

Analysis of Various Major Contributing Factors of Cost Overrun in Construction Projects

Smiritee Srivastava¹, Dr. Satish B. Allampallewar²

¹ME Construction Management, Dr. D.Y. Patil Institute of Technology, Pimpri, Pune, Maharashtra, India

²Professor, Dr. D.Y. Patil Institute of Technology, Pimpri, Pune, Maharashtra, India

Abstract: Cost is among the major considerations throughout the project management and can be viewed as amongst the most vital parameters of a project and the main thrust of project success. Cost overrun is a very important and it's almost associated with nearly all projects in the construction industry. India is confronting basic project management related issues among which cost overrun is very noticeable. There are several factors that are responsible for cost overruns. This paper distinguishes the significant cost overrun in the development division of country, which can serve as the future work in adapting to these overruns. This study is conducted to investigate the cost overwhelps in construction projects and to identify the causes of cost overwhelps. In total 60 factors were short-listed to be part of the survey questionnaire and the survey was conducted with delegates from nearby general contracting firms. An extra finding is that medium measured development firms encounter a more prominent rate of cost overruns owing to expect greater risk for the purpose of business development. Real suggestions include: balancing out cost of materials, expanding supply of materials and apparatus, more included cost estimation forms, careful venture arranging, close recognition and documentation of cost variation trends in the sector and the nation, selection of alternative procurement methodologies, for example, design build contracts, and best value procurement.

Keywords: Cost Overrun, Infrastructure projects, Relative Importance Index, Questionnaire survey, India.

I. INTRODUCTION

Cost has its proven significance as it's the prime element for project success. Most of the significant factors affecting project costs are qualitative such as client priority on construction time; contractor's planning capability, procurement methods and market conditions including the level of construction activity. [6] A project generally finished may not be viewed as an effective attempt until and unless it fulfills the cost confinements connected to it. Despite its demonstrated significance it is normal to see a construction project failing to achieve its objective inside the predefined cost. Cost overrun is an important factor and is nearly connected with all the project of construction industry.

Cost overrun, also known as a cost increase or budget overrun, involves unexpected costs incurred in excess of budgeted amounts due to an underestimation of the actual cost during budgeting. Cost overwhelps is also defined as the difference between the actual and estimated costs as a percentage of the estimated cost, with all costs calculated in constant prices. [4]

II. RESEARCH SCOPE AND OBJECTIVES

The objectives of this paper are as follows:

- The review has been led to recognize the issues in cost overruns in construction projects in India.
- The factors have been recognized through a survey from construction firms.
- To analysis current trend of cost overrun for small (100M to 100M), Medium (1000 to 5000M) and large scale firms (Above 5000)
- Besides, a few recommendations and proposals have been suggested to cope up with these factors

III. LITERATURE REVIEW

The construction industry is a very important sector for the development and economic growth of Pakistan, which is developing country. A large construction project is a project with a budget of more than 1 million US \$. Delays in the completion or delivery of the project are the common problems faced in our construction industry. In construction industry, construction delay refers to the time overrun in specified completion data or time overrun in the delivery of the construction project. [2]

Time and Cost performance are the fundamental criteria for success of any project. Unfortunately construction industry in Malaysia fails in achieving effective time and cost performance. Huge amount of time and cost overrun are the problems faced by most of the infrastructure projects.[1]

Construction has been considered as a dynamic industry which is constantly facing uncertainties in its budgets, processes and technology. Despite of improvements, the problems of cost and time overruns are still a critical issue faced in construction industry. [13]

It was found common risks that are responsible for affecting cost overrun in road construction projects. The construction sector is one of the key economic sectors and is the main force motivating the Palestinian national economy. However, it suffers from a number that affect time, cost and quality performances. [9]

Department of Quantity Surveying, Federal Polytechnic, Bida in Nigeria analyzed the Significant Factors that causes Cost Overruns in building construction project with qualitative research approach was adopted to obtain the major's factors

that causes cost overrun in Construction projects. The factors are ranked according to the degree of significance as assessed by the respondents. The results obtained from the ranking factors shows that the top five major's causes of cost overruns are as follows price fluctuation in price of materials, insufficient time, and lack of scope of work. [12]

The Construction industry is one of the key economic industries in India and is the main motivating force in Indian national economy. The Indian construction industry is an important part country's economy and its growth. The construction sector employs approximately 31 million people, accounts for some 6-9% of GDP and, after agriculture, is the largest employment sector in the country. In general, it has been growing at 911% year on year, primarily due to the strength of increased domestic and international manufacturing activities and industrial growth [8].

