RISK ASSESSMENT OF FACTORS CAUSING COST OVERRUNS AND DELAY IN RESIDENTIAL PROJECTS

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ABSTRACT: During the implementation of construction projects, due to complexities and uncertainties challenges are very likely to arise. The main root of cause identified is the concern of risk imminent in civil industry. Rise of risk factors during construction of a project have great influence on total cost flow and project schedule. So its identification is our prime concern followed by its detailed assessment. Using the cost flow perspective, analysis is done to evaluate the impacts of risk accompanying during the construction period on the initial forecast cost flow. In the first phase a questionnaire survey was regulated to various regional construction contractors and engineers to determine the crucial risk factors influencing on their cost flow forecast and total time of project. Adopting mean ranking analysis, the survey generated 15 eloquent risk factors. A second phase of data collection takes into account the assemblage of forecast and actual cost flow data from case study projects to substantiate their variation at preordained time periods. By taking assistance of construction experts, who worked on case study projects, were requested to rate the level of risk occurrence and impact by using the significant risk factor recognized in the first phase, resulted in the observed variation. The technical staffs including engineers, contractors, and architects try to work all together to achieve main goal of economy but still the project ends up in cost and time overrun. Main reason of this fiasco is the ignored significant risk factors which finally takes toll on total cost and time of the project. This paper identifies various risk factors, its impact on cost flow profile and also factor specific measures to prevent cost and time overrun.

Key Words: Risk assesment, Cost flow forecast, Cost and Time overruns, Risk factors, Cost flow perspective.

INTRODUCTION

The construction industry is now facing numerous difficulties in achieving their targeted goals, especially in developing countries like India. Due to poor cost and time management, the industry is facing crucial problem of cost overrun. It is very important to study and analyze attributes contributing to cost and time overruns. Also giving key preventive measures for these attributes helps in overcoming the constraints. Nowadays, main aim of construction project managers is to complete the project on time within the determined budget, by following flawless management ideologies and without major deviation in the project. Even after implementing this technique, it is still very difficult to control cost and time overruns due to rising complexities and environment in construction building projects. This study asses, evaluates the impact of various factors affecting total cost and time in construction building in India and giving practical remedies for the given scenario. Cash flow forecast is of tremendous significance to the contractors as well as the client to prevent the objectionable result of liquidation and indebtedness. Results from this research can be applied and utilized in other construction projects in different vicinities keeping in mind the surrounding conditions.

LITERATURE REVIEW

1. Desai Megha, Dr Bhatt Rajiv “A Methodology for Ranking of Causes of Delay for Residential Construction Projects in Indian Context” International Journal of Emerging Technology and Advanced Engineering. Thus, Comprehensive study on these delays is important. Present Study works on identification of causes of delay in residential construction projects in Indian context. Literature review and structured interviews were carried out on construction projects in central Gujarat region of India. The paper presents the framework of causes of delays in residential construction projects. Total 59 causes were identified under 9 major groups. An approach is suggested to carry out ranking of these causes by two different techniques: Relative importance index and Importance index based on degree of severity and degree of frequency. It is hoped that
the findings of the paper will help the stakeholders to act on critical causes and further try to reduce delay of their projects.

2. Shambalid Ahady, Sakshi Gupta, R.K.Malik “A critical review of the causes of cost overrun in construction industries in developing countries” International Research Journal of Engineering and Technology. Fluctuations and increases in material price were found to be the most important problem which led to the construction cost overrun in the developing countries. It was also observed that all the factors are not similar to every project, although most of them are common to the projects in the developing countries such as poor management, inaccurate material estimates and financial status of the contractor. A considerable attention is required to build a policy so as to ensure the reduction in impacts of identified factors for infrastructure development in developing countries. The most important issue is the management of cost overrun and ignoring it will not decrease the purpose. The cost overrun was observed to be the major reason for the setback in the construction industry. In order to control and mitigate the cost overrun in building construction projects, Material prices and labour rates should be updated continuously. The quality of activities must be monitored ceaselessly by the consultant and quality professionals to set the required quality system in the different activities of the project so as to minimize and avoid any mistakes that may lead to rework of activities. The top management must react positively to the environmental and political changes by means of financial and managerial policies. The developing nations must come out with a few policies, rules and regulation to curb the cost overruns in construction projects in developing countries.

