

Investigation of Factors Influencing Cost Overrun in High-Rise Building Constructions

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Abstract - Cost overruns has been a major issue in many Indian construction projects specially in high- rise building projects. The successful execution of construction projects and keeping them within prescribed schedule and cost is very important for effective cost performance. The aim of the study is to investigate the factors influencing Cost overruns in Indian construction projects. A valid questionnaire for the survey was developed based on factors for cost overruns identified from literature review. These factors are grouped into 8 categories for cost overruns and distributed to Contractors, Consultants, and Owners of high-rise construction projects.

Key words :- Cost overrun, construction, high-rise construction projects, cost performance.

I. INTRODUCTION

The Construction industry is one of the key economic industry in India and is the main motivating force in Indian national economy. But, it suffers from a number of problems that affect time, cost and quality performances. The scenario grabs more attention in the case of high-rise buildings.

Due to the rise in the number of buildings sprouting in every corner of the country, there are more stringent building rules developed by every Municipality/Corporation. Limiting of Floor area ratio (FAR) with respect to plot area, norms laid out by pollution control boards in each localities etc, builders and developers are forced to look in to alternatives to increase their profits, by able to project more saleable area keeping into account all the statutory obligations are met. The solution was to go for high rise constructions. These would help in achieving the needs without compromising in the area for usability. But this type of construction often suffers from cost overruns.

Cost overruns and time overruns can be either avoidable or unavoidable. Overruns due to design plan or project management problems are avoidable because they could have reasonably been foreseen and prevented. However, there are some unavoidable costs such as those due to unanticipated events which cannot reasonably be prevented. Cost overruns may add value to projects when extra work is done with the intention of producing a better output. Overruns may also add value when they involve work that was omitted from design plans but clearly needed to be done. However, some overruns may not add value and represent wasted money if they do not result in a better product.

Successful management of construction projects is based on three major factors i.e. time, cost and quality. The successful completion of construction projects within the specified budget has become the most valuable and challenging task for the Managers, Architects, Engineers and Contractors. It's a rare scene in construction industry, that a project is completed well within the estimated budget and time and with desired quality.

II. NEED OF COST OVERRUN STUDY

High-rise building constructions often suffers problem of cost overruns due to many of the factors. Therefore it is necessary to investigate these factors which influencing cost overruns. Although the factors identified can influence

privately funded projects the effects were particularly detrimental to publicly funded projects. The public funds available for a pool of projects are limited and there is a backlog of critical infrastructure needs. Therefore, if any project exceeds its budget other projects were dropped from the program or the scope was reduced to provide the funds necessary to cover the cost growth.

III. LITERATURE REVIEW

Kaming, Olomolaiye, Holt & Harris (1997), who studied 31 construction projects in Indonesia, found that from a contractor's point of view, cost overruns were mainly caused by "inaccuracy of material take-off", "increase in material costs" and "cost increase due to environmental restrictions". [1]

S. Shanmugapriya, Dr. K. Subramanian (2013), who found reasons for Cost overruns were high transportation cost, change in material specification, and escalation of material price, frequent breakdown of construction plants and equipment's and rework. [2]

T. Subramani, P S Sruthi , M. Kavitha (2014), who found slow decision making, poor schedule management, increase in material/machine prices, poor contract management, poor design/ delay in providing design, rework due to wrong work, problems in land acquisition, wrong estimation/ estimation method, and long period between design and time of bidding/tendering are the major causes of cost overrun.[3]

Hemanta Doloi (2013)

By performing an in-depth analysis of the roles and responsibilities of these key stakeholders, the author intended to unfold the industrywide perception of cost performance being heavily reliant on the contractor's performance alone. Based on relevant industry inputs, 73 attributes associated with cost performance were identified for investigation. Based on the relative importance weighing technique on 48 selected attributes, planning and scheduling deficiencies have the highest impact on cost performance from clients, consultants, and contractors' perspectives. Confirmatory factor analysis on the combined responses across all three groups suggests that robust control procedures and adequate programming, along with efficient design and effective site management, are the most critical factors. These factors are primarily associated with the responsibilities of contractors and consultants for managing cost overruns in projects.[4]

Ade Asmi Abdul Azis (2013)

Poor cost performance in construction project is a common problem worldwide resulting in significant amount of cost overrun. Since, there were very few studies on cost issues in construction projects in Malaysia, hence this study was carried out in Malaysia. Author presented qualitative research method using semi-structured interview with experienced personnel's involved in handling construction projects. A total of 21 respondents from client, consultant and contractor organizations were interviewed and requested to evaluate the eight (8) categories of cost overrun factors determined from the author's previous work. Out of the eight categories of cost overrun factors, the respondents had ranked "contractor's site management" as most severe contributor of cost overrun and followed by "information and communication" category while the least severe category is financial management.[5]

IV. EXPERIMENT AND RESULT

The research methodology for this study has adopted questionnaire survey to identify significant factors influencing cost overruns in high-rise construction projects in India.. To identify cost overruns factors, literature reviews, books, conference proceedings and discussion with practitioners of all parties involved in high- rise construction are carried out. Questionnaire for the survey is developed based on 54 factors of cost overruns and grouped in to 8 major groups.

For each factor the respondents were requested to rate using five point scale of 1 to 5 is adopted. It is categorized as follows 5=very high; 4=high; 3=medium; 2=low; and 1=very low. Prior to formulating questionnaire, a field study was carried out to get feedback from experts in construction industry on the factors identified from literature reviews.

