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SOME STUDIES ON COST OVERRUN FACTORS AFFECTING REPAIRS AND

REHABILITATION OF BUILDINGS

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ABSTRACT

Deterioration of RCC is found in large number of buildings in India over the years maybe due to poor workmanship some times and delay in project constructions thereby compromising quality sometime. It is scientifically proven that the number of these structures can be actually restored by concrete repairs and rehabilitation. However, due to some constraints, cost overrun in repairs industry is more than 20% of estimated values. This study was conducted to identify major factors for such overruns. Further, it calculates the statistical analysis for measures to avoid cost overrun in main group of factors. Information was collected through the set method of interviews and survey from experienced consultants and contractors. The result of this study indicates that large no. of issues is mainly associated with cost estimating factors.

KEYWORDS: Cost Overrun, Estimated Value, Reliability, Repair and Rehabilitation

INTRODUCTION

In India, for various reasons, concrete repair and rehabilitation is an area that was not given the thrust it needed till about a decade ago. However, things are changing for the better in recent times. Rapid globalization, increasing awareness levels and the growing importance of India as a country that has embarked on a major infrastructure development drive, have all contributed to the gradual change in the scenario. Today the country is also globally the second largest consumer of cement and one of the biggest "construction sites of the world" [11]. As the use of concrete is only predicted to increase with time which makes concrete repairs and rehabilitation major developing industry in India. Even though concrete repairs, rehabilitation and restoration is still in its developing stages in India as compared to the developed world still the huge potential of this industry is undeniable. Further, in construction industry things are changing rapidly due to availability of variety of equipments and technologies as well as entry of new construction chemical companies.

The inability to complete projects on time and within budget continues to be a chronic problem worldwide and is worsening [6]. Therefore, the problem of cost overruns is severe and persistent and probably affects every country [3]. In general it is observed that there are cost overruns in 95% of the projects in construction industry & hardly 5% of the projects complete within the budget and cost under run this is applicable to new construction and repairs, rehabilitation work also.

In order to discover factors affecting cost overrun in repairs and rehabilitations an engineer must have a sound

knowledge about procedures and direct/ indirect factors. Many researchers have worked and contributed their efforts for the study of cost overrun in various industries. The papers published by these researches give more information about the cost overrun factors in various sectors.

Chantal C. Cantarelli et al. (2012) had done a detailed analysis on characteristics of cost overruns for Dutch transport infrastructure projects and the importance of the decision to build and project phases. Result shows that in the Netherlands the majority of the cost overrun occurs in the pre-construction phase. The frequency as well as the magnitude of pre-construction cost overrun is significantly higher than in the construction phase [2]. Desai Megha and Bhatt Rajiv (2013) have suggested and discussed about a methodology to carry out ranking of causes of delay by two different techniques i.e. Relative importance index and Importance index based on degree of severity and degree of frequency in India wherein comparative study of contractor, consultant and architects had been done [5]. M. P. Venkatesh and C. Umarani (2013) have identified the factors affecting resource scheduling in Indian construction projects, in the private and public sectors to find problems related to factors affecting the resource schedule, due to overruns during the construction phase from different viewpoints of the parties with respect to three types of indices [7]. Fredrik Brunes and Hans Lind (2015) have studied cost overruns in infrastructural projects in two parts. The first part of the journal paper a new structure for analysing cost overruns is proposed. The descriptive part is a development of Flyvbjerg´s theories and identifies four possible explanations: political/strategic aspects, psychological aspects, competence related and bad luck. It is argued that Flyvbjerg´s technological explanation belongs to the descriptive part [1]. Chen Yongmin and Ron Smith (2001) have carried out detailed studies of a model in which the apparent cost overruns arise not as systematic expectation errors but as equilibrium phenomena. Study showed as the initial price of the project is less than the expected cost in most of the projects hence the cost overrun occurs. [4]. T. Subramanian et al. (2014), this research was carried out to identify the causes leading to cost overrun in construction projects. The causes found in the research were correlated by Spearman's co-efficient and ranked accordingly to identify severity of causes on the project.

In view of above reviews a lot of studies on cost overrun are taking place across the globe. Several factors causing cost overrun were identified by different authors/ researchers. Different methodologies are used to compare severity of these factors. Further, they have suggested some solutions to avoid cost overruns. Till date the studies are done for infrastructure as well as new construction in various countries as well as various states in India. Accordingly in this dissertation we are assessing factors causing cost overrun in repairs and rehabilitation of buildings.