3. S. Shanmugapriya, Dr. K. Subramanian “Investigation of Significant Factors Influencing Time and Cost Overruns in Indian Construction Projects”. Time and cost overruns is a severe problems faced by large construction industries 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 statistically using relative importance index method on 76 and 54 factors on time and cost overruns. It was found that five most significant factors causing time and cost overruns in Indian construction are material market rate, contract modification, high level of quality requirements, project location, depends on the fresher’s to bear the whole responsibility for time overruns and high transportation cost, change in material specification, escalation of material price, frequent breakdown of construction plants and equipment’s, and rework for cost overruns. So this implies that a need of urgent attention is to be put on these factors to avoid time and cost overruns.

4. Sai Murali Krishna Reddy.Raya and S.S Bhanu Prakash “COST AND TIME OVERRUNS IN INDIAN CONSTRUCTION INDUSTRY”. A lot of research and studies have been done to identify the root cause of the time overrun and cost overrun in construction projects which lead to the delay in the project completion. Time and cost are the lifelines of any and every project. It is of supreme importance to study, analyse and evaluate the common factors leading to these constraints and suggest the best mitigation measures to overcome time and cost overrun constraints. During the construction phase it is the prime responsibility of the project managers to monitor cost and time and avoid the overruns of the both cost and time. Due to these limitations, this paper discusses the effective cost and time control overrun practices in construction industry.

OBJECTIVE

The objective of this study is to identify and assess the risk factors having impact on total cost and time duration of the construction project. Along with this, it helps construction contractor to foresee the likely changes to their cost flow profile as a result of risks occurring during the construction stage, without recourse to the usual cumbersome calculations. This information will potentially help the contractor to devise a proactive response to the risk factors impacting on their cost flow forecast. This is necessary because most of the contractors and engineers overlook the different risk factors in the initial phase of the project and later on, these significant risk factors hamper the total cost and project schedule resulting in serious concerns like instability of cash flow, etc. Identifying the risk factors, knowing their impact and taking necessary measures and actions aid in preventing cost and time overrun of the project.

SCOPE OF STUDY

The study recognizes the risk factors affecting total cost and time of a construction project and analyse the impact of these significant risk factors on industry. In this study, questionnaire survey has been serviced to discover factors affecting total cost and project schedule. This study is mainly concentrated on main data search by acquiring perspectives from engineers as well as contractors/sub-contractors/site
supervisors/managers/clients and to find out cost and time overrun problems. Also preventive measures and appropriate recommendations are discussed from above findings to curtail and control further increase in total cost and time of a construction project.

**METHODOLOGY**

The fundamental understanding of the subject information for this study has been gathered with the help of literature review and questionnaire survey circulated to contractors, subcontractors, engineers. The literature review was stockpiled through paramount construction management, research and engineering journals. In this phase, various risk factors contributing to the total cost and time overruns of the construction project were studied. From the literature study, various difficulties contributing in total increased cost and time of project were acquired. After this stage, questionnaires were prepared for contractors and engineers. Details about risk factors like Changes in initial design plans, Changes due to harsh weather, Alteration in works, Labour shortage, Delay in production target, Delay in agreeing variation/day works, Delay in resolving claims, Difficulties in foundation, Underestimating convolutions in project, Estimating errors, Client’s bankruptcy, labour strike were included in the questionnaire. Data was gathered from middle to large size construction sites from the areas of Mumbai suburbs and Thane. To fortify that authentic and sufficient data were obtained in the survey, a congruent and comprehensive population sample was needed. It has been found that the majority of small scale firms lack qualified personnel to deliver cost flow predictions through discussions with construction management researchers and industry gurus. As such, it was decided to debar the very small firms and hence the focus of this study was on new-build big projects. After obtaining sufficient samples, data analysis was done to know different risk factors having their impact on total cost and time of the construction project. In last stage, solutions from various sources like internet, books, etc were considered for respective risk factors and put forward.

