

PROJECT PERFORMANCE ANALYSIS USING EARNED VALUE ANALYSIS

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ABSTRACT

The construction industry is the largest and rapidly growing industry in the country. And the occurrence of uncertainties is an obstacle in the completion of the project. Due to uncertainties, there are cost overruns and schedule overruns. There is a need for a process which can tackle these problems and provide an overview of project performance and future forecasts. Earned Value Management is one such method which is able to provide accurate forecasts of project performance. Earned Value goes one step ahead in future and examines actual achievements and compares it with the planned schedule. This helps managers an early insight into potential risk areas with a clear picture. This study emphasis on performance of project using Earned Value Analysis (EVA) with a case study. EVA parameters are calculated using Primavera software. All the EVA terminologies and histograms and cost curves are included. It also covers the future forecast of the project in terms of cost and time to take corrective measures so that the project is on track.

KEYWORDS: Earned Value, Performance, Forecast, Cost Curves

INTRODUCTION

The construction industry is the second largest industry in India. Delay in the project due to uncertainties is a most common problem, which eventually leads to wastage of financial resources which increases the project cost. Project managers have a difficult task to execute the project as per plan. With new emerging technological advancements, It becomes very imperative that the objectives of the project are attained within the constraints of time and resources. A methodology designed in dealing with the project's uncertainty of prime necessity. Project control is based on the comparison of the plan project baseline for comparison with the actual results in an effort to identify deviations, which facilitate management to take corrective actions. Earned value analysis provides a systematic process to deal with the issues involved in project progress.

An industry standard method of measuring a project's progress at any given point in time, forecasting its completion date and the final cost is done using earned value analysis. EVA calculates variances in the schedule and budget as the project proceeds. It compares the planned work performed with actual progress, to determine if the cost schedule and work performed are progressing as per plan. EVA shows a snapshot of the project in time. It is a management tool which shows early warning system of any variation in the project progress. In this project, the earned value analysis is done using the primavera software.

DESCRIPTION OF BASIC EVA ATTRIBUTES

The parameters involved in EVA (Earned Value Analysis) are calculated using Primavera software. Basic definitions are:

- Budget At Completion (BAC) - Total Cost of Project
- Planned value(PV) - The planned value is the cost of work that's been budgeted for an activity or for the project during a certain time period
- Actual Cost (AC) - It is the cost of work to date (or for a given time period), including direct and indirect costs.
- Schedule Variance (SV) - At a given point in time indicates whether the project is ahead or behind the schedule.
- Cost variance (CV) - At a given point in time indicates if the project is under budget or over budget value indicates ahead of under budget.
- Cost Performance index - It is a measure of the cost efficiency expressed as a ratio of earned value to actual cost.
- Schedule Performance index - It is a measure of schedule efficiency expressed as the ratio of earned value to planned value.
- Estimate to Complete (ETC) - The estimate to complete (ETC) is the expected cost needed to complete remaining work on the project.
- Variance at Completion (VAC) - Forecasts whether the project is to finish under or over budget
- Estimate at Completion (EAC) - It is the expected total cost of a project at the completion. It is typically the actual cost incurred to date plus a new estimate for the work that remains.
- S- Curve - It simple graph that plots costs, hours, units, other units over time. An easy to understand the cumulative budget, actual, and remaining values over project life cycle.

METHODOLOGY

Oracle Primavera enables its users to track and analyze the performance of the project. It is multiuser and multitasking software which is easy and gives immediate results. The following step by step procedure is adopted for planning, scheduling, updating and controlling project process.

- Detailed Scheduling of Project. and identify the critical path of the project.
- Establishing Baseline and Updating baseline with actual progress of works.
- A collection of cost and time data associated with the actual progress of work at regular intervals.
- By comparing the planned project with the update one, the basic key elements of EVA, variances, indices and forecast can be found out and S- curve is plotted.
- The report is generated.

RESULTS AND DISCUSSIONS

The case study involves a hotel which is being constructed in Bangalore, India. All the activities involved in interior works of the building are considered. The study focuses only on five floors mainly 5,6,7,8,9 and three zones A, C, D on each floor of the building which is under construction. The activities are listed, scheduled, resources and their costs are entered in primavera. The project is assigned baseline. All the data is obtained from the company involved in this project. Three progress reviews are carried out to evaluate the performance of the project. The review is done in a month of December, January, and February. After each review, the actual progress of work is entered in primavera for each and every activity. The change in actual cost if occurs is updated in software and the cost is recalculated. After each review, all the earned value parameters are calculated and S- curve is generated.

Project Baseline

Initially at the start of the project was slow, hence the costs were entered for only one zone of the first floor.

First Review

The first progress review was conducted on 20/12/2016. The actual progress was entered for all activities in zone A of the first floor. The execution of work initially was very slow due to which the project was behind schedule. The actual progress of work in terms of ‘% Work Complete’ is calculated by visual observation of construction progress.

Second Review

The second progress review was conducted on 25/01/2017. The progress was observed in all the three zones of all the floors of the building. The work was simultaneously executed in the mentioned levels. As the project was lagging behind schedule, the resources were increased by 33% in order to finish the project within the deadline

Hird Review

The third review was conducted on 20/02/17. The progress was observed in the zones A, C, D of floors 5,6,7,8,9. The work was simultaneously executed in the mentioned levels. As the cost was increased in the previous review, the cost of resources was decreased to 10% in order to finish the project within deadline and to control the increased cost. Due to this cost variance was reduced and also cost performance was increased.