Methodology

This study was conducted to identify factors causing cost overrun. Based on the research approach explained this section further explains studies done in this project. The study was carried out in the following manner and as shown in Figure 1. Configure of questionnaire survey, case study and analysis, analysing collected data in using statistical analysis.
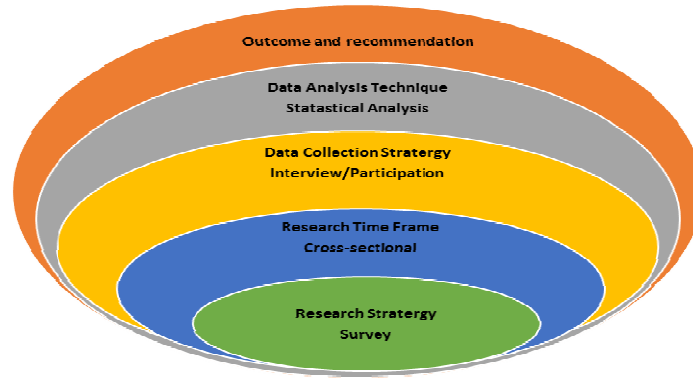
Figure 1: Research Methodology

In this study sub grouping of the enlisted factors is done from information obtained in the interviews. The factors affecting cost overrun are categorised in four sub-groups as shown in Figure 2. Then survey was formulated on the basis of Likert scale. A Likert scale is a psychometric scale commonly adopted in research done using questionnaires. This gave respondents an opportunity to show the level of importance of various factors that have contributed to cost overruns in repairs projects. On the basis of their past experiences respondent provided their answers on scale ranged 1 to 5 [9].
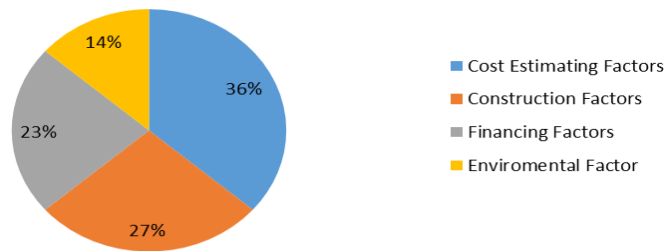

Figure 2: Factors Distribution

RESULTS & DISCUSSIONS

In this study we are using Cronbach's Alpha Test to check internal consistency [8]. The Cronbach's coefficient alpha was related with the factors that causes of cost overruns in repairs and rehabilitations of buildings. Reliability Test for overall feedbacks received is 0.815 which shows good reliability in internal consistency. Further factor wise significance is shown in Table 1 wherein cost estimating factors, construction factors, financing factors shows acceptable reliability and environmental factor very high reliability.

Table 1: Cronbach's Alpha Overall

Sr. No.	Group	No. of Scale Items	Cronbach's Alpha Coefficient	Significance
1	Cost Estimating Factors	8	0.65	Acceptable
2	Construction Factors	6	0.78	Acceptable
3	Financing Factors	5	0.65	Acceptable
4	Environmental Factor	3	0.97	Very High Reliability

In this study Mann Whitney U test is carried out to check hypothesis for non-parametric data. This test is performed to check hypothesis is true or not. Here we are considering null hypothesis as there is no difference in median of feedback of consultant and contractor given for each item. Level of significance is (α= 0.05) is considered for calculation.

We have assumed that data is non-parametric. Mann Whitney's U test is shown in Table 2. According to the p-value of factors all factor shows non significance hence the null hypothesis is true.

Table 2: Mann-Whitney U Test for Causes

Sr. No.	Group	Causes of Cost Overrun	Rank		Z Score	U Crit	P-Value	Signi.
			Contractor	Consultant				
1	Cost Estimating Factors	Job site surprises	2	3	2.7716	4.2850	0.9972	NS
2		Wrong prediction while estimation	1	2	3.1980	3.7850	0.9993	NS
3		Items accidently left out of estimate	3	8	3.1980	3.7850	0.9993	NS
4		Inadequate specifications	6	6	2.7716	3.7850	0.9972	NS
5		Novel material and it's specifications	4	3	3.1980	3.7850	0.9993	NS
6		Long time between execution and tendering	6	1	2.5584	3.7850	0.9947	NS
7		Wastages on site	8	6	3.1980	3.7850	0.9993	NS
8		Price escalation in material or labour cost	4	3	2.5584	3.7850	0.9947	NS
9	Construction Factors	Extent of specialist contractor chose	5	1	2.7716	3.7850	0.9972	NS
10		Delay due to inadequate planning (material/ Labour supply)	2	5	2.9848	3.7850	0.9986	NS
11		decision change for products by client	4	4	3.8376	3.7850	0.9999	NS
12		Lack of co-ordination between contractor and consultant	6	6	3.1980	3.7850	0.9993	NS
13		Additional works	1	2	2.7716	3.7850	0.9972	NS
14		Delay in decisions	2	3	3.1980	3.7850	0.9993	NS
15	Financing Factors	Inadequate allowances	2	2	2.7716	3.7850	0.9972	NS
16		Hidden litigations	2	3	2.7716	3.7850	0.9972	NS
17		Inadequate Funds	1	1	2.5584	3.7850	0.9947	NS
18		Change in Govt. / Local body tax structure	5	5	3.1980	3.7850	0.9993	NS
19		local vandalism	5	5	3.1980	3.7850	0.9993	NS
20	Environmental Factor	Negligence of natural climate	2	2	2.9848	3.7850	0.9986	NS
21		Negligence for type of structure	1	1	3.1980	3.7850	0.9993	NS
22		Negligence of Statutory requirement	1	1	3.1980	3.7850	0.9993	NS