**PROBLEM STATEMENT**

The complications faced by the engineers and contractors in Indian construction projects regarding identification and assessment of risk factors like changes in initial design plans, changes due to harsh weather, alteration in works, labour shortage, delay in production target, delay in agreeing variation/day works, delay in resolving claims, difficulties in foundation etc which disturb and have crucial impact on total cost and time of a project are included in our study and factor specific countermeasures for the same are also conferred.

**DATA COLLECTION & ANALYSES**

A questionnaire survey was conducted in several residential building projects in Mumbai suburbs and Thane region and the outcome obtained is presented in form various survey graphs. A total of 80 questionnaires were circulated and out of which 46 of them responded, therefore having response rate of 57.5% which is acceptable.
The above graph illustrates variation in forecasted and actual cost flow curves of a residential project in Thane region. From the above graph, we can clearly see variation in cost curves at 30, 50, 70 and 100% completion of project. For instance, at 30% completion of project, forecasted and actual cost was 6.73 and 7.25 crores respectively. From this difference, we can further investigate its causes.

![Fig.2. Variation between Estimated cost and Actual cost curve](image)

The above graph illustrates variation in forecasted and actual cost flow curves of a residential project in Mulund region which comes under Mumbai. From the above graph, we can clearly see variation in cost curves at 30, 50, 70 and 100% completion of project. For example, at 100% completion of project, forecasted and actual cost was 96.88 and 102.24 crores respectively. From this difference, we can determine main reasons of cost and time overrun.

<table>
<thead>
<tr>
<th>Type of Risk factors</th>
<th>Risk occurrence</th>
<th>Risk Impact</th>
<th>Degree of Risk</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>6.45</td>
<td>9.45</td>
<td>60.95</td>
<td>1</td>
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<tr>
<td>Shortage of key materials</td>
<td>7.00</td>
<td>8.10</td>
<td>56.7</td>
<td>2</td>
</tr>
<tr>
<td>Access to funds at reasonable interest rates</td>
<td>7.00</td>
<td>8.06</td>
<td>56.35</td>
<td>3</td>
</tr>
<tr>
<td>Time overruns</td>
<td>6.45</td>
<td>8.15</td>
<td>52.56</td>
<td>4</td>
</tr>
<tr>
<td>Unavailability of utilities</td>
<td>6.55</td>
<td>8.00</td>
<td>52.40</td>
<td>5</td>
</tr>
<tr>
<td>Changes in initial design plans</td>
<td>6.60</td>
<td>7.80</td>
<td>51.48</td>
<td>6</td>
</tr>
<tr>
<td>Subcontractor's insolvency</td>
<td>6.55</td>
<td>7.85</td>
<td>51.41</td>
<td>7</td>
</tr>
<tr>
<td>Alteration in works</td>
<td>6.50</td>
<td>7.85</td>
<td>50.70</td>
<td>8</td>
</tr>
<tr>
<td>Delay in resolving claims</td>
<td>6.50</td>
<td>7.75</td>
<td>50.375</td>
<td>9</td>
</tr>
<tr>
<td>Incomplete scope</td>
<td>6.25</td>
<td>7.95</td>
<td>49.68</td>
<td>10</td>
</tr>
<tr>
<td>Improper execution</td>
<td>6.20</td>
<td>7.90</td>
<td>48.98</td>
<td>11</td>
</tr>
<tr>
<td>Delay in production target</td>
<td>6.50</td>
<td>7.50</td>
<td>48.75</td>
<td>12</td>
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<tr>
<td>Labour shortage</td>
<td>6.00</td>
<td>8.05</td>
<td>48.30</td>
<td>13</td>
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<tr>
<td>Shortage of plant equipment's</td>
<td>6.35</td>
<td>7.6</td>
<td>48.26</td>
<td>14</td>
</tr>
<tr>
<td>Client's bankruptcy</td>
<td>6.05</td>
<td>7.8</td>
<td>47.19</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 1. Computation of Degree of Risk of Top 15 Risk Factors

