Time-cost and Resource Optimisation of Residential Construction Works using SPSS Software

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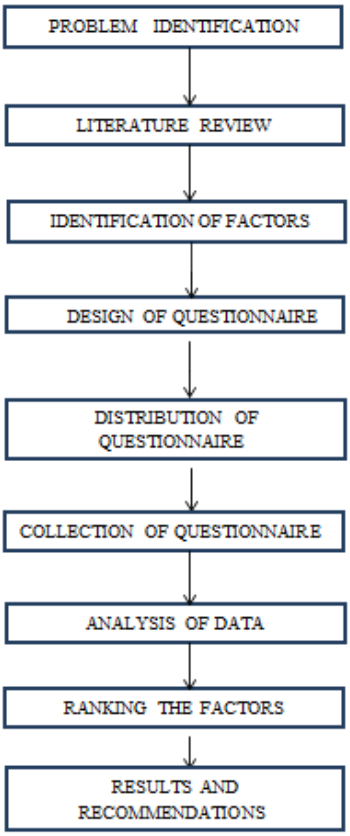
Abstract- *The main objective in the construction field is to complete each and every project on time, with good quality and within the estimated cost. In the construction projects time-cost and resources are the most crucial factors to be considered in the planning period. The residential projects are in need of affordable housing without any delays. Hence it is in need to identify the options that bring a balance between the time and cost of the construction works. The optimization of the time-cost and resources will balance both the time and cost overrun of the projects. So that, the housing projects can be delivered on time within the estimated cost. Thus the numerous factors affecting the proper execution of the work are made into a survey questionnaire. The factors are analyzed using SPSS software and ranked using the relative importance index. The outcome of the project helps personnel and practicing agents to understand the major factors that causing the delays and cost overrun.*

Keywords- Time-cost , optimisation , factors causing delays and overrun.

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. The term “residential project” in the construction industry is the process in which a building should be regarded as residential building when more than half of the floor area is used for dwelling purposes Housing is the construction or springing up of a relatively high number of residential buildings in an area in a relatively short period of time due to high demand. Also there is a huge backlog in the housing sector so the upcoming projects should cater to this backlog as well as the rising demand. For this it is essential to complete these 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. Bringing a trade-off between the two in affordable housing projects can bring down the time and cost overrun issues in housing.

II. METHODOLOGY



III. OBJECTIVE

1. To identify delay factors that currently existing in construction industry for the poor service delivery in housing projects.
2. To identify major factors affecting time, cost and resources in a project.
3. To analyze how these factors affect the project resources and time.
4. To rank the factor based on its impact on project
5. To create an optimum methodology for construction project in which all these factors can be controlled.

IV. LITERATURE SURVEY

A.Determination of time and cost as basic resource:

From the study of the literature the in construction project, time and cost are the most important factors to be considered in the planning of every project. the aim of the project is to finish the project on time , with in the budget and to achieve other project objectives . The time and cost are the two main and basic resources in the project. Based on this the resources are scheduled in the project.

B. Determining the factors for successful project :

The aim of the paper is to develop a conceptual framework on critical success factors ~CSFs!. Seven major journals in the construction field are chosen to review the previous works on project success. Five major groups of independent variables, namely project-related factors, project procedures, project management actions, human related factors, and external environment are identified as crucial to project success. Further study on the key performance indicators ~ KPIs! is needed to identify the causal relationships between CSFs and KPIs. The causal relationships, once identified, will be a useful piece of information to implement a project successfully

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Designing of the questionnaire:

According to the author Construction Industry is one of the very fast growing industries but it also faces any problems which impinge on the performance of their projects. The aim of the author study is to identify the factors affecting the local construction projects and analyze them. the author questionnaire is prepared from the 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.

V. PROBLEM STATEMENT

Mass housing is the construction or springing up of a relatively high number of residential buildings in an area in a relatively short period of time due to high demand. One of the notable periods which brought about the idea of mass housing and also came along with numerous housing problems was the industrial revolution. It was called a revolution because it changed the society in a rapid and significant way. This scarcity of housing led to the construction of mass housing, which had poor living conditions and were characterized as unhygienic, overcrowded and also lacked infrastructures and social amenities. Traditional scheduling in repetitive housing projects mainly concentrates on the time aspect of the projects alone; costs and resource utilization are seldom considered. The mathematical models are too complex to apply practically in the real constructions. Hence the need for a simple model that considers time, cost and resource utilization simultaneously and practically understandable to construction practitioners. A Residential building would come to be an important and essential development in most developing countries because of the amount of people moving from rural parts of the country to the urbanized and developing parts of the country.

