

APPLICATION OF PRIMAVERA P6 FOR COST OVERRUN PREDICTION

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Abstract - The Construction Industry plays an important role in the country's infrastructure development. India's construction industry is the country's second largest, yet improvement is not uniform across the country. Time and cost overruns are causing huge problems in the construction industry. These challenges develop as a result of the project's lack of effective planning, scheduling, and control. So, in this study, I devised a method for predicting cost overruns in construction projects and offered some solutions for reducing cost overruns. Main reasons of Cost Overrun were found through the Literature Review in the categories of Men, Material, Machinery, and Money. Few Responses were collected by the Construction Professionals and using the Weighted Average Score Method most important causes of Cost Overrun were identified. Five stories building was chosen as a case study, and Primavera P6 was used to schedule this project. We identified Cost Overrun activities by applying actuals to project schedule. By evaluating the actual progress of work and the results of the Questionnaire Survey, we identified comparable factors. As a result, we may predict Cost Overrun activities and eliminate Cost Overrun well in advance by using Project Management Tool.

Key Words: Cost Overrun, Questionnaire, Primavera P6

1. INTRODUCTION

Construction management is both an art and science and we all know that it is hard to accomplish. The Construction Industry is a critical component of the country's infrastructural evolution. The construction industry is India's second largest sector, though this progress is not uniform across the country. There is a difference between the Rural and Urban infrastructure. To cope up with urban region, rural region needs tools for development in economy, usage of land and environment planning. To achieve these goals, we need an effective project management.

Construction Industry is facing major issues due to Time and Cost Overrun. These issues arise due to lack of proper planning, scheduling and controlling of the project. By the analyst's observations show that proper proficient management is crucial regarding completion of project on period and on budget with the resources available. There must be some cautionary advice in the process which can notify quickly about the success and failure of the project.

1.1 PROJECT MANAGEMENT

Building plans have been defined as diverse and irregular in kind, with no two projects being same. Even if two projects are identical, the execution approach will differ because maximum projects are particular to location. When the project's final cost exceeds the original cost, it is referred to as a Cost Overrun. Project Delays and Cost Overruns are regular occurrences all around the world. The failure is mostly caused by time and money, and it can affect owners, builders, shareholders, and other project participants equally.

1.2 INTRODUCTION TO PROJECT MANAGEMENT TOOL

The use of information technology in building projects has become unavoidable as they have grown in size and complexity. Project management software are being developed these days, such as Primavera P6, P3, Microsoft Project, and so on. To make Project Management easier Primavera is very helpful. Primavera helps to create strategies, controlling the delays and to determine efficient resource allocation in projects. So primavera is needful in Civil Engineering. To complete the project within time and budget Primavera is used. Primavera applications of measurements and methodologies are used to project tasks in order to fulfil the owner's intention. For all type of projects, the Primavera is used to scheduling, estimating and controlling purpose. By this study we can observe that monitoring and controlling of projects can be done through Primavera P6. As the work progresses in the site, we can update it in Primavera. These updated works can be completely monitored by the Primavera.

1.3 OBJECTIVES OF THE STUDY

The target of this study is to identify and reduce the factors of affecting to increase in the budgets. For this purpose, the following objectives are set.

1. To list different causes of cost overrun
2. To conduct a Questionnaire Survey in order to identify the most crucial factors causing budget Overrun.
3. To rank the factors on the scale of 1 to 5 (1-Very low, 2-Low, 3- Moderate, 4-High, 5-Very High).
4. To select a project in which the task of Cost Overrun mitigate can be carried.

5. To schedule all the activities in the project using Primavera P6.
6. To identify the activities which will potentially lead to Cost Overrun.
7. To overcome Cost Overrun by using Project Management tool.

2. LITERATURE REVIEW

The below are few literatures from various nations that have been investigated in order to analyses budget alterations and determine the causes of cost overruns in building projects.

