



TIME, COST AND RESOURCE OPTIMIZATION OF A RESIDENTIAL PROJECT

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Abstract— In the construction project, time, cost and resource are the most important factors to be considered in the planning of every project. The aim of project is to finish the projects on time, with available resources and within budget to achieve other project objectives. Construction projects often experience lots of challenges in their execution which require to be carefully managed in order to optimally accelerate the activities without overriding the construction costs. Hence it is necessary to identify options that can bring a balance between these two critical objectives. Factors affecting Time-cost and resource is the process of determining the optimum schedule that can give best possible saving in both time and cost. Residential building projects are the need of the time as the deficit for affordable housing is rising in the country. These residential projects which are mostly repetitive in nature needs an optimum schedule that strikes a balance between time and cost so that the housing units can be delivered in the shortest possible time at an affordable price. Workflow of crew and crew utilization as well need to be considered.

Keywords— Critical risk factor, Relative Importance Index

I. INTRODUCTION

The housing sector contributes immensely to growth of a nation, as it forms a part of the productive economic sector and actively contributes to Gross Domestic Product of a country. But there is slow down in the sector and lot of time-cost in the residential projects. As per the 2011 census, around 31.16 % of India's population lives in urban areas. With more population moving into cities there is a huge housing shortfall in towns and cities. There is a huge demand and supply crisis in India's housing sector. During 11th five year plan a technical group constituted by Ministry of Housing and Urban Poverty Alleviation (MoHUPA), estimated that the total housing requirement in Indian cities by end of 2012 would be 26.53 million dwelling units and with the current increase in the backlog, a minimum of 30 million additional houses will be required by 2020. Making affordable houses to the masses is the only solution for this crisis. Also there is a huge backlog in the housing sector so the upcoming projects should cater to this backlog as well as the

projects on schedule. Extra ordinary processing and time delays are concern in the housing sector. Time and cost of projects are two intricately related objectives. [8] discussed about amplifier power relation, impedance, $T \pi$ and microstripline matching networks. Bringing a trade-off between the two in affordable housing projects can bring down the time and cost overrun issues in housing.

II. OBJECTIVE OF THE STUDY

The primary aim and objective of this study is to develop a time cost and resource optimization model that suits mass housing projects. And to identify delay factors that currently existing in construction industry for the poor service delivery in housing projects.

III. LITERATURE REVIEW

A numerous literature are studied and to find the delay factors that are existing in the construction industry. The major factors for delay in housing projects are identified the below literatures:

1) Desai madhura .c, Prof.s.v.desale "Study factors affecting of delay in residential construction projects for Nasik city" in the International Journal of Latest Trends in Engineering and Technology (IJLTET) Vol. 2 Issue 3 May 2013: The author collected factors from the literature reviews that he studied, based on the factors the author framed the questionnaires. The questionnaire was distributed to owner, contractor, engineer, architect and consultant. After collecting the questionnaires they ranked the factors based on the impact on construction of residential building. The author used average index analysis for analysing the questionnaires

2) B. Indhu, P. Ajai M.tech, "Study of Delay management in a Construction Project - A Case Study" International Journal of Emerging Technology and Advanced Engineering Volume 4, Issue 5, May 2014 : The main purpose of this author study is to identify the delay factors and the effect on the project completion by doing a case study in ongoing projects. By analyzing the



due to contractor, client and also due to nature's act like rain. The major effects of delay are cost impact, reduced labour productivity, postponement in work, change in labour allocation etc. They conclude that not all delays can be rectified, but few of them can be overcome by improving management responsibilities.

3) Yakubu Adisa Olawale, Ph.D. and Ming Sun, Ph.D. "Cost and time control of construction projects: inhibiting factors and mitigating measures in practice" *International Journal of Science and Research (IJSR)* volume 4, 2014 : According to the author view the availability of various control techniques and project control software many construction projects still do not achieve their cost and time objectives. So research in this area so far has mainly been devoted to identifying causes of cost and time overruns. And they conducted survey in more than 250 constructions, identified that the common factors that inhibit both time and cost control during construction projects were firstly identified.

4) Mr.K.James Baburaj, Dr.N.S.Elangovan "Time And Cost Optimisation In Construction Using M.S Project" *International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)* Vol. 3, Special Issue 2, March 2016: Their work is to , estimate and cost the building is done in terms of optimization time and cost. The project also includes visiting of some construction companies and conducts questionnaire surveys, then analyses the difficulties due to cost and time and suggests improvement for the phase of the construction project. The main goal of the project is to finish the project with minimum cost and within the time

5) Melba Alias, Dhanya R, Ganapathy Ramasamy "Study and Analysis of Factors Affecting the Performance of the Construction Projects" *International Journal of Science, Engineering and Technology Research (IJSETR)* Volume 4, Issue 4, April 2015: The aim of the author study is to identify the factors affecting the local construction projects and analyse them. A questionnaire is prepared from literature review. The questionnaire contains two parts; part A dealing with the general information of the company and the respondent and Part B is subdivided again into different factors like cost, time, health and safety, client satisfaction, community satisfaction factors, productivity factors and environmental factors. Each respondent was asked to rank the factors in a range of one to five. The analysis of the response was done using the SPSS software. The top 5 factors affecting the performance of projects were identified as increase in material cost, inadequate supply of labour, incorrect planning, wrong method of estimation, and poor financial control on site.

