

# Investigation on Construction Project Cost Overrun Using Statistical Method

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**Abstract** - The construction industry greatly influences the economic development of every country. The successful cost execution of construction projects depends on the timely completion with prescribed cost and schedule. Multiple number of factors results in overrun of cost in construction projects. The factors which cause budget increase in construction projects are identified and questionnaire is prepared for conducting survey. The various factors identified are connected to Contractor, Owner, Consultant, Material management, Equipment and Labor. The analysis of budget increase in cost is done by statistical method. The outcomes of this study will help the undertaking supervisor to follow up on basic causes and further attempt to decrease the overrun cost of construction project.

**Key Words:** Cost overrun, Relative Importance Index, Factor Analysis, Control Measures

## 1. INTRODUCTION

Construction Industry is one of the most important industries of today that has a terrific impact at the economy of any nation. The activities of the industry are also essential to the fulfillment of country wide socio-economic development dreams of offering shelter, infrastructure and employment. It is apparent that creation activities affect nearly each factor of the financial system and that the industry is important to the continued increase of the financial system. The construction industry is dynamic in nature due to the increasing of uncertainties in technology, budgets and improvement procedures across the world. Time and budget overruns in construction industry these days, become a serious difficulty around the arena and in India during previous few decades. Increasing need of infrastructure for the growing population around world, particularly in developing countries, the project managers need to deliver assigned projects in time and within the envisioned budget.

In construction, value overruns are relatively common, happening when the charges being incurred are in extra of the amounts which have been budgeted for. Cost overruns are not unusual in infrastructure, building, and technology projects. Taking under consideration the scarce financial assets of the country, value overrun is one of the primary problems. Cost is considered one of the primary measures of

the success of a project. In general, maximum construction projects go through price overrun at some stage in their execution phase. This study specializes in examining, identifying and analyzing the important causes of cost overrun within the construction enterprise in Kerala. The main objective is to observe the elements causing budget overrun of construction projects of Kerala. The Statistical method will be conducted to recognize the belief of construction's experts in project towards factors influencing construction budget. The relative importance index method is used for the analysis and ranking of the different factors.

Subramani et al. [1] studied the cost escalation and delays in construction industry using SPSS. The factors which cause delay in construction projects were identified based on their importance in the view of contractors and clients. The identified factors, which results in escalation in cost and delay in schedules were used to conduct a questionnaire survey. Based on the analysis of survey results, factors were ranked and measures were provided to control the cost overrun. Gayathri and Lekshmi [2] have done analysis of construction cost overrun using Statistical Fuzzy, Multiple regression and PLS-SEM Method in residential buildings. The prominent factors causing cost fluctuation was identified by all the three methods. Then a comparison was carried out among the methods to identify the accurate method. Wanjari and Dobariya [3] had done investigations identifying factors causing cost overrun of the construction projects in India. The appropriateness of the factors was checked using reliability analysis and was found to be reliable. The major factors identified were hike in the price of raw materials, lack of proper co ordination and detain in activity planning. Ahdas and Celik [4] did an investigation on time and cost overrun in construction projects. The success of project depends on the main factor which is the completion of the project within estimated time and budgeted cost. The study recognized and classified problems and proposed measures to control the factors causing cost overrun. Murali and Kumar [5] have done a case study on factors which causes overrun in construction time and cost. The major factors identified were unskilled labors, financial difficulties of contractor, conditions of site, difficulties in machines and equipments and substandard management of materials.

## 2. METHODOLOGY

The methodology adopted is questionnaire survey to identify significant factors influencing cost overruns in construction projects. From existing literatures certain causes of budget overrun on project was recognized. A questionnaire was then drawn up. As the result of review 50 factors of cost overrun were identified.

These questionnaires were given to Contractors, Owners and Site Engineers and statistical analysis was carried out on the data. The point of view of respondents was ranked based on the relative importance index and most significant factors of price overrun were identified.

The questionnaire was designed in such a way that it is order that it is simple to read and easy to fill up. An ordinal scale of dimension can be carried out for measuring factors in questionnaire survey. 1 for Insignificant Factors; 2 for Considerably Significant; 3 for More Significant and 4 for Most Significant factors. These rankings make it possible to cross-examine the relative significance of the factors as perceived by means of the respondents. All the numerical scores of each of the identified factors have been converted to relative importance indices to determine the relative ranking of the factors. Higher the cost of RII, more critical is the cause of price overrun.

## 3. DATA COLLECTION

The questionnaire targeted on the elements causing the price overrun of construction projects. The respondents involved within the survey had many years of experience (greater than 10 years minimum) in handling various kinds of projects consisting of buildings, bridges and roads.

## 4. DATA ANALYSIS AND RESULT

The relative importance index technique is used to decide the relative importance of the varied reasons of price overrun.

The RII Equation for calculating Relative Importance Index is:

$$RII = \sum W / (A \times N)$$

Where, W = Given weightage given to each of the factors

A = Highest weight (4 in this case)

N = Total number of responses

The contribution of the factors to overall price overrun was tested and the ranking of the characteristics in phrases of their criticality as perceived via the respondents turned into executed by use of Relative Importance Index (RII). The results of the analysis are presented in Table 1. From the evaluation of results, it was observed that skilled labor shortage and delay in the delivery of materials to site were ranked highest.

