

Earned Value Analysis of Construction Project at Rashtriya Sanskrit Sansthan, Bhopal

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Abstract: Project cost is the one of the governing factor in project success. Project management is used to increase productivity in terms of human resource and materials. Earned value management (EVM) is a project performance evaluation technique which has been adapted for application in project management. The technique helps in comparison of budgeted cost of work to actual cost. The present study deals with the scheduling and project monitoring process along with it also discuss main parameter's involves in the calculation of Earned Value Analysis in cost management of civil construction projects. Primavera P6 software is used for EVM calculations. It is concluded that use of primavera P6 software for earned value analysis calculation of projects.

Keywords: Project management, Primavera, Earned value management.

I. INTRODUCTION

Construction industry an important industry at both the global level and national level. It is second largest sector in India. It provides huge employment to the people and plays very significant role in country economy. Project delay is most common problems in the construction industry. Project overruns due to time and cost result in delays during project execution. In developing countries project overruns is a serious where implementation of project faces many uncertainties. It result in wastage of scare financial resources, delays in providing facilities, development and also make construction costlier^[4]. With globalization and technology driven economic growth all over the world, a scientific and systematic approach to project management becomes imperative to ensure that project objectives are attained within the constraints of time and resources [6,10].

EVM is the process of measuring performance of project work against a baseline plan. EVM application helps in providing performance standard for the evaluation of progress report of project and it also act as a control device to take care of time and cost schedule by responsibility defined in OBS. It provide better performance picture of project and gives better forecast of the final completion cost. Earned Value is an enhancement over traditional process of cost accounting [9].

Traditionally the budgeted cost is evaluated by computing the difference between planned cost and actual cost incurred in a project. The focus was on planned expenditure and actual costs. Earned Value reveals future opportunities and it also examines actual accomplishment. With the help of EVM, project managers get sufficient help to keep deep intuitive understanding into potential risk areas. So that with the help of clearer picture of the project cost performances, managers can create risk mitigation plans based on actual cost, schedule and technical progress of the work. It is like an alarm for the managers to identify and control problems by taking timely corrective actions before they become too great to overcome [1, 9].

It provides better understanding of the project in terms of time and cost schedule. Earned Value Management System is a set of guidelines to provide satisfactory completion of project. it has been seen that to cover cost overrun, project team undergoes cost reduction either by reducing the project scope and quality or by providing additional. Similarly in case of time overrun, they plan crashing of activities or fast tract programs. Therefore with the use of EVM system, project goals are achieved in better way [5, 9].

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- **Concept of EVM**

Earned Value analysis is a method of performance measurement. Earned Value is a program management technique that uses “work in progress” to indicate what will happen to work in the future. Earned value management is system for planning and controlling the project cost performances. EVM establish work packages earned value baseline by integrating project scope, time schedule and cost objectives ^[6, 8].

This baseline is called as cost control and is used for performance evaluation of project on a given date. Analysis of variance from the baseline provides the cost related information’s for problem identification, trend analysis and corrective actions such as re-planning and revising budget. Earned value analysis serves two main purposes ^[2, 6].

It analyses cost changes which is resulting in time and cost over-run or under-run so that timely corrective actions are taken such as modification of cash flow, updating financial forecast and project profitability expectations. Analysis of variance from the baseline using earned value management systems gives variety of variances which are analysed to provide current status of project, to initiate corrective actions and to forecast future trends. ^[6]

- **Case Study**

The case study is foundation work of boy’s hostel at Rashtriya Sanskrit Sansthan, Bhopal. The useful information’s has been taken from the actual project. A tender document, bill of quantities and abstract sheets provides necessary data for project cost and scheduling activities. Total area is 2348.55 m². The work should be completed within 3 months.

The main objective of study is to understand the role of earned value management for monitoring and control in progress and timely completion of construction project. Project goals are achieved through literature review and methodology involved in earned value management.

II. METHODOLOGY & ANALYSIS

The construction projects are so vast and complex in nature and therefore for simplification of work, use of software’s came into existence. The project was scheduled and monitored using Primavera P6 software. Primavera software is the Project management Software use for Planning, scheduling and controlling the Construction Project. The steps involved in foundation work of boy’s hostel building are as follows, mobilization of site, excavation, pcc, steel erection, shuttering, concreting, curing and filing.

The WBS for the project is created and several activities are identified. The durations of the activities are estimated on the basis of literature review, interviews with project manager and applications of analysis of rates. The relationships are examined and applied to the activities. The following steps involved in scheduling and monitoring projects.