Further, measures are enlisted and separated in groups of factors causing cost overrun in repairs and rehabilitation project. As shown in the Table 3 the major controlling measures are in construction factors i.e. during execution of the project we can control or avoid the maximum factors like prequalification of contractor in terms of experience, finance and adequate resources, adequate planning and resources, proper co-ordination between consultant/client and contractor, timely firm decisions, control over planning/ timely review of project etc. The least controlling measures are in environmental factors i.e. consideration of environmental factor.

Table 3: Factor Wise Statistics for Measures Enlisted

Sr. No.	Group	No of Causes	No of Measures
1	Cost Estimating Factors	8	4
2	Construction Factors	6	7
3	Financing Factors	5	2
4	Environmental Factor	3	1
	Total	**22**	**14**

Table 4 and Figure 3 presents the mean scores of the measures that were related with cost overruns and is organised into defined groups and ranked according to their significance. It is observed that the Overall, Finance-related items are the most dominate item to avert cost overrun. Secondly, opinions of the contractor and consultants are same for all the factor groups.

Table 4: Overall Means Score and Ranking of Measures

Sr. No.	Group	Mean (Rank)		
		Consultant	Contractor	Overall
1	Cost Estimating Factors	3.20 (3)	3.46(3)	3.34(3)
2	Construction Factors	3.51(2)	3.74(2)	3.64(2)
3	Financing Factors	3.70(1)	3.75(1)	3.73(1)
4	Environmental Factor	2.40(4)	2.67(4)	2.55(4)

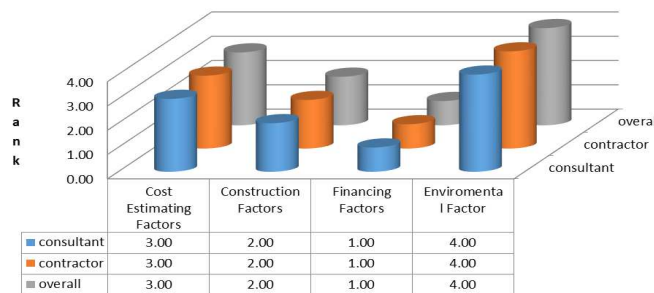|	Cost Estimating Factors	Construction Factors	Financing Factors	Enviromental Factor
consultant	3.00	2.00	1.00	4.00
contractor	3.00	2.00	1.00	4.00
overall	3.00	2.00	1.00	4.00

Figure 3: Ranks for Measures to Avert Cost Overrun

The results show that the only 40% of financing factors can be controlled but the impact of this group is ranked 1 by both consultant and contractor. Although issues associated with construction items are the dominant factors i.e. 6 causes are listed under this category and 7 measures can be taken to avoid cost overruns in repairs and rehabilitation industries which are also ranked 2 among the categories.

CONCLUSIONS

The outcomes presented in this study could offer insight regarding measures that could be set up to avert cost overruns. These findings apply to both the repairs and rehabilitation of buildings and other infrastructural projects. The study shows that the factors affecting cost overrun can be averted or minimized for certain causes whereas for some causes cannot be minimized. Based on the analysis conducted following recommendations are proposed:

Cost estimating factors: More effective testing prior to estimate can be done to increase accuracy of the estimations. This will mean the testing on major part of the structure rather than inadequate false testing. Proper assessment of works and accordingly specification is required to assess the exact costing of the unit price for the work. Study of Future market escalations material / labour is necessary for stocking and planning timely delivery of project hence reducing cost overrun for the contractors.

Financing factors: Smooth cash flow is required to maintain schedule of the work which in terms reduces overheads. Provision of adequate allowances will result in the quality work to reduce maintenance after the completion.

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