The above table shows the top 15 risk factors which was been computed by the questionarie survey. Degree of risk was calculated by the following formula:
DOR = RO * RI
Where,
DOR = Degree of Risk
RO = Risk Occurrence
RI = Risk Impact

The above graph shows degree of risk of various factors influencing total cost and time of project. It is clearly visible that Inflation has highest degree of risk (4.55) followed by Shortage of key materials (4.2), Access to fund at reasonable interest rates (4) and so on. The risk factor having lowest degree of risk is Shortage of plant equipment (2.4).

The above graph displays percentage impact of various risk factors at 0 to 30% completion of project situated in Mulund region. Top 7 risk factors having crucial % impact are Inflation (8.95), Changes in initial design plan (8.74), Time overruns (8.54), Shortage of key materials (8.05), Unavailability of utilities(7.94), Improper execution(7.75) and Access to fund at reasonable interest rates (7.04).
The above graph shows percentage impact of various risk factors at 30 to 50% completion of project. Here Time overruns plays a crucial role in affecting total cost of the project having 9.76% impact. It also demonstrates that Subcontractor’s insolvency and delays in resolving claims have moderate % impact of 7.59 and 6.86 respectively. The lowest %impact of 4.23 of risk factor Legislature constraints can also be depicted from the graph.
The graphs above (Fig 6 & 7) emphasize the %impact of various risk factors causing cost and time overruns between 50-70% and 70-100% of completion of project. Risk factors having significant roles between 50-70% completion of project are Changes due to harsh weather, Inflation, Labour shortage, Delay in resolving claims and Unavailability of utilities has minimal %impact of 6.43. Also in the bar chart of 70-100% completion of project, it can be easily deduced that Delay in production target (13.52%) and estimating error (12.25%) are the top most influencing risk factors and subsequently Improper workmanship (3.43%) has the lowest % impact on total cost and project schedule.

CONCLUSION

Construction industry in Indian context is facing a strenuous challenge of completing residential projects in the planned budget and time. This paper not only identifies the critical risk factors affecting total cost and time of project but also evaluates and shows the impact of such deadly factors. We can clearly conclude from the above findings that construction firms are not able to control the actual cost flow with respect to forecasted cost flow due to above identified risk factors. This paper gives a superlative vision of all methodologies and steps for assessment and evaluation of crucial risk factors causing cost and time overruns. From analysis of above data, it is crystal clear that Inflation, Improper execution, Access to funds at reasonable interest rates, labour shortage, Unavailability of utilities, changes due to harsh weather are the main factors affecting cost and time of project. Poor program management, slow decision making, delay in acquisition of land and handing over the site to contractor are chief causes of time overruns identified during this research. Based on research findings, preventive and control measures of cost and time overruns are:

- Project planning should be main priority.
- Overcome the shortage of human resources, poor site management.
- Check a vendor’s/ contractor’s capabilities thoroughly before hiring.
- Utilize excellent scheduling methodology and techniques.
- Make sure the stakeholders are all together on a same page.
- Always have rough view of adverse and unforeseen conditions.
- Project manager should be in the loop with all his team members so the work can carried out smoothly and efficiently.
- Constantly track and measure performances against the goals and plans of organization, also correct any deviations from standard.
- Proper execution of work with quality workmanship.
- Reward good performance of staff.
- Improve management capabilities of all staff.

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