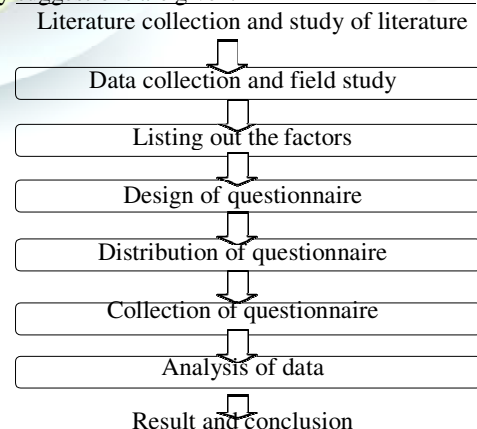
6) Vignesh.N,Vinoth "Resource Scheduling In Residential building Construction By Considering Cost And Time" in *international journal of advanced research*

projects are taken into an account for residential building in terms of optimizing time, cost and resource. From building, analysis done to optimize time and cost. In analysis part, for the building scheduling they performed using Microsoft project. Then factors are introduced to increase the duration of the project, then by schedule crunching and project crashing technique optimization of time and cost will be found .

7)Rhuta Joshi¹, Prof. V. Z. Patil² -Resource Scheduling of Construction Project: Case Study *International Journal of Science and Research (IJSR)* : In Several construction activities can be managed to achieve the profit within limited funds and time. Thus project management techniques are useful in scheduling and coordinating the various resources by controlled method. Management techniques such as Critical Path Method, Program Evaluation and Review Techniques (CPM/PERT) have been successfully implemented. These techniques help management in efficient and economic use of resources for completion of project objectives with unlimited availability of resources, though it is observed that resources are limited in real project scenario. It has been observed that the project delays occur due to insufficient supply of resources. Computer packages like MS Project and Primavera project planner are used in construction industry. Project management techniques can be used to resolve resource conflicts and also useful in minimizing the project duration within limited availability of resources to make the project profitable.

IV.METHODOLOGY

This study consists of three major steps. The first step is the collection of general information. Second step is conducting surveys and interviews to the experts in construction field. And then list of important factors causing delay in construction are identified. The third step is the finding factor having great impact and finally suggestions are given.



V.ANALYSIS OF DATA



analysis software. so for getting results i used SPSS for this project. The data are analyzed by using average index. The analysed results are shown below in table-1

Table-1

The table-1 shows analysed data results

S.no	Factors	N.I	L.I	Avg	I	V.I	Avg. Indx
ABOUT COST							
1	Market share of organization	13	7	0	0	0	0.27
2	Cash flow of project	0	0	3	9	8	0.85
3	Cost of project	1	4	7	3	5	0.67
4	Overhead percentage cost	1	7	11	1	0	0.52
5	Project design cost	0	1	6	7	6	0.78
6	Material and equipment cost	0	0	1	8	11	0.9
7	Project labour cost	0	0	0	7	13	0.93
8	Project over time cost	0	2	8	7	3	0.71
9	Motivation cost	7	9	4	0	0	0.37
10	Rework cost in project	0	5	7	6	2	0.65
11	Cost of material waste	0	0	0	10	10	0.9
ABOUT DESIGN							
12	Sufficient data collection and survey before design	1	7	9	2	1	0.55
13	Use of advanced design software	3	9	20	0	0	0.50

14	Finding of design	0	7	7	3	20	0.75
15	Finding Complexity in project design	2	4	4	6	4	0.66
16	Experience d design team in project	0	0	9	5	6	0.77
ABOUT TIME							
17	Site preparation time	4	6	8	2	0	0.48
18	Planned time for project construction	1	6	10	3	0	0.55
19	Percentage of orders delivered late	0	0	4	9	7	0.83
20	Delay in project approval	0	10	10	0	0	0.5
21	Delay time for payment from owner to contractor.	0	0	1	12	7	0.86
ABOUT MATERIALS							
22	Availability of resources as planned	0	0	0	10	10	0.9
23	Delay of construction materials	0	0	2	10	8	0.86
24	Shortage of construction material	0	0	0	9	11	0.91
25	Changes in material types and specification during construction	0	0	7	9	4	0.77
26	conformance to specification	0	5	9	6	0	0.61
27	Availability of personals with high experience and qualification	0	0	3	9	9	0.85



