EVA- A performance appraisal Project Management Tool

Duhita U. Paithankar	*Gaurav G. Jadhav*	*Sangram S. Patil*
duhii28@gmail.com	*gauravj1080@gmail.com*	*sangram.kaka09@gmail.com*
D. Y. Patil College of Engineering and Technology, Kolhapur, Maharashtra	*D. Y. Patil College of Engineering and Technology, Kolhapur, Maharashtra*	*D. Y. Patil College of Engineering and Technology, Kolhapur, Maharashtra*
Amruta A. Lakade	*Abhay. M. Joshi*	*A. K. Gupta*
amrutaspatil7@gmail.com	*abhaydyp@gmail.com*	*gupta7962@gmail.com*
D. Y. Patil College of Engineering and Technology, Kolhapur, Maharashtra	*D. Y. Patil College of Engineering and Technology, Kolhapur, Maharashtra*	*D. Y. Patil College of Engineering and Technology, Kolhapur, Maharashtra*

ABSTRACT

Efficient Management of projects in construction industries is becoming a challenge with the passing time. Many project managers manage their project performance by comparing planned to actual results. Earned Value Analysis is not only a planning tool but controlling tool which is used during the execution phase of project to check if the project is ahead or behind the schedule and if it is over budget or under budget. Earned Value Analysis can track project at any stage and helps the remaining project. So, it gives an idea about the approximation of the project to the project managers or the respective firm.

Keywords— Earned Value Analysis, Controlling tool

1. INTRODUCTION

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 (EVM) has proven itself to be one of the most effective performance measurement and feedback tools for managing projects. EVM has been called ''management with the lights on'' because it can help clearly and objectively illuminate where a project is and where it is going as compared to where it was supposed to be and where it was supposed to be going. Most of the infrastructure development projects are developed with a backdrop of urgent need, with a high pressure to deliver and along with preciseness in work. Earned Value Management System includes various parameters like Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), and Schedule Performance Index (SPI) which helps to monitor the project with respect to planning, scheduling and costing.

1.1 Concepts of EVA

1.1.1 Planned Value (PV): This is the first element of earned value management. Planned Value is the approved value of the work to be completed in a given time. It is the value that you should have earned as per the schedule. According to the PMBOK Guide, "Planned Value (PV) is the authorized budget assigned to work to be accomplished for an activity or WBS component. "You calculate Planned Value before actually doing the work, which also serves as a baseline. Total Planned Value for the project is known as Budget at Completion (BAC). Planned Value is also called Budgeted Cost of Work Scheduled (BCWS).

1.1.2 Actual Cost (AC): This is the second element of earned value management. Actual Cost is the total cost incurred for the actual work completed to date. In other words, it is the amount of money you have spent to date. According to the PMBOK Guide, "Actual Cost (AC) is the total cost actually incurred in accomplishing work performed for an activity or WBS component. "Actual Cost is also known as the Actual Cost of Work Performed (ACWP).

1.1.3 Earned Value (EV): This is the third and last element of earned value management. Earned Value is the value of the work actually completed to date. Earned Value will show you the value that the project has produced if the project is terminated today. According to the PMBOK Guide, "Earned Value (EV) is the value of work performed expressed in terms of the approved budget assigned to that work for an activity or WBS component. "Although all three elements have their significance, Earned Value is more useful because it shows you how much value you have earned from the money you have spent to date. Earned Value is also known as Budgeted Cost of Work Performed (BCWP). There is a difference between Planned Value and Earned Value. Planned Value shows you how much value you expected to earn in a given time, while Earned Value shows how much value you have actually earned on the project.

1.1.4 Schedule variance (SV): The difference between the amounts budgeted for the work you actually did and for the work you planned to do. The SV shows whether and by how much your work is ahead of or behind your approved schedule.

$$\text{Schedule variance (SV)} = \text{Earned value (EV)} - \text{Planned value (PV)}$$

- If SV is negative then the project is behind the schedule.
- If SV is positive then the project is ahead of schedule.

1.1.5 Cost variance (CV): The difference between the amount budgeted and the amount actually spent for the work performed. The CV shows whether and by how much you're under or over your approved budget.

$$\text{Cost variance (CV)} = \text{Earned value (EV)} - \text{Actual cost (AC)}$$

- If CV is negative then the project is over budget.
- If CV is positive then the project is underbudget.

1.1.6 Schedule Performance Index (SPI): The ratio of the approved budget for the work performed to the approved budget for the work planned. The SPI reflects the relative amount the project is ahead of or behind schedule, sometimes referred to as the project's schedule efficiency. You can use the SPI to date to project the schedule performance for the remainder of the task.

$$\text{Schedule performance index (SPI)} = \text{Earned value (EV)} / \text{Planned value (PV)}$$

- If SPI =1 then the project is on time.
- If SPI is less than 1 then the project is behind schedule.
- If SPI is more than 1 then the project is ahead of schedule.