Construction sector accounts for nearly 45% of the total investment in infrastructure and is expected to be the prime beneficiary of the surge in infrastructure investment in the near to medium term. Development of adequate infrastructure to achieve/sustain high GDP growth is a priority for the Government of India. Investments in infrastructure reported a compounded annual growth rate of 18% over the last three years, with the spending increasing to Rs. 4.0 lakh crore in FY 2009-10 from 2.4 lakh crore in 2006-07 [10]

In the construction industry cost overwhelms or overruns are very common phenomenon. Very few projects get completed within estimated cost and time. According to the reply, Statistics Minister Srikant Kumar Jena gave to the Rajya Sabha, as on March 31, 2012, 555 projects (worth Rs 150 crore and above) were on-going, out of which 179 projects reported cost overruns. Rs 1.23 lakh crore was total cost overrun found of these 179 projects. The following major reasons for cost overruns noticed are under estimation of original cost, change in rates of foreign exchange and statutory duties, escalation in cost of land, high cost of environmental safeguards and rehabilitation measures, inflation and delay in projects." The details provided by the minister reveal that the cost overrun of projects in railways sector was Rs 69,551.81 crore followed by Rs 15,886.71 crore and Rs 15,113.80 crore in petroleum and power sectors. The cost of projects escalated by Rs 6,187.54 crore, Rs 5,272.90 crore, 4,838 crore in steel, urban development's and atomic energy sectors respectively" (The Economic Times, 8 March 2013). [14]

Construction is a multidisciplinary industry and its work involves many parties such as the owner, various professionals, contractors and suppliers and therefore cost overrun involves many factors [3]. [12] For the purpose of analysis the identified top ten cost overrun factors have been arranged into three broad categories viz.;

- a. Large scale Economic Factors
- b. Administration Factors
- c. Business and Regulatory factors

This is helpful towards evaluating the treatment measures that can be considered to enhance the situation of cost overrun in infrastructure projects.

- *Large scale Economic Factors*

Variation in costs of raw materials and cost of fabricated or manufactured materials are extreme when these components are hard to find in market, to balance out the cost of materials, increase of supply of materials can be helpful to break the monopoly of few suppliers controlling the supply chain of the market.

- *Administration Factors*

Thorough estimation process for project costs calculations, keeping in view trends of inflation and depreciation factors, cost variations trends in sector and country with lead to smoother implementation and achievement of desired cost control.

- *Business and Regulatory conditions*

Conventional contracts but also the design-build contracts should be adopted by the government. Alternative procurement strategies such as best value procurement should also be adopted in the projects undertaken by government, semi government bodies and agencies. One type of competitive bid can be the average-bid method, in which the winner on is the contractor whose bid satisfies a certain relationship with the average of all bid prices. The basic advantage of the average-bid method, from an owner's perspective, is that it safeguards against signing a construction contract for an unrealistically low bid price that almost certainly will lead to adversarial relationships during construction. On the other hand also safeguard contractors to fall for their mistaken low amount bids.

Through this literature review the major reasons for cost overruns in construction sector of the country were found based on that questionnaire were prepared which can further help in coping with these overruns.

IV. METHODOLOGY

The methodology of the study is as follows:

1. An exhaustive literature review was done, through which various cost overrun causes were recognized in the construction industry scenario. In all Sixty (60) factors were made for survey questionnaire.
2. Questionnaire of two sections A and B was developed. In Part A individual Information of the respondent was inquired. Part B was planned to get data about reasons for cost overrun in infrastructure projects, it was made a request to rate those sixty (60) factors according to the given scale.
3. A Survey was conducted through individual meetings in which respondents were made a request to rank and score these factors according to their experience.

- Assessment of feedback from questionnaire survey was made. Analysis is discussed in detail in the following section, on the basis of which recommendations to construction industry were made.

V. ANALYSIS

The analysis of the survey conducted is made in two sections. In the first part, analysis of cost overrun factors is made on the basis of which major factors have been identified and their causes and impacts discussed. In the second section, discussion was done on the current trend of cost overrun for the local industry.