ABOUT EQUIPMENT							
28	Equipment allocation problem	0	6	6	6	2	0.64
29	Frequent equipment breakdowns	0	5	7	6	2	0.65
30	Improper equipment selection	4	8	6	2	0	0.46
31	Inadequate modern equipment	11	9	0	0	0	0.29
32	Low efficiency equipment	2	4	11	3	0	0.55
33	Shortage of equipment	0	0	8	7	5	0.77
ABOUT LABOUR							
34	Absenteeism	0	0	0	8	12	0.92
35	Low motivation and morale of labour	1	4	10	5	0	0.59
36	Shortage of labour	0	0	0	7	13	0.93
37	Slow mobilization of labour	0	0	1	10	9	0.88
38	Unqualified /inadequate experienced labour	0	0	4	11	5	0.81
ABOUT QUALITY & PRODUCTIVITY							
39	Quality assessment system in organization	0	3	7	9	1	0.68
40	Regular quality training and meeting	4	8	8	0	4	0.53
41	Regular quality inspection	1	5	11	2	1	0.57
ABOUT MANAGEMENT							
42	Coordination between owner and project	0	0	0	9	11	0.91
43	Leadership skills of project manager	0	0	2	10	8	0.86
44	Slowness in decision making	0	0	0	10	9	0.84
45	Delay in progress payment	0	0	0	7	13	0.93
46	Quality and availability of regulator documentation	1	11	8	0	0	0.47
47	Consider employee attitudes in project	0	0	2	8	10	0.88
48	Employee motivation in project	1	5	11	3	0	0.56
ABOUT HEALTH AND SAFETY							
49	Application of health and safety factors in organization	1	1	7	10	1	0.69
50	Following safety norms in project	0	0	1	9	10	0.89
51	Use of safety devices in site	0	6	9	5	0	0.59
ABOUT EXPERIENCE AND SKILLS							
52	Using experienced persons in project	0	0	0	8	12	0.92
53	Updating skills of employee	0	0	2	12	6	0.84
54	Training the human resources in the skills	0	0	10	6	4	0.74
55	Team Work in project	0	0	3	9	8	0.85
ABOUT EXTERNAL ENVIRONMENT							
56	Air quality in site	3	5	8	4	0	0.53



57	Noise level in construction site	14	6	0	0	0	0.26
58	Waste around the site	3	8	9	0	0	0.46
59	Climate conditions in the site.	9	11	0	0	0	0.31

WHERE: N.I- NOT IMPORTANT, L.I-LOW IMPORTANT, I- IMPORTANT, V.I-VERY IMPORTANT, AVG.INDX-AVERAGEINDEX

VI.RESULTS

TABLE-II

This table shows major impact factors from the above table

Rank	Factors	N.I	L.I	Avg	I	V.I	Avg.i ndx
1	Project labour cost	0	0	0	7	13	0.93
2	Shortage of labour	0	0	0	7	13	0.93
3	Delay in progress payment	0	0	0	7	13	0.93
4	Absenteeism	0	0	0	8	12	0.92
5	Using experienced persons in project	0	0	0	8	12	0.92
6	Shortage of construction material	0	0	0	9	11	0.91
7	Coordination between owner and project parties	0	0	0	9	11	0.91
8	Material and equipment cost	0	0	1	8	11	0.9
9	Cost of material waste	0	0	0	10	10	0.9
10	Availability of resources as planned	0	0	0	10	10	0.9

WHERE: N.I- NOT IMPORTANT, L.I-LOW IMPORTANT, I- IMPORTANT, V.I-VERY IMPORTANT, AVG.INDX-AVERAGEINDEX

VII.CONCLUSION

The top 10 delay factors are identified based on the questionnaire

1. For project labour cost the construction companies and contractor may prefer use of machineries to minimize the labour cost.

2. For shortage of labour use of machineries to reduce man power, plan for proper human resource before starting the project

3. For delay in progressive payment contractor should have proper agreement related to term and conditions for regular progressive collection of payment

4. For Absenteeism the contractor or company have to provide comfortable environment to the labours and provide proper wages to avoid absenteeism

5. Having experienced persons in project helps for the quicker completion of project.

6. For shortage of construction materials the resources should be well planned, the resources scheduling should be done before starting the project.

7. Proper coordination between owner and contractors helps in smooth going of project and helps in better and quicker completion of project. Agreement should be made between them to avoid conflicts during the construction period.

8. Material and equipment cost is the major factor affecting the project, lack of equipment and material delays the project, so appropriate equipment should be used in the project.

9. Cost of material waste should be controlled to avoid over run cost. The materials play vital role in every construction industry, proper quantity survey are done to avoid material waste in site.

10. Availability of resources planned is important for the smooth on going for project, resources should be planned as per the schedule.

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