1.1.7 Cost Performance Index (CPI): The ratio of the approved budget for work performed to what you actually spent for the work. The CPI reflects the relative value of work done compared to the amount paid for it, sometimes referred to as the project's cost efficiency. You can use the CPI to date to project the cost performance for the remainder of the task.

$$\text{Cost performance index (CPI)} = \text{Earned value (EV)} / \text{Actual cost (AC)}$$

- If CPI =1 then the project planned value and actual cost are same.
- If CPI is less than 1 then the project is underbudget.
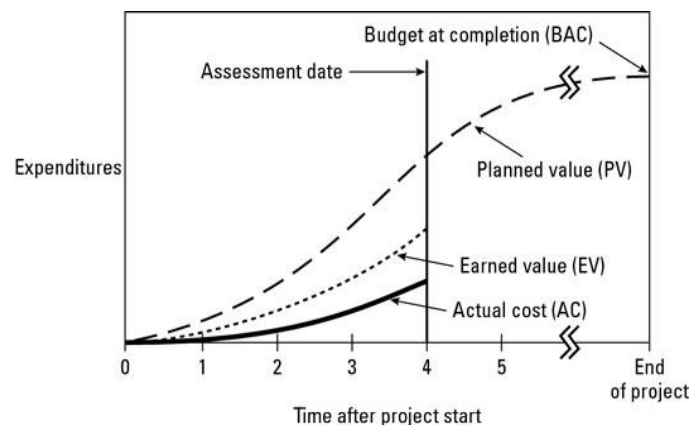- If CPI is more than 1 then the project is overbudgeted.

Fig. 1: Cost Performance Index

2. LITERATURE REVIEW

The Earned Value Method (EVM) is recommended as the global standard for project performance measurement. The method really integrates scope, cost and schedule measures, and could give good picture of current project status at date of control. Application of EVM in the construction site management practice do require systematic register of time and cost data (usually once a week) in order to get the following values: ACWP which is Actual cost of Work Performed and BCWP – Budgeted Cost of Work Performance. The third required value, namely BCWS- Budgeted Cost of Work Scheduled can be defined before start of work, based on time schedule of all works and the respective cost plan. (Andrzej Czemplik)

Earned Value Management (EVM) has proven itself to be one of the most effective performance measurement and feedback tools for managing projects. It enables managers to close the loop in the plan-do- check-act management cycle. EVM has been called ''management with the lights on'' because it can help clearly and objectively illuminate where a project is and where it is going as compared to where it was supposed to be and where it was supposed to be going. Practicing Earned Value Management (EVM) can help project stay on time and on budget. It often produces valuable insight to organizations. Biggest benefit to implementing EVM

is that it is a single system that can track the project in terms of work, time and money. Project managers do not have to learn multiple systems. EVM can measure the amount of work actually completed forecast the cost and completion date; compare the actual performance of the project versus the plan; and track the project's budget in real time. (Shyama Salikuma)

Earned Value Management is a powerful methodology that helps executive, project manager, program manager and other stakeholders of the project to manage the project more effectively. Earned schedule is an important extension to EVM that allows EVM metrics to be transformed to time or duration metrics to enhance the evaluation of project schedule performance, forecast the duration needed to complete the project. It helps the project managers to understand the time estimates for the completion of the project, and provides further insights for making better decisions about the project schedule and other critical parameters. The project manager can understand, very well, from the first day, the probability of success is not 90%. It's more likely to be 60%, at best. Therefore, a small amount of inefficiency caused by risk impacts will nearly consume the project's reserves. (Rajesh Ganpat Virle and Sumedh Y Mhaske)

EVA is a project management technique that uses "work in progress "to indicate what is the status of the project and also helps to predict the future. EVA is enhancement over traditional accounting. It is "early warning "project management tool that enables managers to identify and control problems before they become unsolvable. We all have heard the problem or the delays with completing the projects due to various reasons like deviation from initial plan, scarcity of resources, poor planning, poor execution, natural calamities, etc. which results in over budget and for government contractor there is more publicity when something goes wrong. (Arihant. A. Adake)

