

Avoiding Cost Overruns of Residential Construction Projects in Western Part of Pune City, India

Chandan Sarada¹, Dr. N K Gupta²

¹PG student, Department of Civil Engineering, Dr. D.Y. Patil Institute of Technology, Pune, MH, India

²Professor, Department of Civil Engineering, Dr. D.Y. Patil Institute of Technology, Pune, MH, India

Abstract – The main aim of this paper is to identify the major reasons for cost overruns in Residential construction projects of Western part of Pune, India as well as the critical success factors that are helping to avoid the cost overruns. For this, existing literature is reviewed and various contributing factors for overrun were identified and Questionnaire was designed. Data was gathered using structured Questionnaire survey among clients, Consultants and contractors in Pune. Statistical method (Relative Importance Method) was used to analyze the data. Investigation on the causes of cost overrun involves 44 common factors identified through the literature review and discussion with the experts. The finding of the paper will help the civil engineers to act on critical causes and further try to reduce cost overrun of project.

Key Words: Factors of Cost Overrun, Residential Construction Projects, Relative Importance Index, Preventions over cost overrun.

1. INTRODUCTION

Construction industry now-a-days is facing severe problem of poor cost management resulting in huge amount of cost overrun. The problem of poor cost management and overrun in project cost is serious issue in both developed and developing countries. This needs serious attention for improving the construction cost performance as rarely projects are completed within budget. In order to explore the problem of cost performance in construction projects worldwide, Flyvbjerg *et al.* studied 258 projects in 20 nations with an approximate worth of US\$ 90 billion (size of projects range from US\$ 1.5 million to 8.5 billion) and found that cost escalation was a common practice and happens in almost nine out of 10 projects with an average of 28% higher than forecast costs. They concluded that average cost escalation in Europe was 25.7%, North America 23.6% and other geographical areas was 64.6%, while cost performance in construction projects has not improved over time and it is in the same order of magnitude today as it was 70 years ago. World Bank also reported that 63% of the 1778 construction projects financed faced poor performance with overrun in budget at an average of 40% as cited by Ameh (2010) and Zujo (2010).^[1]

Construction industries have become an important player and are vital for the economic development of any country particularly the developing countries. This industry in developing countries suffers from a number of problems that

affect the time, cost and the quality performances. Successful completion of construction projects within the specified budget has become a challenging task. It is uncommon that a project is completed well within the estimated time, budget and desired quality.^[2]

Good management of construction cost is an important task for the successful completion of a project. Most of the time, it is difficult to achieve good cost management and the project experience a huge amount of cost overruns. Effective cost planning relates the design of buildings to their cost so that while taking full consideration of quality, changes, risks, utility and appearance, the cost of a project is planned to be within the economic limits of the expenditure.^[2]

Cost overrun is described as the ratio of the change in the original contract amount to the original contract award amount. For the ease of comparison, the cost overrun can be converted into a percentage value. Mathematically it can be expressed as:

Cost overrun = $\frac{\text{Final Contract Amount} - \text{Original Contract Amount}}{\text{Original Contract Amount}}$

Original Contract Amount

Chitkara (2011) reported that the cost is the budgeted expenditure, which the client agrees to commit to creating or acquiring the desired construction facility. Cost overrun is the difference between the actual final cost of a construction project at completion and the contract amount, agreed by the contractor the owner during the signing of the contract. Cost overrun also called cost increase, cost escalation or budget overrun.^[2]

To study the cause factors of Residential project cost overruns a questionnaire has been prepared. The feedback was taken from civil professionals in western part of Pune region of Maharashtra in India. The Statistical method is carried out to understand the perception of construction's professionals in project towards factors of Residential project cost overruns. An ordinal scale of measurement is applied for data measurement in questionnaire survey. Data is collected using develop structured questionnaire. The ranking of factor is calculated based on relative important index value.

2. LITERATURE REVIEW

A major factor in project success is completion on budget. Furthermore, cost performance is the key measurement of an organization's productivity and profitability. Project cost overrun is measured as the difference between the planned cost (estimate) and actual construction cost on completion. The construction industry in Afghanistan is generally unable to complete projects within the original estimated cost. A number of studies have been conducted to address the issue and factors that cause project cost overruns. A research by Flyvbjerg et al. revealed that 9 out of 10 construction projects experienced cost overrun with an average budget overrun of 28%. 258 construction projects in 20 countries were studied where the cost performance were very poor. Another study conducted by Cantarelli et al. showed that cost overrun is a common issue in construction projects, which investigated 87 projects and found that on average 10.3% of projects faced cost overruns. In Malaysia, 359 projects (308 public and 51 private projects) were evaluated, with the findings showing that only 46.8% of public projects and 37.2% of private projects were delivered within contract amount. [3]