Respondent's profile:

The questionnaires were distributed to owners, consultants and contractors of High- rise construction projects.. 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 in Table I. Table I indicates that majority of the respondents (36% respondents) are working with contractors organizations followed by consultants and owners.

TABLE I : RESPONDENTS DEMOGRAPHICS

| Parameter | Frequency | Percentage (%) |
|-----------------------------|-----------|----------------|
| Type of Organization | | |
| Owner | 22 | 31 |
| Contractor | 25 | 36 |
| Consultant | 23 | 33 |

Reliability analysis:

Reliability test is conducted to check the stability and consistency of a data by using cronbach alpha method that is widely adopted. In this study, cronbach alpha was calculated using statistical software SPSS Version 21 as shown in Table II.

TABLE II: RELIABILITY TEST FOR COST OVERRUNS FACTORS

| Factors | Cronbach alpha |
|-------------------------------------|----------------|
| Financial groups | 0.714 |
| Construction parties | 0.804 |
| Construction items | 0.728 |
| Environmental group | 0.385 |
| Political group | 0.729 |
| Materials | 0.650 |
| Labour and equipment | 0.702 |
| Owner's responsibility | 0.642 |
| Overall Cronbach alpha value | 0.946 |

Relative Important Index (RII): The questionnaires are collected and analysed using statistical software package SPSS v 21. The ranking of factors was calculated based on Relative Importance Index

$$RII(\%) = \sum a * \left(\frac{n}{N} * \frac{100}{5} \right)$$

Where:

RII = Relative Important Index

a = constant expression weight

n = frequency of response

N = total numberof response

Ranking of causes of Cost Overruns: Hierarchal assessment of factors was carried out to determine ranking of the factors based on level of significance. It was assessed based on Relative important index (RII) value and calculated for each group of respondent's i.e. contractor, consultant and owners.

TABLE III

| Factors of Cost overruns | Overall rank | | Owner | | Contractor | | Consultant | | Group |
|--|--------------|------|-------|------|------------|------|------------|------|------------------------|
| | RII | Rank | RII | Rank | RII | Rank | RII | Rank | |
| High transportation cost | 54.28 | 1 | 47.27 | 6 | 49.2 | 11 | 50.43 | 8 | Labour and equipment |
| Change in material specification | 53.14 | 2 | 49.09 | 4 | 52.8 | 2 | 52.14 | 7 | Material |
| Escalation of material price | 52.85 | 3 | 54.54 | 1 | 53.6 | 1 | 62.60 | 1 | Material |
| Frequent breakdown of the construction plant and equipment | 52.85 | 3 | 49.09 | 4 | 49.6 | 9 | 56.52 | 2 | Labour and equipment |
| Rework | 50.28 | 5 | 50.90 | 2 | 49.6 | 9 | 53.91 | 3 | Construction items |
| Lack of coordination at design stage | 49.42 | 6 | 40 | 18 | 43.2 | 16 | 43.47 | 17 | Construction items |
| Fluctuation in money exchange rate | 47.71 | 7 | 41.81 | 17 | 47.2 | 12 | 53.04 | 5 | Financial |
| Material fluctuation | 47.42 | 8 | 47.27 | 6 | 50.4 | 7 | 50.43 | 8 | Environmental |
| Additional work at owners request | 46.57 | 9 | 47.27 | 6 | 50.4 | 7 | 46.08 | 13 | Owner's responsibility |
| High maintenance cost of machinery | 46.57 | 9 | 41.81 | 14 | 52 | 3 | 48.69 | 10 | Labour and equipment |
| Shortage of materials | 46.28 | 11 | 47.27 | 6 | 45.6 | 14 | 53.91 | 3 | Material |
| Lack of coordination between designers | 46 | 12 | 39.09 | 19 | 40 | 18 | 43.47 | 17 | Construction parties |
| Lack of information flow between parties | 46 | 12 | 38.18 | 20 | 48 | 13 | 42.60 | 19 | Construction parties |
| Lack of financial management and planning | 45.17 | 14 | 44.54 | 11 | 41.6 | 17 | 52.17 | 6 | Financial |
| Incomplete design | 45.71 | 14 | 41.81 | 14 | 52 | 3 | 44.34 | 16 | Construction items |
| High quality of work required | 45.71 | 14 | 50 | 3 | 43.2 | 16 | 48.69 | 10 | Owner's responsibility |
| Difficulties on importing equipment's and materials | 45.42 | 17 | 44.54 | 11 | 40 | 18 | 45.21 | 15 | Political |
| High cost of machinery | 44.28 | 18 | 42.72 | 13 | 44.8 | 15 | 46.95 | 12 | Labour and equipment |
| Mistakes during construction | 44.28 | 18 | 41.81 | 14 | 51.2 | 6 | 45.27 | 14 | Construction items |
| Wastage on site | 44.28 | 18 | 47.27 | 6 | 52 | 3 | 42.60 | 19 | Construction items |

V. CONCLUSION

Cost overruns is a severe problems faced by high-rise building construction projects in India. It is resulted from various factors which had been identified in this study. A total of 70 samples were found as valid and analysed. It was found that five most significant factors causing cost overruns in high-rise constructions are high transportation cost, change in material specification, escalation of material price, frequent breakdown of construction plants and equipment's, and rework. So this implies that a need of urgent attention is to be put on these factors to avoid cost overruns. The recommendations are given to contractors, owners, consultants who are involved in the projects.

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