3. OBJECTIVES
- To study Earned Value Analysis indicators.
- Applying EVA concept for selected construction project activities.
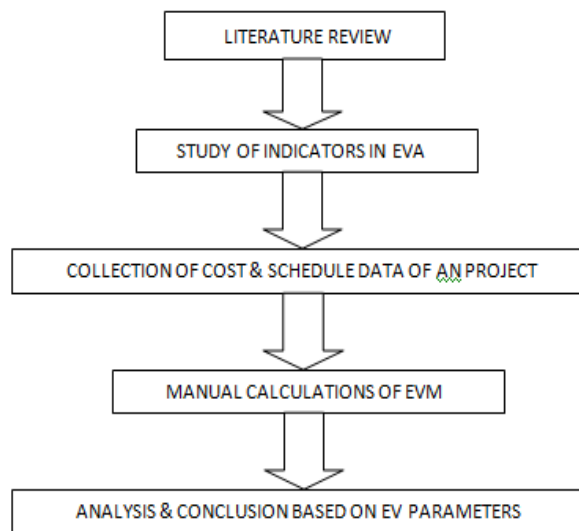- Identifying benefits and suggestions for its application.

4. METHODOLOGY

Fig. 2: Flow chart

Table 1: Details about activities and their duration

S no.	Activity ID	Activity	Duration (days)	Cost
1	A	Cleaning	2	5000/-
2	B	Excavation	8	6480/-
3	C	Ground Beam	4	120000/-
4	D	PCC for footing	1	14560/-

(a) In first approach is various research papers and are studied along with the reference books to understand the concept of Earned Value Analysis and its related terms such as Project Planning, Project Cost and Schedule.
(b) In second approach various Earned Value Analysis indicators and formulae were studied.
(c) In third approach an ongoing project is selected and collection of cost and schedule data of that project is collected so that we can implement Earned Value Analysis on that project.
(d) In fourth approach manual calculations of various parameters of Earned Value Analysis are calculated using collected data.
(e) In final approach a conclusion is been drawn from the calculated values based on Earned Value parameters.

5. APPLICATION
Ground Floor consist of 11 activities. Till date 4 activities are completed namely A, B, C, D. Based on planned and actual EVA is implemented.

Table 2: Percentage completion of 4 activities from 11 activities

Activity	% Complete	Actual cost
A	100	2300/-
B	100	31,825/-
C	100	1,89,650/-
D	100	28,231/-

Table 3: EVA indicators

Act	PV	AC	EV	CV	CPI	SV	SPI
A	5000	2300	5000	2700	2.17	0	1
B	6480	31825	6480	-25345	0.2	0	1
C	120000	189650	120000	-69650	0.63	0	1
D	14560	28231	14560	-13671	0.5	0	1

Table 3 indicates activity wise updating at 4th activity. If we consider activity A the value of SV is positive and SPI is 1 which indicates that the project is ahead of schedule. CV is positive and CPI is greater than 1 the activity is underbudget.

Table 4: Data after updating project at 4th activity

	PV	AC	EV	CV	CPI	SV	SPI
Project	146040	252006	146040	-105966	0.57	0	1

Table 4 indicates the value of SV is positive and value of SPI is equal to 1 which indicates that the project is ahead of schedule. The value of CV is negative and the value of CPI is less than 1 which indicates that the project is overbudgeted.
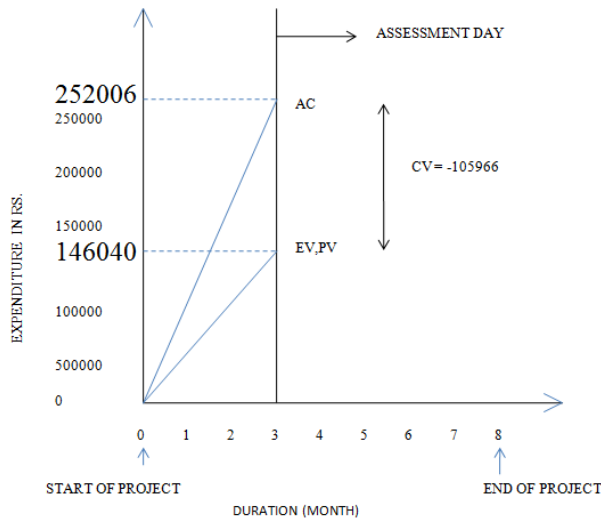

Fig. 3: EVA indicators

6. CONCLUSION
This paper gives info about EVA concept and its benefits after implementing to an ongoing project benefits after implementing to a ongoing project. Various parameters were calculated related to performance of project after completion of 4th activity as shown in table no (4). EVA is powerful project management tool which helps to check the current scenario of a project at any stage as and required from the most important perspective i.e. cost. This is the factor which helps to avoid overbudget project and take preventive measures at early stage. This work focuses on implementation of EVA to residential building. Hence the future scope can be implementation of EVA through MSP for managing complex activities for big project.

7. REFERENCES
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