

## EARNED VALUE ANALYSIS AND COST CONTROL OF A PROJECT

Anup Bhave<sup>1</sup>, Deepa A. Joshi<sup>2</sup>

<sup>1</sup> PG student, civil engineering, Dr. DIT, Pimpri, Pune,

<sup>2</sup> Professor, civil engineering, Dr. DIT, Pimpri, Pune,

**Abstract—** *Earned value is used to evaluate the progress of a project. It measures the cost of work performed up to the project status date to examine the cost and schedule accomplished are progressing in accordance to the plan. The earned value calculation helps in evaluating economic status of the project. This paper summarizes effective use of earned value analysis with the help of MS Project and study status of the project. It was studied that the project had cost overrun and was behind schedule.*

**Keywords—** *earned value analysis, cost control, lean construction, project management, lean thinking*

### I. INTRODUCTION

A project can be simply defined as set of activities which has to be completed in certain duration, The objective of the project is to reach specific outcome for the unique idea which it is designed for. When earned value (EV) of a project is calculated, original cost estimates to the actual work performed is compared. EVA has three main parameters which are the planned (or budgeted) value of work scheduled (PV), the actual value of work completed (AC), the earned value of the work completed (EV).

EVA is an effective method of program/project management because it integrates cost, schedule and scope and can be used to forecast future performance. It allows projects to be managed better – on time, on budget [2]. EVA if to be implemented, the method should be used according to its purpose. It facilitates progress monitoring, determination of project status on time? to budget?, a rough estimate of their combined effect on the project’s outcome. [4].

Two parameters of EV i.e. cost performance index (CPI) and schedule performance index (SPI) clearly indicate the lacunas of project in terms of cost and schedule which can help to track the project and hence help in successful completion of project. This can be helpful in megaprojects [5].

Construction project can be tracked based on Lean Construction thought. Cost control system, activity based costing method, earned value analysis and cost variance (CV), schedule variance (SV) and improvement measures can be suggested with the help of lean construction. Lean construction helps to carry out cost control and effectively improve the production efficiency with minimum resource waste and lower costs [6]. Based on EV parameters the different measures are as follows-

TABLE I  
Earned Value Measures [6]

No.	Parametric relationship	Variance	Measure
1	$AC > PV > EV; SV < 0; CV < 0$	Low efficiency, slow progress and overrun cost	Replace the low-efficiency staff; add materials
2	$AC > EV > PV; SV > 0; CV > 0$	Low efficiency, fast progress and overrun cost	Reduce staff
3	$PV > EV > AC; SV < 0; CV > 0$	Low efficiency, slow progress and cost decrease	Add high-efficiency staff and accelerate the progress
4	$EV > PV > AC; SV > 0; CV > 0$	High efficiency, fast progress and cost increase	Can maintain the status quo
5	$EV > AC > PV; SV > 0; CV > 0$	Fast progress and cost increase	Reduce staff; slow the progress; reduce cost
6	$PV > EV > AC; SV < 0; CV > 0$	High efficiency, slow progress and overrun cost	Add staff and accelerate the progress

### II. METHODOLOGY

The objective of the study was to find out EV parameters and examine the status of the project. The project was fit out project which includes construction of a back end office of a telecom company at Margaon, Goa. It majorly included internal fit out activities. Analysis is made after collecting schedule and cost data. The EVA is done when the project was near completion. Based on the results, suitable conclusions and improvement measures are drawn regarding cost and schedule of the project at completion.

The progress of the project has been analysed after setting status date. Till now 63 % of the project has been completed. Status date has been selected in such a way that all internal fit out activities are completed or partially completed. Thus all these activities have earned a value according to what they have planned. These values are calculated by using MS Project software. Based on the schedule and cost analysis, conclusions have been drawn.