A. Respondent Organizations

The survey carried out involved all the construction firms, with majority of respondents (67%) involved in infrastructure construction, commercial building construction (54%) and industrial construction (50%).

B. Cost Overrun Factor Analysis

Before giving the questionnaire survey, respondents were made a request to count the five noteworthy cost overrun elements as per their point of view. It was found that the factors were present in the list no additional inputs were required in the list.

Then a list of sixty (60) factors was given to the respondents to rank and score them on the size of 1 to 4 and were told to rate score 1 to the elements which they discover minimum contributing towards the cost overrun and a score of 4 to those elements they see as most huge towards creating project cost overrun and rating of in the middle to check the seriousness of element extending from low, medium to high. Effect of each component was then calculated by the following formula:

$$\text{Relative importance index } RII = \frac{\sum w}{A \times N}$$

Where;

w = weighting given to each factor by the respondents and ranges from 1 to 4 where '1' is 'not significant' and '4' is 'extremely significant',

A = highest weight (i.e. 4 in this case), and

N = total number of respondents.

C. Existing Cost Overrun Scenario

To judge the current cost overrun situation in the nearby construction industry respondents were asked in the questionnaire about the minimum, average and maximum scopes of cost overrun.

Firms with generally smaller Annual volume of work are seen to accomplish higher overruns when compared to larger firms. This proves that small firms having low management skills

have weak cost and budget control measures in their activities. Figure 2 between annual volume and percentage cost overrun is reflecting the current trend of cost overruns for the respondents depending upon the size of organization.

Maximum cost overruns experienced by the contractors in their project in indicated in Top most trend line in Figure 1 is representing the. Even the large firms experience nearly about 30 % overruns which is the least among the volume ranges, this percentage increases up to overruns nearly about 60 % for the medium size firms (on the basis of annual volume of work). In comparison to the trend line for average and minimum percentage cost overruns ranges for maximum cost overruns are quite high.

Average cost overruns experienced by the contractors in their project in indicated in mid trend line in Figure 1. Cost overrun range increases as compared to small size firms and then there is a declination in cost overruns as it moves towards large firms. In attempt to get more business medium sized firms falls for projects and situations more prone to cost overruns

Last trend line in Figure 1 indicates minimum cost overrun within the local set up, near around the 10 % of the total cost of the project is found to be experienced as the minimum range of cost overrun. Again it is to be noted that medium size firms experiences somewhat greater percentage of cost overruns due to their tendency to take greater risk.

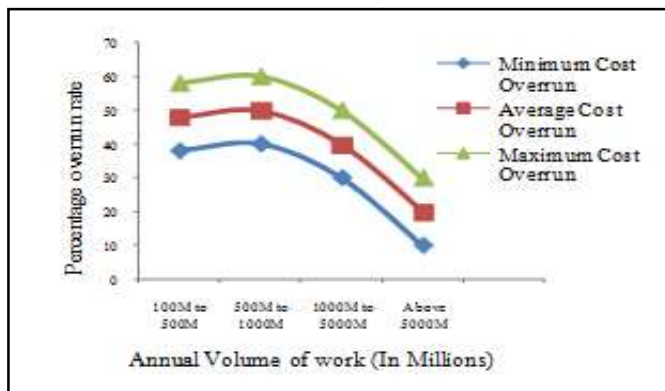


Figure 1: Current Cost Overrun Trends

VI. RESULTS AND CONCLUSIONS

The following conclusions have been determined:

- The top ten factors identified through questionnaire survey for cost overrun are as follows:

Table I: Top Factors Of Cost Overrun

Rank	Factor ID	Description	RII	Category
1	31	Fluctuation in prices of raw materials	0.92	Large scale Economic Factors
2	30	Difficulties in obtaining construction materials at official current prices	0.90	Large scale Economic Factors

3	41	Equipment availability and failure	0.82	Large scale Economic Factors
4	1	Poor Project management and contract administration	0.80	Administrative Factors
5	10	Delay in preparation and approval of drawings	0.80	Business and Regulatory Factors
6	11	Deficiencies in cost estimates prepared	0.77	Business and Regulatory Factors
7	36	Labour productivity Human resource (workforce)	0.75	Administrative Factors
8	15	Inadequate planning and scheduling	0.75	Large scale Economic Factors
9	8	Incomplete design at the time of tender	0.75	Administrative Factors
10	2	Change in scope of the project	0.72	Large scale Economic Factors