A number of studies have been carried out to determine the causes of cost overruns in construction projects. Adnan Enshassi (2009) it was found that Construction projects located in the Gaza Strip, Palestine suffer from many problems and complex issues such as unavailability of competent staff, late delivery of materials and equipment, material shortage, waste rate of materials, escalation and fluctuation of material prices, quality of equipment and raw material, delay in progress payment, cash flow of project, cost of variation order, differentiation of currency prices, cost of rework, cost control system, poor site management, poor communication and coordination by owner and other parties, conformance to specification, project complexity, absenteeism rate through project, planned time for construction, time needed to rectify defects, inadequate planning and scheduling, mistake and discrepancies in design documents, late in reviewing and approving design document by consultant and client. Abtab Hameed Memon (2010) founded factors of cost over are lack of experience of contractor and subcontractor, Inaccurate time and cost estimate. A study on UK construction industry by Yakubu Adisa Olawale (2010) founded cost overrun factor that are lack of software, Inaccurate time and cost estimate, cash flow of project, equipment breakdown, material shortage. Similarly Ismail Abdul (2013) found significant factor causing cost overrun in construction project are shortage of labour low productivity level of labours, lack of experience of contractor and subcontractor, equipment breakdown, financial difficulties by contractor, unclear and inadequate detail drawing, design change. [4]

3. OBJECTIVES OF THE STUDY

1. To Identified major causes of cost overruns and associated remedial measures in constructions by thorough Literature survey.
2. To find out Top factors which influence Cost Overrun by conducting Questionnaire survey within Civil Engineering Professionals
3. To Recommend possible Solutions/Prevention to avoid cost overrun.

4. RESEARCH METHODOLOGY

Research method is the systematic stepwise process to carry out any survey work. This study is conducted through several phases that include literature reviews and research papers, data collection, data analysis and conclusion. From the literature review we identified 44 influencing factors causing cost overrun in construction industries. Then the data collection was carried out through questionnaire amongst the various parties like Contractors, Clients, Consultants involved in handling construction projects.

The questionnaires were distributed to clients, consultants and contractors. The respondents involved in the survey had several years of experience in handling various types of projects. The characteristics of the respondents participated in survey are summarized indicates that majority of the respondents are working with contractors organizations followed by consultants and owners.

Assessment of causes of Cost overrun was carried out using 4-point Likert scale from 1 to 4 representing can be neglected (0-25%), low influence (25-50%), medium influence (50-75%) & high influence (75-100%) respectively. Data analysis was done calculating Relative Importance Index (RII) by following formula, adopted from Memon et al. 2012 [2] as RII is best suitable method to do the ranking analysis.

5. DATA COLLECTION

A total of Eighty (80) sets of questionnaires were sent to various construction companies (Clients, Consultants and Contractor). Out of 80, Fifty Two (52) (65%) completed sets were received back which were evaluated in order to find the important factors causing cost overrun in construction.

TABLE I

Demographic Characteristic of Respondents

	Frequency	Percentage (%)	Cumulative %
Type of Organization			
Client	15	28.8	28.8
Consultant	07	13.5	42.3
Contractor	30	57.7	100.0
Level of Qualification			
Masters	06	11.5	11.5
Degree	20	38.5	50.0
Diploma	16	30.8	80.8
Others	10	19.2	100.0
Work Experience			
8-12 Years	21	40.4	40.4
12-16 Years	14	26.9	67.3
16-20 Years	12	23.1	90.4
More than 20	05	9.6	100.0

TABLE II

Top Cost Overrun Factors Overall

Sr. No.	Factor ID	Cause	RII	Rank
1	42	Delay in Preparation and approval of drawings.	0.88	1
2	19	Cost of Rework.	0.84	2
3	30	Inadequate Planning and Scheduling.	0.83	3
4	16	Equipment availability.	0.83	3
5	36	Change in scope of project.	0.81	4
6	43	Incomplete design at the time of tender.	0.81	4
7	02	Shortage of Labour.	0.80	5
8	20	Inaccurate Time and Cost Estimate.	0.80	5
9	21	Financial difficulties by contractor.	0.79	6
10	32	Poor Site Management.	0.79	6
11	08	Material Shortage.	0.79	6

6. DATA ANALYSIS

Assessment of causes of cost overrun was carried out using 4 point Likert scale from 1 to 4 representing can be not at all, no, most of the times, yes respectively. Data analysis was done calculating Relative Importance Index (RII) by following formula, adopted from Memon et al. 2012^[2] as Relative Importance Index (RII) is best suitable method to do the ranking analysis.

$$RII = \frac{\sum_{i=1}^4 w \times x}{A \times N}$$

Where,

- RII = Relative importance index
- W = Weighting given to each factor by respondents and its ranges from 1-4
- X = Frequency of it response given for each factor
- A = Highest weight (i.e. 4 in case)
- N = Total no. of respondents.