TABLE III  
EV Parameters

Task Name	% Completion	PV (BCWS)	EV (BCWP)	AC (ACWP)	CV	SV	SPI	CPI
Project	63	48,53,219.25	29,67,845.16	61,18,270.89	-31,50,425.73	-18,85,374	0.61	0.49

Table III shows a cost variance (CV) of Rs. (- 31,50,426) for the project. The cost performance index (CPI) is 0.49 which means for every 1 rupee that they have spent on project, they have earned only 0.49 rupee till status date. The CV is majorly due to delay in furniture delivery. This shows project has cost overrun. This is how cost analysis is interpreted. The table also shows schedule performance index (SPI) as 0.61 which means it is progressing at 61 % of what was originally planned. The schedule variance is Rs. (-18,85,374). This shows project is running behind schedule. This is how schedule analysis is interpreted. On further investigation, it was observed that the main delay was because of delay in delivery of furniture and HVAC units.

### III. RESULTS & DISCUSSION

The graphical representation of the EV parameters and indices is shown below in fig 1 and fig 2.

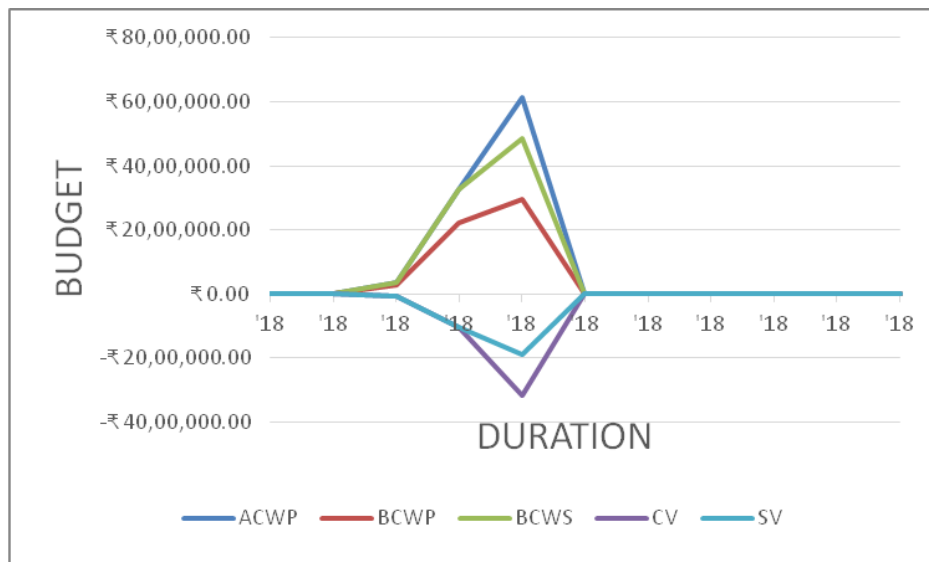


Fig 1 Earned value and variances over time

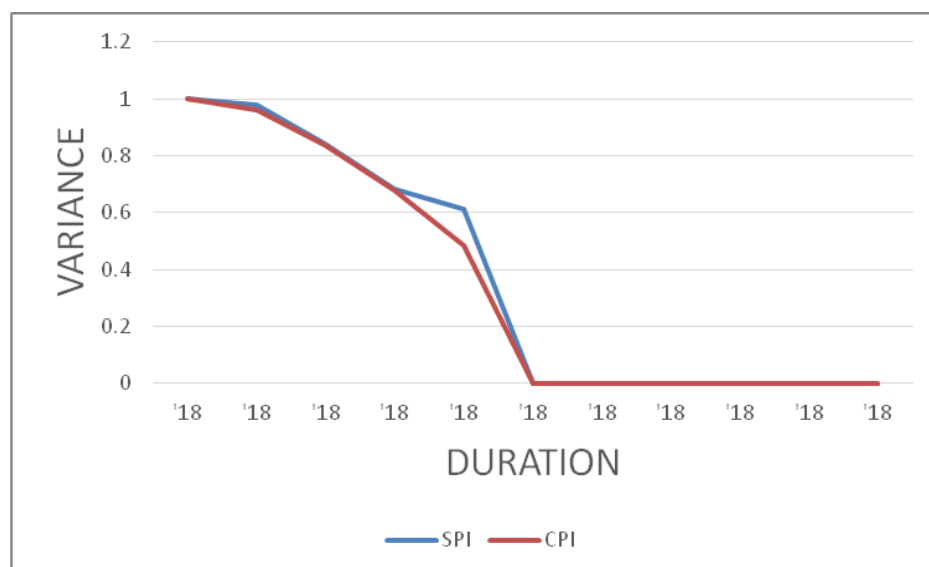


Fig 2 Earned value indices over time

Graphical representation of various EV parameters is shown in fig 1. AC is higher than EV, which shows project is over budget. PV is higher than EV, which shows project is behind schedule. CV and SV value as 1 suggest that you are earning and running project as what you have planned. CV and SV values are negative which means project is over budget and behind schedule respectively.