Amirhossein Balali et al., [1]. This research paper mainly focused on the mega hospital construction project where it is facing different types of limitations which affecting on the cost directly. The study's goal is to identify cost overrun drivers in an Iranian hospital construction project. In this project they have used Delphi and SWARA methods to find out the cost overrun in the project. By the expert opinion the cost overrun factors are noted and then differentiated according to consultants, employers and contractors. The final conclusion of this study results illustrated that "Unacceptable quality that leads to rework in project" with 0.458 score, and "During the project the lack of fund" with the 0.44 score are the most important factor for contractors, employers and group consultant respectably. The concluded factors are affecting to increase the cost of the project.

Reshma Mary Johnson et al., [2]. Using mixed approaches, this research investigates the key drivers of cost overruns. Mixed methods include questioner survey and interview with professionals in UAE construction field. Variations in design from the consultant and client, unrealistic timetables and delays in the project to obtain government clearances, approximate time estimation, and client decision delays are among the top reasons of duration and expense overruns. They have collected 53 questionnaire responses from the professionals in construction like project manager, project engineer, architects, planning professionals, quality surveyor, site engineer etc. By personnel responses which helps to identify the lags in the project. 52 responses from questioner survey agrees that cost and time are inter related to each other in construction industry. Then they have calculated the responses by using weighted score method and average score formula. The above analyses give the main causes for cost overrun in construction project.

Hitanshu Saini [3]. In this study they have find out the delays which are occurring in the project and monitoring and controlling of the project is done. They have taken four story Ayurveda Research Centre building for their case study, which is present in Pandoh, Mandi (H.P). They scheduled the project by using Primavera and monitored, analyzed the different types of delays and which leads to the increase in the duration of completion.

They have used some methodology like; personal interview with workers at the site, colleting the data and analyzing the data by using primavera. By analyzing many causes for cost

overrun are found and due to these reasons project delays and completed four months late.

T.Subramani et al., [4]. In this research paper they have conducted questioner survey to find out cost overrun in construction projects. By the clients, consultants and contractors each 30 questionnaire responses were collected. The questioner survey includes the ranking of the causes according to the priority. The relevance of causes is determined based on the cumulative effect of incidence and high impact. The results were comparing with the other country results and they found similar.

From the above-mentioned literature reviews we can get to know the process and approaches of using the project management practices and applying the same to the project. It also provides samples of the project which was accepted previous and how the process was obliging in improving the project.

3. RESEARCH METHODOLOGY

3.1 GENERAL

To achieve the desired results well defined methodology becomes very important. Hence, after identifying the causes for Cost Overrun in project the following methodologies are set to achieve the goal.

The following methodology is used in this project

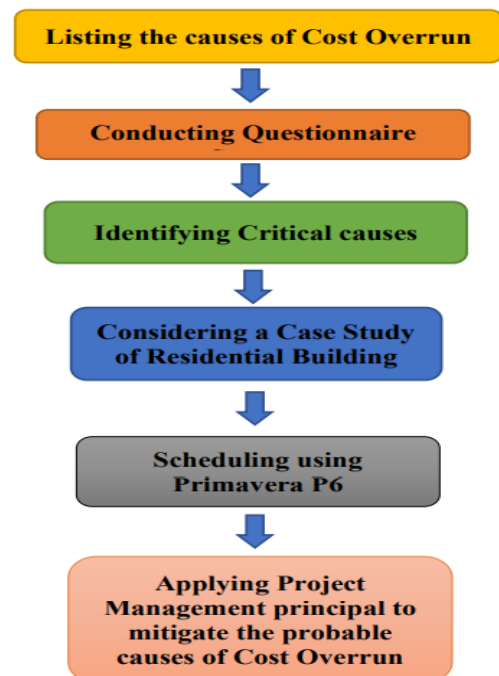
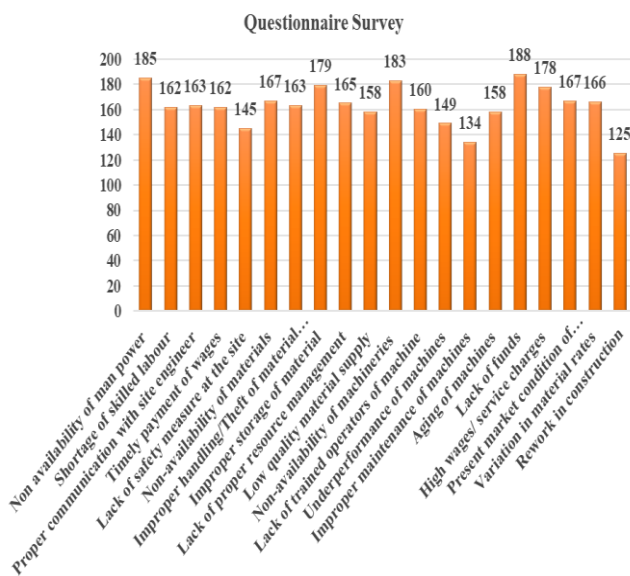


