

Analysis of Cost Variation between Estimated Cost and Actual Cost of Residential Building Project

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Abstract—The main aim of this study is to prioritize the main causes of cost overrun in construction projects. Sangli area is selected to collect the data. The collected data is then analyzed and compared to the actual budget the estimated cost to see the various causes of cost overrun. With the help of various workers such as Consultants contractors site engineers and others questionnaire is prepared to the various factors which causes Cost overrun. The study will show the main factors which results in cost overrun. In further projects this type of study he's going to help the project manager to work on various causes of cost overrun.

Keywords—Cost overrun; Relative importance index; Factors of cost overrun; Relative important index

1. INTRODUCTION

Cost is the major factor which is to be considered as one of the most important parameter of the project and he's also proven most construction projects fail to achieve its objectives the specific cost. Almost all the projects have been in construction industry have been affected by cost variation in frequent cases. Cost overrun differs from region to region and is also dependent on economic and geographic factors. Human resources are also related to Cost overrun in few cases. To identify and prioritize the major cause of cost overrun is the focus of this case study. This will help to reduce cost over similar projects. With the help of various workers such as architects and engineers a questionnaire is formed. These factors are ranked by Relative importance index.

2. METHODOLOGY:

To achieve the objectives of the study the following activities have been conducted:

2.1 Questionnaire Design

The questionnaire has been developed based on the literature findings & preliminary discussions with consultants, contractors & architects. To ensure maximum participation the questionnaire has been

distributed to consultants, contractors/builders and Architects. The questionnaire response from consultants, contractor's, builders and architects was collected first and then after studying their responses ranking has been done to causes of cost variation. The data collected has been presented, tabulated & analyzed using suitable statistical technique. Also a case study has been taken for study of causes of cost variation in construction industry. A discussion of the results is linked with findings of the literature and case- study, then cost variation were identified and ranked based on their severity. A conclusion of the major findings is stated & some recommendations are given to mitigate the salient problem. Selection of data collection technique. Personal interviews and desk study discussions were carried out and a questionnaire is formed. The questionnaire is prepared by honest and frank opinions as the respondents are not required to state their names. If interviews are conducted by the author then respondents and particularly contractors and consultants might not express their opinions frankly on the issues related to their clients. The causes of construction cost variation are too many to be covered in 30 minutes interview and the respondents might not have longer time to spend on longer interviews. The questionnaire is

Sr . No.	Category	Explanation	Weightage
1.	Never	0% cost variation contributing factor.(Not affected)	0
2.	Less	1-20% cost variation contributing factor.(less affected)	1
3.	Sometime	21-40% cost variation contributing factor.(slightly affected)	2
4.	Aveage	41-60% cost variation contributing factor.(moderately affected)	3
5.	Often	61-80% cost variation contributing factor.(significantly affected)	4
6.	Always	81-100% cost variation contributing factor.(less affected)	5

Table.1 Category and weightage for the explanation

designed carefully to obtain the required data from the respondent .The English language is chosen for the questionnaire as it suits all the respondents. The first category is the information about the respondent's characteristics and their involvement in the building projects. The second one concerns respondent's opinions on the cost variation faced. The first and second category of the questions is designed based on the respondent's knowledge and the familiarity of the construction industry and the involvement. The questionnaire is kept as short as possible, but comprehensive enough, so that it could be completed within 20 to 30minutes.

2.2 Collection of causes

Causes are collected from two sources-Literature survey (National & international journals and papers).First, an international literature survey was performed to create an initial pool of possible causes for cost variations in construction projects. This literature survey encompassed dozens of journal articles. Any potential cause for cost variations in construction mentioned.

References had been added to the list. The literature survey yield sample number of potential causes. Discussion with guide and an expert practicing in this construction industry. In a parallel route local expert

survey was carried out. The experts were not exposed to the previous findings of the international literature survey. Their answers pertained to the local, city-specific circumstances. This discussion yielded 36 potential causes. The first focus phase of this study consisted of categorizing, filtering duplications, and merging similar or closely related causes. Figure 1 shows Pie chart of the respondents involved in the questionnaire survey. The questionnaire is designed carefully to obtain the required data from the respond. The present status of construction industry with the help of literature review was used to form the questionnaire. Some questionnaires that are related to topic are reviewed and some questions that are found to be applicable to the construction industry were extracted from them. The main data required for this study is divided into two main categories. The first category is related to the information about the respondent's characteristics and their involvement in the construction industry. It identifies the questions concerning the performance of the projects that respondents have been involved in number of the projects that respondent has participated in and in how much is the cost variance. From this amount of the cost variation is got.The second section includes cost variation causes that were collected earlier to which respondents give their opinions on the severity of certain causes of construction cost variation in building projects. This section contains 6 categories in which 36 cost variation causes are classified. For each factor, the respondents were requested to answer the severity impact of it cost. A six-point scale of 0 to 5 was considered for evaluating the 36 impact of each factor. These numerical impact values are assigned to the respondents rating

- 0: Never;
- 1: Less;
- 2: Sometimes;
- 3: Average;
- 4: Often;
- 5:Always

2.3 Questionnaire Content

The questionnaire included 36 cost varying factors which are divided into six categories that are related to the factors of cost.