Table 1 Step in Primavera

1	Create Project
2	Define WBS
3	Creating Calendars
4	Define Activities
5	Appoint Activity Durations
6	Assign Logic Links
7	Perform Scheduling
8	Allocating Resources / budgeting
9	Creating Baselines
10	Updating Schedule
11	Earned value analysis
12	Publishing Reports

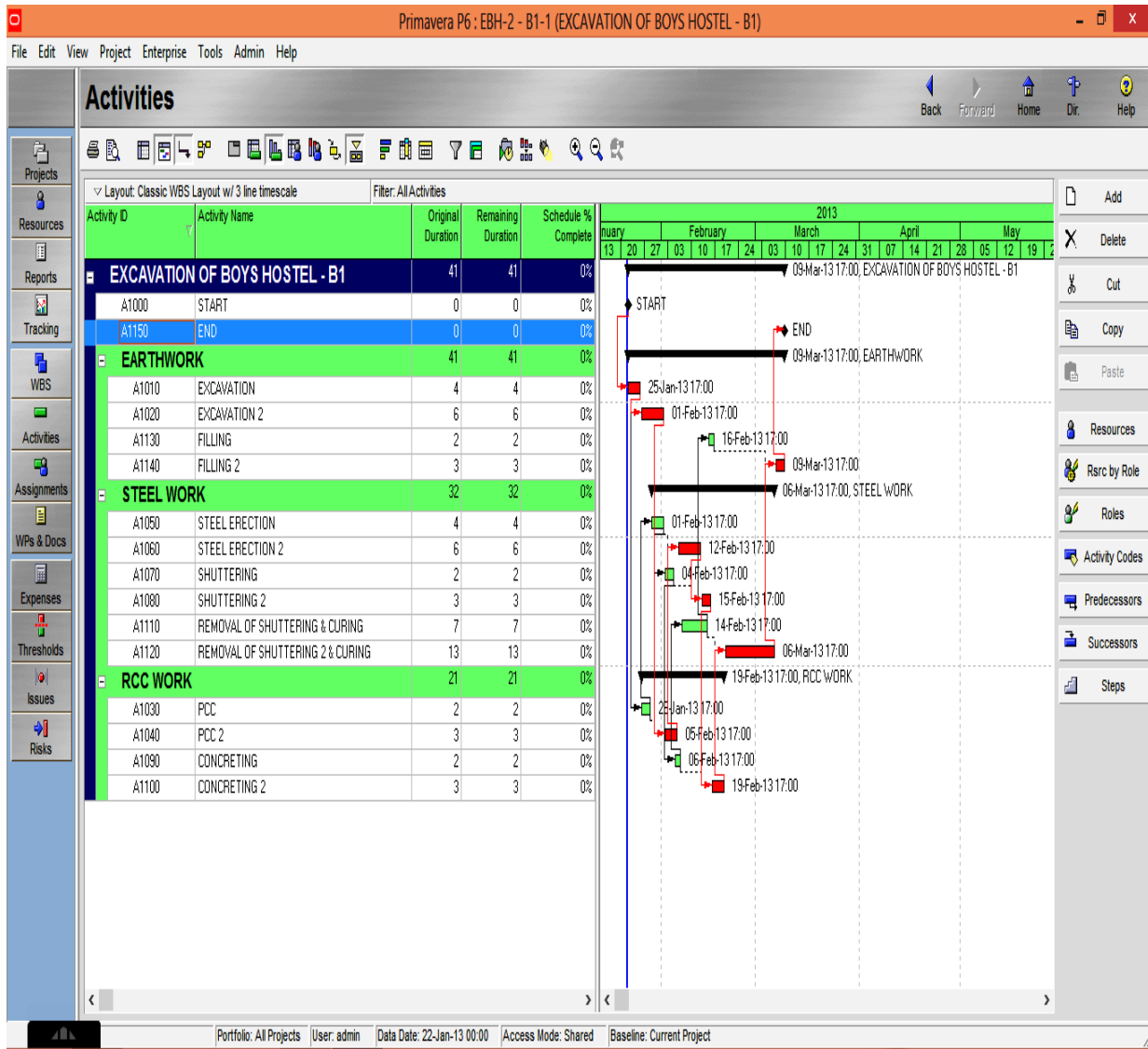


Fig. 1 Critical path of project

A. Schedule Analysis

Earned value is a technique for measuring project performance according to project cost and schedule. The comparison in between budgeted and actual performance is performed. As per K.K.Chitkara, there are three earned value parameters as shown below,

Planned Value (PV) It is the cost of the project according to the schedule of the project. it is also called as Budgeted cost of work scheduled (BCWS)

Earned Value (EV) It is the budgeted cost of the work performed till date. It is cumulative budgeted cost incurred in activities that have been completed on the due date.

Actual Cost (AC) It is the actual cost that have spent on the project till date. It is also called as actual cost of work performed (ACWP).