Fig -3.1: Flow Chart of Methodology

4. RESULTS AND DISCUSSIONS

4.1 Questionnaire Survey

Following section discusses the findings of the Survey Form, which was used to collect responses from construction authorities. Total 50 responses were collected from Questionnaire Survey. And the result of Questioner Survey is shown in the below graph:



Graph – 4.1: Results of Questionnaire Survey

The responses were calculated using Weighted Average Score Method (Fig 4.1). Below Formula is used to estimate the score.

$$\text{Weighted Average Score} = \frac{(X_1W_1+X_2W_2+X_3W_3+\dots+X_nW_n)}{\text{Total}}$$

Where,

X = Count of Responses

W = Position rank weightage

Rank	Causes	Very high impact	High Impact	Moderate impact	Low Impact	Very Low Impact	Total	Score
		5	4	3	2	1		
1	Non availability of man power	13	12	22	3	0	50	3.7
2	Shortage of skilled labour	7	13	15	15	0	50	3.24
3	Proper communication with site engineer	5	19	14	8	4	50	3.26
4	Timely payment of wages	8	15	12	11	4	50	3.24
5	Lack of safety measure at the site	5	11	13	16	5	50	2.9
6	Non-availability of materials	9	12	20	5	4	50	3.34
7	Improper handling/Theft of material at site	6	16	15	11	2	50	3.26
8	Improper storage of material	8	19	17	6	0	50	3.58
9	Lack of proper resource management	6	18	15	7	4	50	3.3
10	Low quality material supply	9	10	16	10	5	50	3.16
11	Non-availability of machineries	10	19	17	2	2	50	3.66
12	Lack of trained operators of machine	6	15	16	9	4	50	3.2
13	Underperformance of machines	1	14	21	11	3	50	2.98
14	Improper maintenance of machines	2	5	23	15	5	50	2.68
15	Aging of machines	7	15	13	9	6	50	3.16
16	Lack of funds	10	21	16	3	0	50	3.76
17	High wages/ service charges	12	15	14	7	2	50	3.56
18	Present market condition of construction industry	4	21	16	6	3	50	3.34
19	Variation in material rates	11	14	11	8	6	50	3.32
20	Rework in construction	3	6	12	21	8	50	2.5

Fig 4.1: Likert Scale analysis by using Weighted Average Score Method

By the analysis of weighted score method, 10 most critical causes leading to Cost Overrun were identified and listed in Fig 4.2. In these the top three causes has score of 3.76, 3.7 and 3.58 respectively.

Rank	Causes	Score
1	Lack of funds	3.76
2	Non availability of man power	3.7
3	Non-availability of machineries	3.58
4	Improper storage of material	3.6
5	High wages/ service charges	3.56
6	Non-availability of materials	3.34
7	Present market condition of construction industry	3.34
8	Variation in material rates	3.32
9	Lack of proper resource management	3.3
10	Improper handling/Theft of material at site	3.26

Fig 4.2: Top 10 critical causes of Cost Overrun

4.2 Cost Overrun Activities using Primavera P6

Top 3 Causes of Cost Overrun are by the Questionnaire Survey are:

1. Lack of funds
2. Non availability of manpower

3. Non availability of machinery

By analyzing these causes with the case study, we found the activities which will potentially lead to Cost Overrun.