Parts of the questionnaire are:

- Factors related to finance

- Management factors
- Factors related to labour
- Factors related to material
- Factors related to project
- Other factors (external factors)

Scoring system and method of analysis. In the questionnaire, an Ordinal scale of measurements is applied for data measurements in questionnaire survey. Ordinal scale used for this study includes Never; Less; Sometimes, Average, Often and Always. However, abbreviation replaced with numbers i.e.

- 0 for never (0%);
- 1 for less (1-20%);
- 2 for sometimes (21-40%);
- 3 for average (41-60%);
- 4 for often (61-80%);
- 5 for always (81-100%).

In the study Relative Important index (RII) have been employed and calculated for ranking of causes of cost variation in the construction project. The RII is used to rank the different causes. These rankings make it possible to cross-compare the relative importance of the factors as perceived by the two groups of respondents (i.e. owner and contractors). Following formula is used for the calculating the Relative Importance Index (RII) for different causes

$$RII = \frac{\sum W}{A * N}$$

W= Score given to each cause by respondent ranges from 0 to 5 (where 0 is not affected and 5 is extremely affected.)

A= Highest Score i.e. 5 in this case

N= Total No. of respondents

Description	No. of respondents
Architects	8
Contractors	16
Builders	16
Total	40

Table 2. Total no of respondents.

Participants in questionnaire survey are

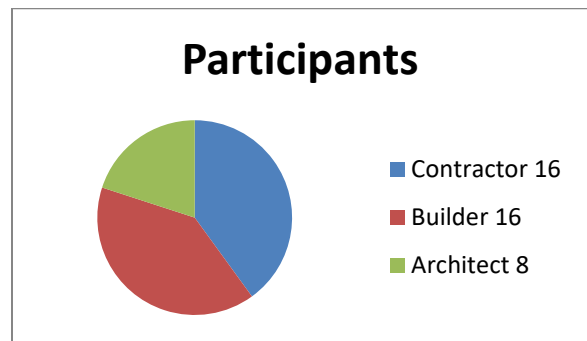


Fig.1 Pie chart of total participants.

Fig shows pie chart which indicates .Total 40 participants were there, in which 8 of them were architects, 16 were builders and remaining 16 were contractors.

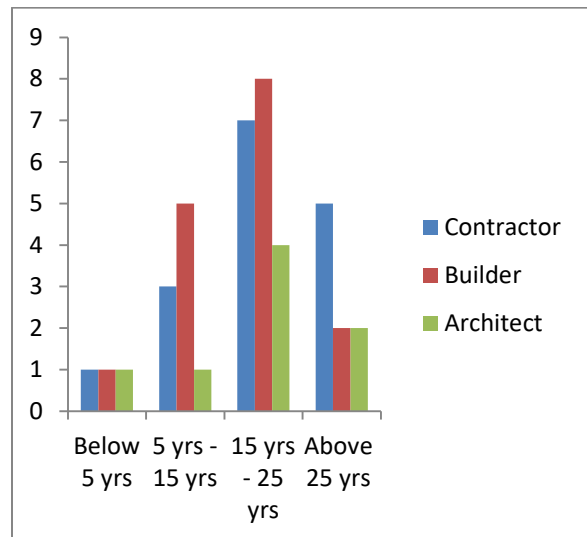


Fig.2 Experience of Participants.

Majorly participants have the experience of more than 15 years, they are highly experienced. So the result obtained

is much more accurate. There are less chances of error.

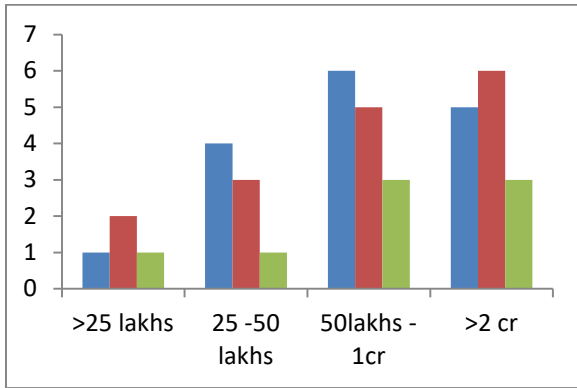


Fig.3 Different scale projects respondents worked.

Majorly the respondents have worked in bigger projects. In large scale projects, different types of cost variance can be observed. So chances of error is less. Content validity and reliability test has been found by using IBM SPSS statistics data analysis software.