TABLE III

Top Cost Overrun Factors Consultants

Sr. No.	Factor ID	Cause	RII	Rank
1	42	Delay in Preparation and approval of drawings.	0.95	1
2	30	Inadequate Planning and Scheduling.	0.91	2
3	08	Material Shortage	0.86	3
4	03	Change in scope of project.	0.86	3
5	36	Cost of Rework.	0.82	4
6	20	Inaccurate time and cost estimates	0.80	5
7	06	Shortage of Labour.	0.79	6
8	32	Poor Site Management.	0.79	6
9	07	Conformance to specification.	0.77	7
10	07	Incomplete design at the time of tender	0.77	7
11	07	Financial difficulties by contractor.	0.77	7

7. CONCLUSIONS

This study on the cause factors of residential projects cost overrun in western part of Pune region has identified and analysed major factors of cost overrun (Overall). It was observed that Delay in Preparation and approval of drawings, Cost of Rework, Inadequate Planning and Scheduling, Equipment availability, Change in scope of project, Incomplete design at the time of tender, Shortage of Labour, Inaccurate Time and Cost Estimate, Financial difficulties by contractor, Poor Site Management and Material Shortage.

Major factors of Consultants are Delay in Preparation and approval of drawings, Inadequate planning and Scheduling, Material Shortage, Change in scope of project, Cost of Rework, Inaccurate Time and Cost Estimate, Shortage of Labour, Poor Site Management, Conformance to Specification, Incomplete design at the time of Tender and Financial difficulties by contractor.

It is necessary to prevent all the factors which contribute to Cost Overrun. Some of the possible preventions are listed below.

- Appointment of Competent Staff in all aspects
- Approved GFC Drawings must be ready before starting Project.
- All the Quantities must be freeze before starting of Project
- Buffer time between Indent and Delivery must be known.
- If possible multiple contractors must be appointed.
- All the Specification must be finalized and freeze before starting of project.
- ERP and relative software must be used for the healthy maintenance of documents.
- Contractors must be finalized only after analyzing there past performances.
- Planning and Scheduling must be done by competent person.
- Market analysis regarding rates must be done every now and then.
- Equipment requirement and availability must be checked before starting of Project.
- Scope of Work must be finalized before finalization of Project.

Unexpected Natural calamities such as Earthquakes, Monsoon Troubles, Monsoon Floods, Land Slides, Storms, Cyclones and Droughts have not been considered in the research as they are unpredictable.

The finding of the paper will help the Civil Engineers to act on critical causes and further try to reduce cost overrun of projects.

APPENDIX

TABLE IV

Ranking of Causes of Cost Overrun

Factor ID	Cause of Cost Overrun	RII	Rank
1.	Unavailability of competent staff	0.53	24
2.	Shortage of Labour	0.80	5
3.	Low productivity level of Labour	0.67	13
4.	Lack of experience of contractor and sub-contractor	0.63	17
5.	High cost of Labour	0.63	17
6.	Labour dispute and strike	0.51	25
7.	Late delivery of Material and Equipment	0.66	14
8.	Material Shortage	0.79	6
9.	Waste rate of Material	0.58	20
10.	Escalation and Fluctuation of Material Prices	0.71	9
11.	Delay in material procurement	0.64	16
	Changes in material specification and type	0.63	17
12.	Equipment breakdown	0.75	8
13.	Quality of Equipment and Raw Material	0.54	23
14.	Low level equipment operating skills	0.62	18
15.	Equipment availability	0.83	3
16.	Inadequate modern equipment	0.54	23
17.	Delay in Progress Payment	0.56	21
18.	Cost of Rework	0.84	2
19.	Inaccurate Time and Cost Estimate	0.80	5
20.	Financial difficulties by contractor	0.79	6
21.	Overhead percentage of Project	0.60	19
22.	Financial difficulties of Owner	0.60	19
23.	Project Overtime Cost	0.48	26
24.	Poor financial control on site	0.60	19
25.	Delay payment to supplier and contractor	0.70	10
26.	Mistakes during construction	0.69	11

27.	Poor Cost control system	0.64	16
28.	Inadequate Monitoring and Controlling	0.68	12
29.	Inadequate Planning and Scheduling	0.83	3
30.	Improper Construction method by contractors	0.63	17
31.	Poor Site Management	0.79	6
32.	Inaccurate Quantity take off	0.66	14
33.	Poor communication and coordination by owner and other parties	0.66	14
34.	Conformance to Specification	0.64	16
35.	Change in scope of project	0.81	4
36.	Delay in decision making	0.65	15
37.	Obstacles from government	0.78	7
38.	Unclear and inadequate detail Drawing	0.55	22
39.	Frequent design changes	0.71	9
40.	Mistakes and Errors in drawings	0.63	17
41.	Delay in Preparation and approval of drawings	0.88	1
42.	Incomplete design at the time of tender	0.81	4
43.	Poor design	0.60	19

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