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The variances are used to check deflection or deviation of project from the path of original schedule. It is also used to analyse the extent and causes for the delays of works or tasks of the project. Following are the two variances,

Cost variance: It is used to check the difference between the proposed planned project and present project on specific date. It shows the variation of project in form of cost. The formula used for calculating cost variance is,

$$\text{COST VARIANCE} = \text{Earned value} - \text{Actual Cost}$$

Schedule Variance: It is used to examine the deflection of present project from the planned project.

If considerable change appears than the project objectives must be revised. The formula for calculating the schedule variance is,

$$\text{SCHEDULE VARIANCE} = \text{Earned Value} - \text{Planned Value}$$

The indices are used to forecast the present trends in different forms such as productivity, cost and time. There are two types of indices,

- Cost variance index = $(EV - AC) / EV$ OR $(BCWP - ACWP) / BCWP$
- Schedule variance index = $(EV - PV) / EV$ OR $(BCWP - BCWS) / BCWS$

Budgeted cost on completion of the contracted work at contract rate is called BAC. Figure 2 shows the critical path where red bars show critical activities and green bars shows non critical activities. Figure 3 shows EVM parameters for each activity. Figure 4 shows S curve.

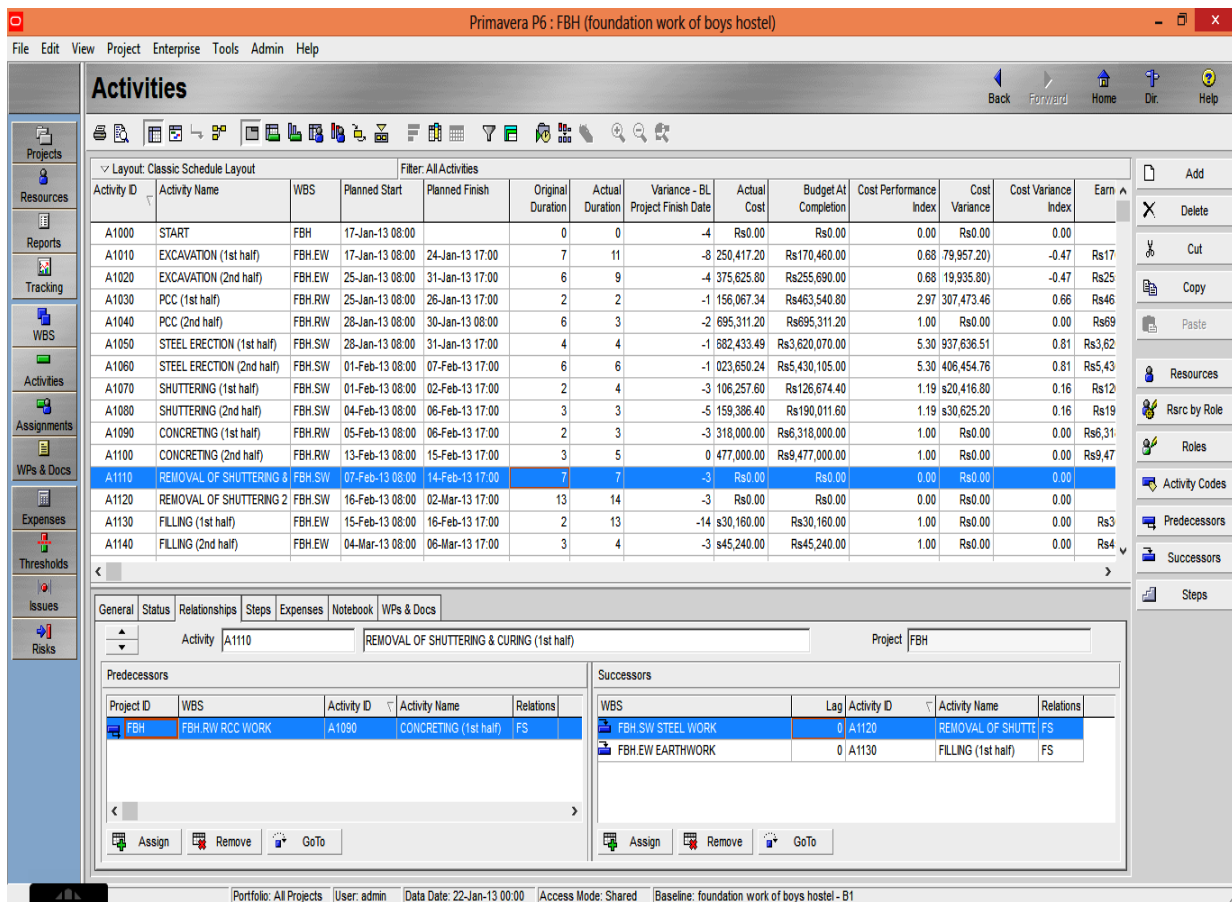


Fig. 2 Earned value analysis of project activities