1) Lack of funds

Execution of various activities at the same time leads to increase of the cash flow. When the capital supply for a project is insufficient, the project will be delayed. Then in the end it leads to Cost Overrun. In my project at the month of December to January we have parallel activities are planned. So, for this we need a high cash flow so that we can manage to complete the activities within the time. Due to lack of funds in this project delay of activity occurred in December month so, Cost Overrun of the project is happened.

Activity ID	Activity Name	Original Duration	Budgeted Total Cost	At Completion Total Cost	Variance - BL1 Total Cost
SUJ1.1	BASEMENT	52	Rs5,069,639.00	Rs5,408,060.45	(Rs4,084,409.45)
SUJ1.1.1	EXCAVATION	0	Rs0.00	Rs0.00	Rs0.00
SUJ1.1.2	CENTERING	31	Rs139,098.00	Rs139,098.00	Rs0.00
A1120	Beam	11	Rs56,740.00	Rs56,740.00	Rs0.00
A1130	pocket slab	2	Rs23,127.00	Rs23,127.00	Rs0.00
A1140	main slab	11	Rs60,231.00	Rs60,231.00	Rs0.00
SUJ1.1.3	REINFORCEMENT	49	Rs2,331,881.00	Rs2,679,705.45	(Rs2,119,296.45)
A1180	plinth beam	1	Rs176,239.00	Rs205,612.17	(Rs137,943.17)
A1190	beam	6	Rs858,942.00	Rs1,002,099.00	(Rs717,623.00)
A1200	pocket slab	7	Rs69,640.00	Rs69,640.00	Rs0.00
A1210	main slab	7	Rs1,227,060.00	Rs1,402,354.28	(Rs1,263,730.28)
SUJ1.1.15	Shuttering	44	Rs594,516.00	Rs594,516.00	(Rs536,516.00)
A4550	Plinth beam	1	Rs30,000.00	Rs30,000.00	(Rs27,000.00)
A4560	Beam	1	Rs5,000.00	Rs5,000.00	Rs0.00
A5110	slab	1	Rs35,000.00	Rs35,000.00	Rs0.00
A5090	Pocket slab	1	Rs524,516.00	Rs524,516.00	(Rs509,516.00)
SUJ1.1.4	CONCRETE	44	Rs1,990,644.00	Rs1,991,241.00	(Rs1,428,597.00)
A1250	plinth beam	3	Rs224,975.00	Rs224,975.00	(Rs187,962.00)
A1260	beam	1	Rs539,104.00	Rs539,701.00	(Rs417,979.00)
A1270	pocket slab	1	Rs103,065.00	Rs103,065.00	Rs0.00
A1280	main slab	1	Rs1,123,500.00	Rs1,123,500.00	(Rs822,656.00)
SUJ1.1.5	Deshuttering	42	Rs3,500.00	Rs3,500.00	Rs0.00
A4590	Plinth Beam	1	Rs500.00	Rs500.00	Rs0.00
A4600	Beam	1	Rs500.00	Rs500.00	Rs0.00
A5100	Pocket Slab	1	Rs1,000.00	Rs1,000.00	Rs0.00

Fig 4.3: Cost Overrun activities due to lack of funds

2) Non availability of man power

Man power in Construction industry are the workers. The increase in the demand causes non availability of man power and then it leads to delay in construction projects. Hence availability of man power must be adequate and steady in order to building a higher quality work. On the other hand, lack of man power exclusively reduce the productivity and production and slow down the output rate which will cause a reduction in returns and income of the company. In this project the activities are delayed due to non-availability of man power.

The below images show examples regarding non availability of man power cause. Here the planned dates are varying with respect to actual dates.