VI. OPTIMIZATION

Optimization is an act, process, or methodology of making something (as a design, system, or decision) as fully perfect, functional, or effective as possible specifically the mathematical procedures (as finding the maximum of a function) involved in this optimization.

Time -Cost optimization

Time-cost optimization is useful to find the least cost point which is the optimum point between the normal activity time-cost point and the crash activity time-cost point. The traditional time-cost optimization technique is based on the critical path method (CPM) and has been used in the construction industry over the previous fifty years. This technique “requires that all operations in a project be represented in activities, each of whose start is dependent upon completion of other activities”. Moreover, an “input time- cost curve is required of each activity that describes the relationship between activity duration and direct cost for alternative plans for performing the activity”.

Resource optimization

Resource optimization is the set of processes and methods to match the available resources (human, machinery, financial) with the needs of the organization in order to achieve established goals.

When a company is managed using the philosophy of Intelligent Management then resource optimization is strictly linked to the concept of constraint and a systemic vision of the company. Indeed, without a systemic vision of the company we are unable to identify the global effectiveness of resource allocation and we run the risk of using resources available mainly to respond to emergencies that daily occur in the various parts of the organization.

VII. DESIGNING OF THE QUESTIONNAIRE

According to the author Construction Industry is one of the very fast growing industries but it also faces any problems which impinge on the performance of their projects. The aim of the author study is to identify the factors affecting the local construction projects and analyze them. the author questionnaire is prepared from the 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.

Based on several reviews the questionnaires are made in advanced with description. The questionnaires are designed based on literature reviews and some expert comments. The questions are made depend on factors affecting time, cost and resource. This each factor has 34 questions for questionnaire survey.

Questions are distributed to the contractors, owner and consultant of various companies. Around 50 companies questionnaire were distributed and obtained only 35 responses. Then the questionnaires are collected from the companies and analyzed.

VIII. ANALYSIS AND INTERPRETATION

All the data collected through the survey are entered in the SPSS work sheet. Each questions from the questionnaire are assigned as different variables and the value label for each type of questions are framed.

Then the frequencies of the factors are calculated by generation of the frequency tables. The consolidated data are entered in the MS-Excel and the ranking is done.

The following is the important tools used in the analysis. The results are obtained by applying this formula for each factors given in the questionnaire.

Relative Importance Index formula :

RII = $\sum$ W / A*N
W = The weight given to each factor
A = The highest weight
N = The total number of respondents

IX. RESULTS

Rank No	Factors Influencing	Very Important	Important	Average	Less Important	Not Important	Average
1	Cost of project	13	15	2	0	0	0.87
2	Experienced design team in Project	15	10	5	0	0	0.87
3	Unqualified labour	15	11	2	2	0	0.86
4	Coordination between owner and project parties	16	9	3	2	0	0.86
5	Planned time for project Construction	11	14	2	3	0	0.82
6	Material and equipment cost	6	19	5	0	0	0.81
7	Availability of resources as Planned	12	8	10	0	0	0.81
8	Project labour cost	4	16	4	2	0	0.8
9	Using experienced persons in project	12	6	10	2	0	0.79
10	Training the human resources in the skills	7	16	5	2	0	0.79

X. FINDINGS

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 contactor 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.

XI. SUGGESTIONS

1. The project aim need to improve the cash flow of the project affect.

2. The cost of the project should be maintained with in the estimated cost so it doesn't affect the profit rate of project.

3. Regular project budget update help controlling project cost

4. The resources should be utilised according to the budget and need of the work.

5. The equipment's required for the project should be accessed near to the locations to avoid miscellaneous expenses.

6. The material and equipment should be selected as that it doesn't affect budget of the project.

7. A monthly meeting should be conducted between the contractor and clients to discuss the status of the project.

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