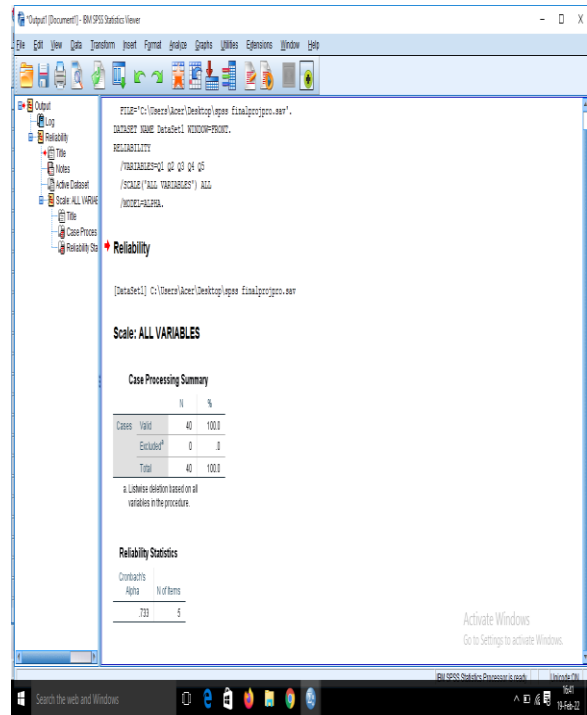


Fig. 5 Cronbach's Alpha value in SPSS

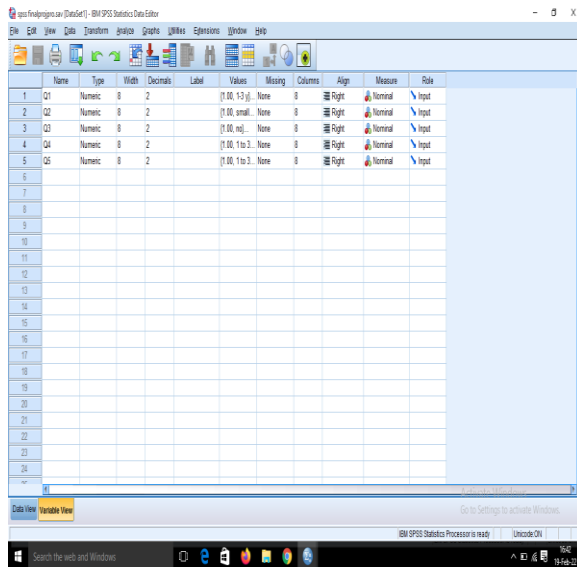


Fig. 4 SPSS data inputs value.

1. Result and discussion

Table 3. Ranking of factors according to RII value

Sr. No	Factor	RII	Ran k
1	Liquidity of organization	0.849	1
2	Site characteristics	0.839	2
3	Taxes and interest rates	0.774	3
4	Predetermined underestimations	0.715	4
5	Cost of rework	0.672	5
6	Project size	0.602	6
7	Quality of finishing	0.581	7
8	Project location	0.581	8
9	Design changes	0.565	9
10	Transportation material	0.548	10
11	Damage	0.538	11
12	Project type	0.532	12
13	Demand and supply	0.522	13
14	Inappropriate contractors	0.511	14
15	Storage of material	0.511	15
16	Mistakes in construction	0.505	16
17	Construction equipment	0.505	17
18	Unexpected ground condition	0.505	18
19	Inflation	0.489	19

20	Shortage of material	0.457	20
21	Number of stories	0.457	21
22	Unavailability of competent staff	0.446	22
23	Disputes	0.446	23
24	Forms of procurement	0.446	24
25	Health and safety cost	0.435	25
26	Land cost	0.430	26
27	Incentives	0.409	27
28	Construction management	0.403	28
29	Absenteeism rate	0.382	29
30	Inspection and testing	0.349	30
31	Time needed to rectify defects	0.349	31
32	Number of workers	0.339	32
33	Force majeure	0.339	33
34	Labour strikes	0.317	34
35	Items manufactured offsite	0.306	35
36	Deflation	0.296	36

So the top four categories which causes cost variation are liquidity of organization, site characteristics, taxes and interest rates and predetermined underestimations. One of the important scopes of asset liability is management of liquidity risk, measuring and managing liquidity needs are vital for effective operation of banks and financial institution. More time should be given. Proper planning should be done to reduce the variance in liquidity of organization.

Proper surveying and site inspection should be done in ordered to reduce cost variance in site characteristics. The required formation level or the depth of the excavation level should be properly checked with reference to gate level recommendation with help of city engineer. The soil report should be properly checked.

Various ratios and various terms should be checked to reduce the variance in taxes and interest rates such as, statement of profitability, projected Balance sheet, cash flow statements, partners capital, loan from the bank liquidity ratio, loan to value ratio profitability ratio.

To reduce the cost variance in predetermined underestimation, instead of analogous estimation, generally go for parametric estimation. Even the use of Three point estimation will help. In Three point estimation, instead of 1, take average of three estimates. Bottom –up estimation also gives accurate results.

3. CONCLUSION

From the study conducted and by analyzing the feedback of the respondents it can be concluded that that liquidity of organization, taxes and interest rates, site characteristics

and Predetermined underestimations are major factors impacted on cost variation of the construction project. So it is suggested to focus on this main factors so as to avoid cost variation in the construction of new project.

FUTURESCOPE

The study done was limited up to area in Sangli and Kolhapur district. Further study can be done by increasing the area. It may lead to an increase in the variations in project cost and other rates in construction industry.

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