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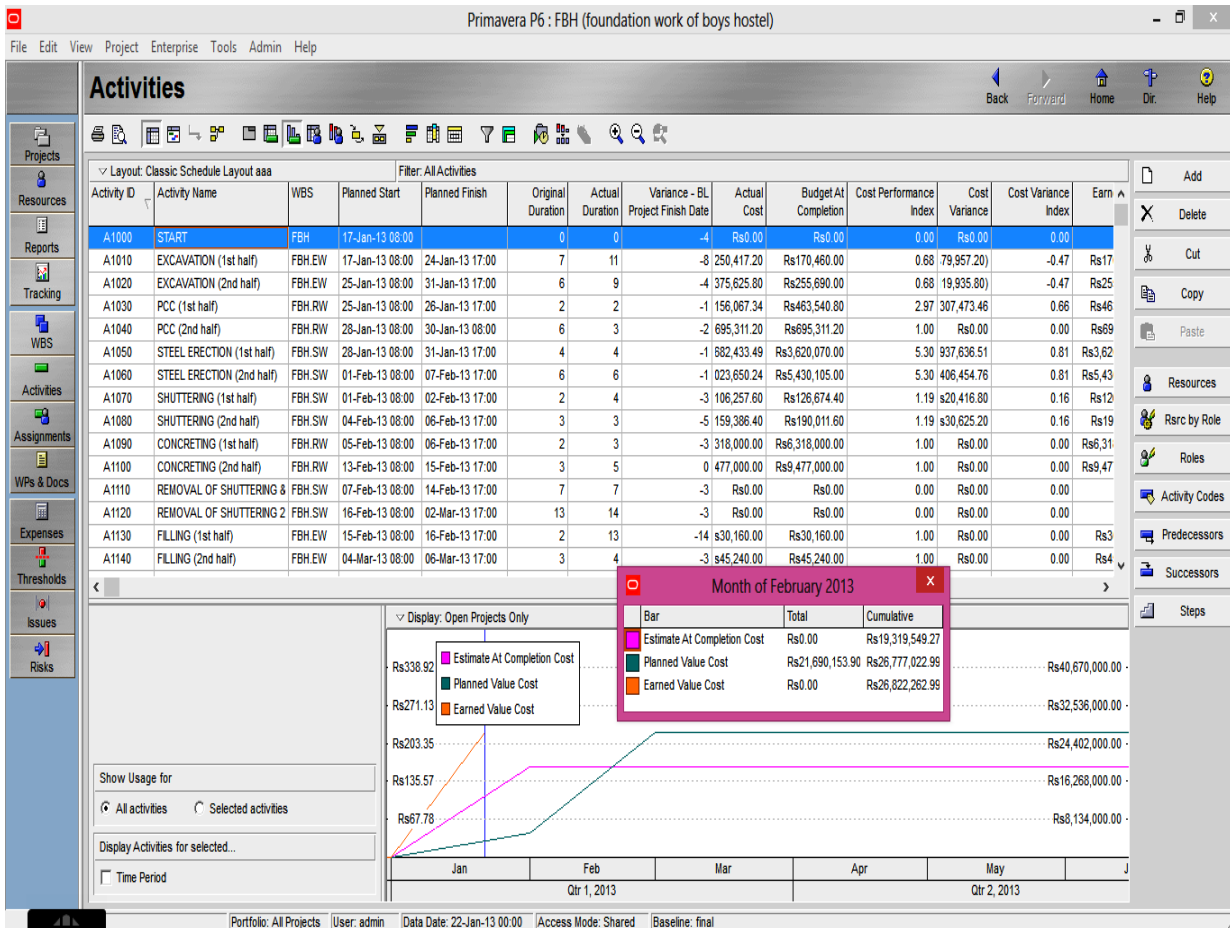


Fig. 3 The EVM parameters and S-curve

III. RESULT & DISCUSSION

Earned value analysis work has been carried out and earned value management parameters are calculated. Table 2 shows result obtained from Primavera.

Table 2 Result obtained from Primavera

Actual Cost	19,319,549.27
Earned Value	26,822,262.99
Planned Value	27,372,473.45
Project budget (BAC)	26822263
Total duration	22nd January 2013 – 9th March 2013
Variance at completion	7,502,713.72

The result is obtained from primavera P6 software. Primavera P6 proves to be an efficient tool in monitoring and controlling any project.

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IV. CONCLUSION & FUTURE SCOPE OF STUDY

Here Project management system is directly responsible on efficient planning, monitoring and controlling of construction project with use of project management software Primavera P6. This study shows importance, implementation and unique features of earned value management that benefits project manager and ultimately results in project success.

The companies which do not use PM software tools efficiently have to increase their investments in training and educating their employed project teams, as well as in establishing information technology systems that will support and help PM teams. The use of such software's helps to complete the project on schedule time and cost.

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