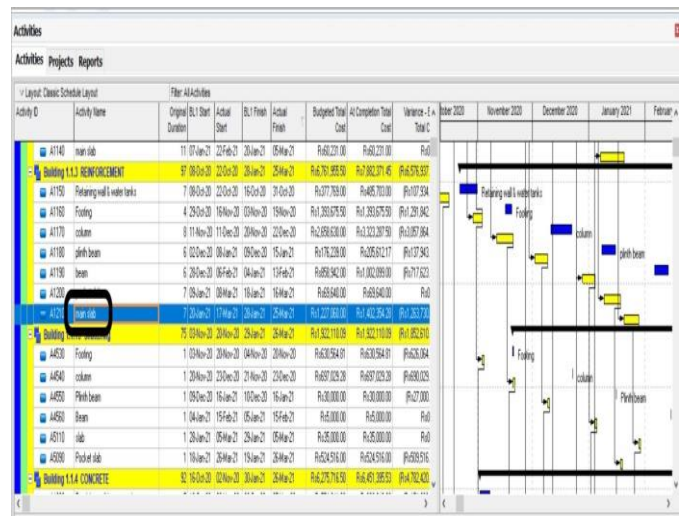


Fig 4.4: Cost Overrun activities due to non-availability of man power

3) Non availability of machinery

The development of several significant building projects, as well as the timely completion of work, are critical. Mechanization is essential in the majority of construction projects where heavy machinery is used. The proper use of certain equipment adds to project economics, productivity, protection, and timely completion. In my project because of non-availability of machine the earth work excavation activity is delayed for 2 days.

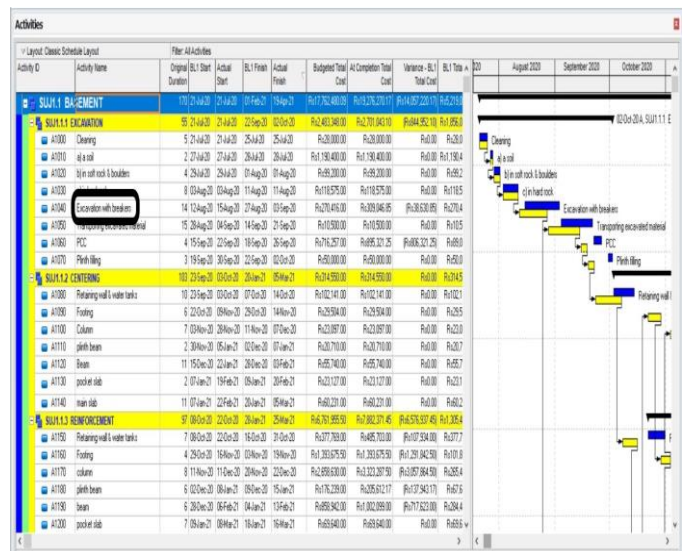


Fig 4.5: Cost Overrun Activity due to Non-availability of Machinery

5. CONCLUSIONS

5.1 GENERAL

One of the most significant goals of project management is to complete a project on schedule and under budget. This is seen as a critical element in the project's success. Budget overruns, on the other hand, are common in building projects due to their complexity. Construction projects all across the world have a dismal track record of meeting deadlines, budgets, and quality standards. This project has tried to identification of causes of Cost Overrun. The factors were identified and prepared in the form of Questionnaire Survey. By taking responses we found critical factors by the use of Weighted Score Method.

Following are the conclusions from this project

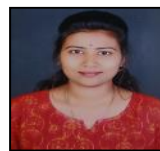
1. Lack of funds is the most important cause for cost overrun. So before starting of the project we must identify the parallel activities for which we need high cash flow. So that we can arrange it well and before.
2. Non availability of man power we can see throughout the project. So, plan according to the availability of man power and manage the workers for all the activities.
3. Plan the activities according to the availability of machines or arrange the machines well and before the start of the activity.
4. Materials shall be stocked and placed in such a way that it should not harm the public and the workers. There should be appropriate planning of the arrangement for storage of materials. And depending upon the individual characteristic's materials should be protected.
5. For high wages and service charges we must plan the budget well in advance so that we can avoid the Cost Overrun.
6. The best way to avoid cost overrun through non availability of material is to book the vendors in advance.
7. By keeping the uncertainties in mind i.e., market condition and variation in material rates, we have to plan the budgeted cost so that we can avoid Cost Overrun of the estimated cost.
8. Track the resource accessibility and allocate with respect to the workload and monitor resource productivity.
9. To avoid the theft at site we have to store material inside, lock up valued items, equipment's and keep good records.

The usage of a Project Management Tool in building projects is among the effective manners for reducing financial losses. The Project Management tool helps us to recognize the activities which will lead to cost overrun so that we can manage the activities while constructing.

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