Dr. D. Y. Patil Institute of Technology, Pimpri, Pune-18
 ME Construction & Management Dissertation
 Name: Smiritee Srivastava
 Guide: Dr. Satish B. Allampallewar

Table2: Factor IDs and Description

		NOT AT ALL	NO	MOST OF TIME	YES
SR NO	COST OVERRUN FACTORS	1	2	3	4
Project Management and Contract Administration related Factors					
1.	Poor Project management and contract administration				
2.	Change in the scope of the project				
3.	Delays in decisions making				
4.	Inaccurate quantity take-off				
5.	Incorrect planning and scheduling				
Design and Documentation related Factors					
6.	Frequent changes in design				
7.	Mistakes and Errors in design				
8.	Incomplete design at the time of tender				
9.	Poor design				
10.	Delay in preparation and approval of drawings				
11.	Deficiencies in cost estimates prepared				
12.	Inaccurate Time and Cost estimates				
Contractor's Site Management related Factors					
13.	Contractor's poor site management and supervision.				
14.	Incompetent subcontractors				
15.	Inadequate planning and scheduling				
16.	Lack of experience				
17.	Mistakes during construction				
18.	Inadequate monitoring and control				
19.	Inadequate contractor experience				
Information and Communication related Factors					
20.	Lack of coordination between parties				
21.	Slow information flow between parties				
22.	Lack of communication between parties				
23.	Relationship between management and labour				
Financial Management related Factors					
24.	Cash flow and financial difficulties faced by contractors				
25.	Poor financial control on site				
26.	Financial difficulties of owner				

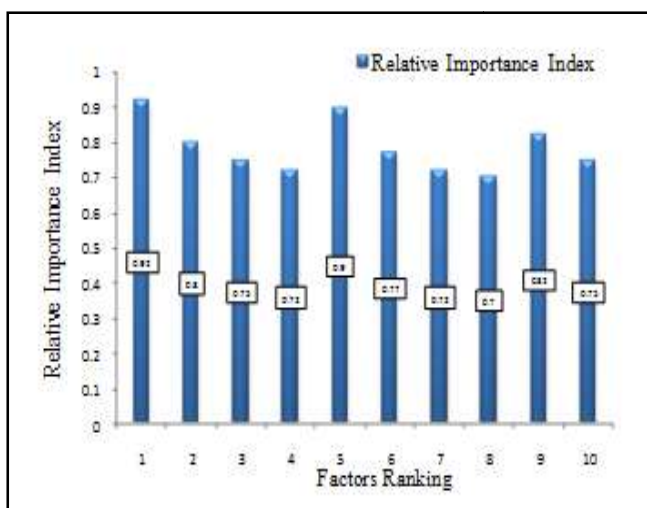


Figure 2: Ranking of Cost Overrun Factors

- Large scale Economic Factors influence the cost of the construction project severely
- Among all components varying cost overrun, administration and management related factors are those which can be controlled most effectively.
- Business and administrative condition is broken and needs drastic changes, more logically demonstrated strategies, devices and procedures might be adopted.
- Medium measured firms are more prone to cost overrun as compared to small and large firms, main reason is that they are in the developing stage where they have to go out take risk to get more business and build them.
- Sample of Questionnaire survey.

27.	Financial difficulties of contractor				
28.	Delay in progress payment by owner				
29.	Delay payment to supplier /subcontractor				
Material related Factors					
30.	Difficulties in obtaining construction materials at official current prices				
31.	Fluctuation of prices of materials				
32.	Delay in material procurement				
33.	Changes in material specification and type.				
34.	Late delivery of materials				
35.	Shortages of materials				
Manforce related Factors					
36.	Labour productivity Human resource (workforce)				
37.	Shortage of site workers				
38.	Shortage of technical personnel (skilled labour)				
39.	High cost of labour				
40.	Problems related to worker's health				
Machinery related Factors					
41.	Equipment availability and failure				
42.	Inadequate modern equipment (Technology)				
43.	Late delivery of equipment				
44.	Insufficient equipment				
Technical Complexity of Project					
45.	Project size				
46.	Project Duration				
47.	Unexpected subsoil conditions				
48.	Unexpected geological conditions				
49.	Unforeseen site conditions				
50.	Unpredictable weather conditions				
51.	Additional work				
52.	Rework				
Disputes related Factors					
53.	Disputes on site				
54.	Labour disputes and strike				
55.	Owner interference				
56.	Lack of experience of local regulation				
57.	Obstacles from government				
58.	Political complexities				
59.	Laws and regulatory framework				
60.	Problem with Neighbours				