Graphical representation of various EV indices is shown in fig 2. If performance indices are above 1, then project performance can be considered good. As per fig 2, the SPI and CPI both are negative, It can be interpreted that project is over budget and running behind schedule.

#### **IV. CONCLUSION**

The case study shows that EVA can be effectively utilised to find out earned value parameters such as EV, PV, AC, CV, SV, SPI and CPI. These parameters show the status of project such as ahead or behind of schedule and within budget or over budget. Thus EVA gives early warning to get project back on track. It is also helpful in effective incorporation of scope change.

#### **REFERENCES**

- [1]. Project Management Institute (2008). "A guide to the project management body of knowledge", 4th Ed., Newtown Square, Pa.
- [2]. Suketu N. (2002). "An Introduction to Earned Value Analysis", PMI, Great Lakes Chapter.
- [3]. Agata Czarnigowska (2008). "Earned value method as a tool for project control", *Budownictwo I Architektura* 3 (2008) 15-32.
- [4]. Valle J. A.; Pereira Soares C. A. (2001) "The Use Of Earned Value Analysis (Eva) In The Cost Management Of Construction Projects", IBEC, Brazil.
- [5]. Dr. Dhawale Arun & Vaishnavi Tuljapurkar. (2015). "Cost control and tracking of a building by earned value method", *International Journal of Technical Research and Applications* e-ISSN: 2320-8163, Volume 3, Issue 2 (Mar-Apr 2015), PP. 15-22.
- [6]. Anning Liu, Xingzhen Ren (2015). "Study on Construction Project Cost Control Based on Lean Construction Thought", 2nd International Conference. on Education, Management and Information Technology (ICEMIT 2015).
- [7]. Sandhya Suresh, Ganapathy Ramasamy N (2015). "Analysis of Project Performance Using Earned Value Analysis" *International Journal of Science, Engineering and Technology Research (IJSETR)* Volume 4, Issue 4, April 2015.
- [8]. Anbari F. T. (2013). "Earned Value project management methods and extension", school of business and public Management, Washington DC, USA.
- [9]. Anup Bhawe, Dr Deepa A Joshi (2016). "A Review Paper on Earned Value Analysis", *International Journal of Engineering Research and Development*, Volume 12, Issue 8 (August 2016), PP.01-03.
- [10]. Bhosekar Sagar K. and Gayatri Vyas (2012). "Cost Controlling Using Earned Value Analysis in Construction Industries" *International Journal of Engineering and Innovative Technology (IJEIT)* Volume 1, Issue 4, April 2012.
- [11]. Byung-Cheol K; and Kenneth F. R. (2011). "Combination of Project Cost Forecasts in Earned Value Management", 10.1061/(ASCE)CO.1943-7862.0000352. © 2011 American Society of Civil Engineers.
- [12]. George M. A. (2007). " Earned Value Management ", *Designing A Template For A Project Management System*, 3p Company, Malardalens International Master Academy - International Project Management System, Department of Computer Science and Electronics.
- [13]. Lipke, W. H. (2006). "Earned schedule leads to improved forecasting." *Proc., 3rd Int. Conf. on Project Management (ProMAC 2006)*, Sydney, Australia.
- [14]. Lukas Joseph A. (2008) "Earned Value Analysis – Why it Doesn't Work", *AACE international transactions*, EVM.01.
- [15]. Mahadik Sunil G. & Bhangale Pankaj P. (2013). "Study & Analysis of Construction Project Management with Earn Value Management System", *International Journal of Innovative Technology and Exploring Engineering (IJITEE)* ISSN: 2278-3075, Volume-3, Issue-4, September 2013.
- [16]. Putz P; David A. M.; et el (2002) "Earned Value Management at NASA: An Integrated, Lightweight Solution", NASA, USA.