning Multiple software programmes are accessible for project planning using Project Evaluation and Review Technique (PERT)/Critical Path Method (CPM), equipment scheduling, personnel planning, cost optimisation and control, monitoring, and other related tasks. This approach can be efficiently utilised through meticulous implementation planning, resulting in the completion of over 50% of the postponed tasks following a thorough project formulation.

Enhanced Formulation and Evaluation of Projects- Investment decisions about a project should only be made after conducting a thorough research, gathering relevant data, analysing it, and clearly defining the concept. Given that the examination of many projects can be costly and necessitate the creation of a comprehensive project report, it is advisable to employ a rapid stage clearance process to reject project concepts that are clearly not feasible and do not warrant the expenditure of further analysis.

Advance Action-- Once the initial stage examination and clearance have been completed and the preliminary feasibility has been confirmed, the project authorities should be allowed to proceed with the following activities:

1. Land acquisition.
2. Obtaining necessary clearances such as environmental and foreign investment approvals.
3. Schedule a meeting with the primary technology consultant for identification and typing up purposes.
4. Prepare initial design and engineering specifications for primary critical plants and equipment.
5. Identify and assemble the core project management team.
6. Provision of initial infrastructure facilities for building.

Certain advanced action areas may necessitate a modest financial commitment. Alternatively, if the project is approved, there will be significant reductions in both time and expense.

Clearances-- Following the government's approval of the project, there may be multiple clearances necessary from different government agencies. To expedite the process, one or more empowered committees, comprising secretaries or senior officials from relevant ministries, may grant some of the required clearances.

Funding Assurance-- After a project has been approved for investment and given the green light, it is necessary to allocate cash to fulfil the requirements outlined in the projected work programme determined by the resource-based network. An ad-hoc based network should not exist. It is recommended to assess the annual funding needs for all ongoing projects during the whole duration of the plan. This assessment should be revised each year throughout the annual planning process.

Monitoring-- An uncomplicated and efficient monitoring system is crucial for detecting and predicting any deviations from the execution plan, analyzing the root causes of problem areas, and proposing appropriate corrective measures.

Anticipation plays a crucial role in proactively addressing and mitigating potential issues to ensure they do not hinder

project progress or incur additional time and financial costs. The primary goal of external authorities, who are overseeing performance, should be to offer assistance in problem-solving rather than focusing solely on identifying mistakes. It is possible to establish joint monitoring groups.

Methods for Reducing Construction Delays

Efficient project management, regardless of project size, often adheres to the following defined process. Below are explanations of four often utilised tools in project planning and project management.

a) Ideation Collaborative brainstorming is an influential tool in management.

Brainstorming is a process that generates novel ideas, resolves issues, inspires and enhances teamwork. It provides motivation since it engages team members with larger management matters.

b) Cause and Effect Diagrams:- The Ishikawa Diagram, commonly referred to as the Fishbone Diagram, is a methodical technique utilised to visually identify and display all potential causes of a certain problem.

c) Critical path analysis of the project (represented by a flow diagram or chart):- 'Critical Path Analysis' (CPA) is a very rational and efficient technique for organising and overseeing intricate undertakings. It is shown as a linear flow diagram, specifically in the form of a time-line.

d) Gantt charts:- Gantt Charts are highly valuable tools for project management. Gantt charts are highly effective tools for efficiently and expeditiously scheduling, budgeting, reporting, presenting, and communicating project plans and progress.

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