Table -1: Most Important Causes of Cost Overrun

SL. NO	Factors Causing Cost Overrun	RII	Rank
1	Delay in material delivery to site	0.900	1
2	Shortage of skilled labor	0.888	2
3	Low labor productivity	0.875	3
4	Unavailability of essential materials in the local market on time	0.863	4
5	Shortage of equipment and manpower and poor distribution on site	0.863	4
6	Contractor's Financial difficulties	0.850	6
7	Poor supervision and site management	0.825	7
8	Escalation and fluctuation in prices of machinery and materials	0.800	8
9	Lack of technical and managerial skills of consultant's staff	0.800	8
10	Mobilization delays	0.800	8
11	Poor communication with consultant and owner	0.788	11
12	Equipment availability and failure	0.788	11

## 5. MEASURES TO CONTROL COST OVERRUN

From the factors identified for project cost overrun, certain measures can be adopted to control the escalation of rise in construction project cost.

- Effective Site Management
- Effective Strategic Planning
- Proper Project Planning and Scheduling
- Use of Appropriate Construction Method
- Use of Experienced Subcontractors and Suppliers
- Frequent Coordination between the Parties
- Use Up to Date Technology
- Comprehensive Contract Administration
- Developing Human Resources in the Construction Industry
- Perform a Preconstruction Planning of Project Task and Resource Needs

## 6. CONCLUSIONS

This study recognized and analyzed reasons of cost overrun in construction industry. The reasons for budget overrun are the delay in the delivery of materials to the project site, Lack of skilled labor, Unavailability of experienced staff, Low

efficiency of labors, Quality of raw materials and equipments. For effectual and efficient price control of construction projects management of materials, resource making plans and management, right financial management and resource management and planning can be adopted. An effort is made to summarize the variables that explain the prevalence and non-occurrence of price overrun in construction projects. Statistical method could support the decision makers to ascertain the factors causing price overrun for enhanced project improvement to keep away from the delays and complete the project on planned time and schedule.

**APPENDIX**

SL.NO	FACTORS CAUSING COSTOVERRUN	RII	RANK
1	Inappropriate top to end planning of project	0.6375	31
2	Imprecise initial scope of project and cost estimate	0.7	18
3	Incompetence in communication between design and construction parties	0.575	40
4	Poor supervision and site management	0.825	7
5	Lack of communication with all the parties dealing the budget	0.6875	20
6	Interference of owner in the project	0.4875	49
7	Poor assistance in project management	0.65	28
8	Weak contract management	0.7	18
9	Poor specification of information to project participants	0.6	37
10	Inflation	0.6625	27
11	Failure to resolve change orders and prevent them from becoming claims/disputes	0.6	37
12	Too many construction activities going on at the same time	0.5125	48
13	No financial incentive to contractor to finish the project ahead of schedule	0.4625	50
14	Lateness of the owner's decision-making process	0.675	23
15	Slow financial and payment procedures by the client	0.6	37
16	Contract modifications (Replacement, addition and change)	0.675	23
17	Approval of drawings and material	0.7125	16
18	Financial difficulties of Owner/Client	0.7375	13
19	Lengthy period between time of bidding and contract award	0.5375	45
20	Difficulties in obtaining work permits from the authorities	0.7375	13
21	Increase in quantity of work (Additional works)	0.55	43
22	Design and work permit changes during construction	0.675	23
23	Absence of consultant's staff in the	0.65	28

	site of the project		
24	Lack of technical and managerial skills of consultant's staff	0.8	8
25	Lack of quality control	0.5625	42
26	Ambiguous or incomplete tender document	0.575	40
27	Poor documentation - Incomplete drawings	0.65	28
28	Slow inspection of completed works	0.6875	20
29	Shortage of equipment and manpower and poor distribution on site	0.8625	4
30	Poor communication with consultant and owner	0.7875	11
31	Contractor's Financial difficulties	0.85	6
32	Low labor productivity	0.875	3
33	Inadequate contractor experience	0.6375	31
34	Rework and wastage of materials	0.6875	20
35	Mobilization delays	0.8	8
36	Inadequate and incompetent subcontractors	0.6125	35
37	Delay in material delivery to site	0.9	1
38	Unavailability of essential materials in the local market on time	0.8625	4
39	Escalation and fluctuation in prices of machinery and materials	0.8	8
40	Monopoly of construction materials supply (Steel, cement)	0.525	47
41	Equipment availability and failure	0.7875	11
42	Lack of maintenance for the equipment	0.675	23
43	Imported materials	0.625	34
44	Shortage of skilled labor	0.8875	2
45	Poor and unforeseen site conditions (Location, ground, ETC)	0.6375	31
46	Severe weather problems (Hot, Cold, Snow, Rain)	0.55	43
47	Political issues-Changes	0.5375	45
48	Poor health and safety condition on site	0.7125	16
49	Changes in laws and regulations during the project obstacles from government	0.7375	13
50	Site accidents	0.6125	35

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