VII. FUTURE RESEARCH

- Current research has identified many factors that are in responsible for cost overrun yet their frequency of occurrence is not known to us. An activity can be led to discover the effect of these factors in connection to their occurrence pattern and their seriousness affect.
- Alternative measures can likewise be researched to reduce the factors causing cost overrun up to certain limits if they can't be destroyed completely.
- Current review has concentrated on contractual workers. Different partners or stakeholders particularly construction managers can also be surveyed for their perspective as to these cost overrun factors. Researcher's findings and research can be helpful to have an overall picture of cost overrun on infrastructure project in our country.

ACKNOWLEDGMENT

I hereby take this opportunity to express my profound thanks and deep sense of gratitude towards my guide Dr. Satish B. Allampallewar, Professor, Department of Civil Engineering for his valuable guidance, constant encouragement and supervision.

I would also like to thank Dr. R. S. Jahagirdar, Principal, Dr. Deepa A. Joshi, Head of the Department of Civil Engineering and the faculty of Department of Civil Engineering whose constant encouragement and expert guidance was instrumental in the completion of this paper

Let me, at the end, express gratitude to all those from whom I received co-operation, help & motivation during the paper.

REFERENCES

- [1]. Aftab Hameed Memon, Ismail Abdul Rahman, Ade Asmi Abdul Aziz, (2012) "THE CAUSE FACTORS OF LARGE PROJECT'S COST OVERRUN: A SURVEY IN THE SOUTHERN PART OF PENINSULAR MALAYSIA", International Journal of Real Estate Studies, Volume 7, Number 2
- [2]. Assaf, S. A., and Al-hejji S. (2006). "Causes of delay in large construction projects". International J. Project Mgmt., Science Direct, 24, 349-357.
- [3]. Chan, S. and Park, M. (2005)" Project cost estimation using principal component regression", Construction Management and Economics, 23, 295-304.
- [4]. Chitkara, K.K. (2011), "Construction Project Management - Planning, Scheduling and Controlling", 2nd Edition, Tata McGraw Hills'
- [5]. Civil and Environmental Engineering, Carnegie Mellon University. (2004). Cost Control, Monitoring and Accounting
- [6]. Elchaig, T., Boussabina A., and Ballal T. (2005) "Critical determinants of construction tendering costs: Quantity surveyors' standpoint", International Journal of Project Management.
- [7]. Gould, F. E. (2002). Managing the Construction Process: Estimating, Scheduling, and Project Control. Upper Saddle River, NJ: Prentice Hall.
- [8]. Harris, E.C. (2011), "Construction Sector Poised for Further Growth as Indian Economy Forges Ahead", viewed 2 April 2013
- [9]. Ibrahim Mahamid, Amund Bruland (2011), 'Cost Overrun Causes in Road Construction Projects: Consultants Perspective', International Conference on Construction and Project Management IPEDR Vol.15.pp.6-10.

- [10]. ICRA (2013), “Indian Construction Sector: Opportunities Expand but Execution Remains a Concern”, ICRA, India
- [11]. KASIMU, M. A (2010), ‘Significant Factors that causes Cost Overruns in building construction project’ Nigeria, Interdisciplinary Journal of Contemporary Research in Business, Vol. 3, pp.775-779.
- [12]. Syed M. Ahmed, Rizwan U. Farooqui, Nida Azhar ,(2008), “Cost Overrun Factors In Construction Industry of Pakistan”, First [15]. International Conference on Construction In Developing Countries (ICCIDC–I), August 4-5, 2008
- [13]. Susana Gomez Arcila, (2012), Avoiding Cost Overrun Overruns In Construction Projects In The United Kingdom, August, 2012
- [14]. <http://economictimes.indiatimes.com/news/economy/finance/infra-projects-cost-escalated-by-rs-1-23-lakh-crore-in-11th-plan/articleshow/18868951.cms>