Table 1: EVA Parameters for All Review

Sl. No.	EVA Parameters	First Review	Second Review	Third review	Remark
1	BL Project total Cost	Rs.1164400	Rs.19396000	Rs.19396000	
2	Budgeted total cost	Rs.1164400	Rs.25884500.02	Rs.20819700.02	
3	Planned Value Cost	Rs.604000	Rs.11438300.04	Rs.14136250.05	
4	% Schedule Complete	51.87	58.97%	72.88%	
5	Activity % Complete	14.89 %	38.36 %	66.16 %	
6	Earned Value	Rs.173400	Rs.7441471.02	Rs.12833922.04	
7	Actual Cost	Rs.173400	Rs.9733646	Rs.13799262.41	
8	Schedule Variance	Rs.-430480	Rs.-3996829.01	Rs.-1302328	Behind Schedule
9	Cost Variance	Rs.00	Rs.-2292175.08	Rs.- 965340.37	Over Budget
10	Schedule Performance Index	0.28	0.65	0.90	Behind Schedule
11	Cost Performance Index	1.00	0.76	0.93	Over Budget

12	Estimate at Completion Cost	Rs.1164400	Rs.25884500.02	Rs.20819700.01	
13	Estimate To Complete	Rs.991000	Rs.16150853.51	Rs.7020437.60	
14	Variation At Completion	Rs.00	Rs.-6488499.96	Rs.-1423699.95	Over Budget

S-Curve

The curves in different colours represents different earned value parameters such as , planned value is represented by light blue colour, actual value is represented by green colour, earned value is represented by orange colour, estimate to complete is represented by pink colour and budgeted cost is represented by yellow colour. The month in which review is conducted is represented by blue colour in a vertical line. The graph is plotted weeks vs cost. The cost on the left side is the total cost of the project and the cost on the right side is cumulative cost of the project.

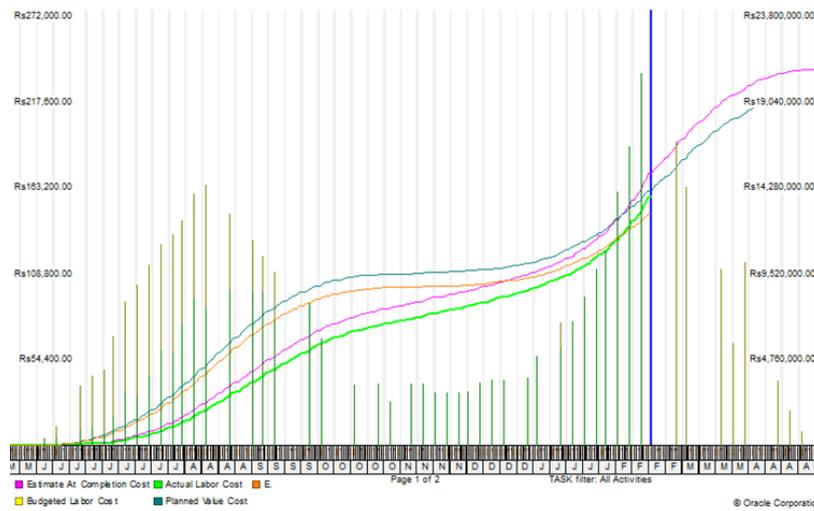


Figure 1: S- Curve for the Third Review

DISCUSSIONS

The values obtained from all three review and from S- curves, the following observations were made:-

- At the end of Feb 2017, an SV of. Rs. -1302328 shows the value of the job is lagging behind the planned date.
- SPI 0.930 showed that project is progressing at 93.0% of the rate originally scheduled.
- CPI 0.9078 means that for every one rupee spent on the project, we are getting a productivity of 90.78 paise only.
- In any project activity on the critical path should be maintained on time as it tends to affect start time of next successive activities causing delay.
- The variation at completion is Rs. -1423699.95, it means that with the current progress rate, the project will require an additional cost of Rs. 1423699.95.

CONCLUSIONS

The study of this project reveals that the schedule and cost data collected for the project can be evaluated through earned value analysis concept. The earned values calculated in this study helps for problem identification, trend analysis and Corrective actions such as re-planning and revising budget which can increase the progress rate of project work. With the evaluation of data, it can be suggested to revise the planning and budgeting of project according to the resources available at the project manager's disposal. The labor resources can be increased in order to complete the project on schedule. This will definitely increase the cost of the project. The increased cost can be calculated by EVA. Earned value analysis of a project gives the futuristic view and a reliable data to analyze and to take corrective or preventive action on the project. It helps to identify precisely the delay and cost overruns in the activities; otherwise manually it is a tedious process in a large project to identify and to take corrective actions. Interpretation is quite simple and gives combined results in terms of time and cost. EVA identifies any deviations in the project well before time which gives us time to find out the possible solution to the deviated activities. This helps to determine and maintain the overall health of the project. Project management team has a grueling task to evaluate the earned values and take proper decisions to complete the project with minimum cost and time overruns.

FUTURE SCOPE OF THESIS WORK

There is a wide scope for this project thesis as current study is carried out up to 10th month i.e. (up to OCT 17). Onto this further study, the upcoming days can yield more performance results depending on HVAC works and Interior Works of the project.

The further detailed study may also be carried on the same project after its completion, in order to check the degree of correctness of forecasts. The degree of correctness may be an indicator of project success or project management success. The project management team should be trained in software in order to handle the large and complex projects. They should be aware of EVA and its concepts, which will guide them in the successful completion of the project. EVA should also be performed on HVAC planning schedule so that the deviation in the project can be obtained and corrective measures can be taken.

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