

Tracking of Construction Project By EVM Using Microsoft Project Software

Lavanya C S, Rajeeva S J, G Narayana

Abstract: Earned value management is a method that predicts the project giving early warning of project cost and schedule. This study is to check effectiveness of EVM in construction industries for tracking the project progress using MSP software. Tracking will enhance the opportunities for project success. Tracking helps to monitor the true progress of the activities from starting of project and manage them using earned value concepts will result in cost saving and time completion

Index Terms: Earned value management, tracking.

I. INTRODUCTION

Construction plays a major role in economic growth through various effects on the other part of economy but, due to the silent nature of construction business, information gained planning, scheduling and tracking of construction project is rarely distributed. Construction performance are not only restricted to the physical activity of allocating men, material and equipments, it involves more than this, an successful management of man power, equipment as well as materials by correct planning using project management tools. The project management is a skill and task of preparing, organizing and directing individual efforts to manage the forces and use the material of nature for the requirement of individual growth.

To know the progress of the construction projects tracking is necessary. Tracking helps to know where the project stands and the future move.

Earned value analysis is most common method using for tracking the project progress. Schedule and cost measurements of a project together can be done through earned value analysis. Comparison of planned and actual duration of the project.

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Lavanya C S, PG Scholar, Infrastructure Engineering and Management, SJCIT, Chickballapur

Rajeeva S J, Assistant Professor, Department of civil Engineering, SJCIT

Dr G Narayana, Professor and Head of the Department of Civil Engineering, SJCIT, Chickballapur.

II. OBJECTIVE OF THE STUDY

- To complete the project on time, project planning is done.
- To define the various activities and arrange in sequential order to develop effective schedule.
- To estimate the time duration required to finish the each activity.
- To identify the resources required and allocate the resources.
- Project baseline is created to know the work progress.
- Comparing planned and actual duration.
- To track the project by EVM method and examine the project finishing is based on estimated time and cost.

III. ABOUT MICROSOFT PROJECT

Microsoft project software is project management software which is widely used in construction industry for efficient planning of construction activities. This software helps to develop plan, schedule the duration, assign the resources to the activities, keep track on progress, and manage the budget and to analyze the work loads. By adding activities, duration and resources with rates budget is developed. In this software basic settings must be done first. After this change the working calendar. After this define the activities and duration. Later allocate the resources. This software is capable of leveling the resources if the resources are over allocated. Later tracking will be done by setting the base line.

Benefits of Microsoft project

- It helps to plan, schedule, and track the projects.
- Over allocated resources can be levelled.
- Reports and graphics can be generated.
- Cost controlling and monitoring can be done.
- Project managers can easily analyse the risks and impacts in the projects.
- Comparison can be done between project plan and project performance

IV. PROJECT MANAGEMENT

A project is a temporary venture with a set of tasks planned from beginning to end of the project. These are interconnected and to be implemented within a preset time and restricted budget and resources. Construction projects have various constraints such as duration, cost, resources and many more.

Management is defined as the process of completing tasks professionally and successfully with and through others. Project management is the function of information, skills, equipments and techniques to project activities in order to meet or exceed stakeholder's needs and expectations from a project. This project management is divided into 5 phases:-

- Project initiation
- Project definition
- Project launch
- Project performance
- Project closure

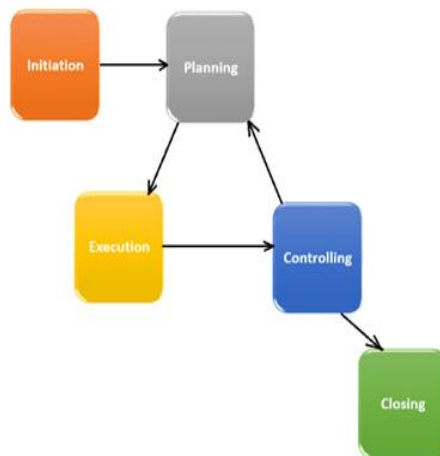


Fig 1: Phases of project management

V. TRACKING

Tracking is most vital aspect in construction project. Project is comparing the project plan with actual progress of the project. The project tracking method provides a highly harmonized, automatic system of accounts. Project tracking handles to time and activities powerfully and to keep track of budget. Tracking is a method of tracing different construction activities to certify whether the work is finished in time. Delay in completion of activities can be analyzed by tracking. Scheduling and planning deviations can be known. Tracking helps to know the present position of the work with respect to development and turnover. To get the schedule in line necessary preventive measures are taken. A project tracking Process assists to identify all the activities that are necessary to complete project efficiently in correct duration.

a. Earned value method

Earned value management is a technique for measuring project presentation and growth in an objective manner.

Earned value management is an organized approach to the integration and quantity of rate, schedule and scope achievement of project. For cost management EVM was developed and now it is used for tracking and forecasting of project duration. To forecast the total duration tracking is done. EVM is a process used to find the variances based on planned work and performed work. In earned value management project baseline is the essential component and it is also called the reference point.

b. Benefits of EVM

- Planning process can be improved.
- To know the efficient functioning of project.
- To differentiate the problems of cost and schedule.
- To check whether the project is ahead or behind the schedule.
- EVM gives clear description of work scale.
- To improve project visibility and responsibility.

c. Basic elements of earned value

- **Planned value (PV):-** Planned value is the authorized budgeted cost which is planned before commencing the project. Overall planned value of the project is identified as budget at completion (BAC).

Planned value can be designed by the subsequent formula,

$$\text{Planned value (PV)} = (\text{BCA}) \times \% \text{ Completed planned activities}$$

- **Earned value (EV):-** Earned value is the value of work finished in terms of approved budget for that work. It is the amount of work done to date. Earned value is also turnover per day. Earned value is a total cost of project completed / performed work. Earned value can be calculated by following formula,

$$\text{Earned value (EV)} = (\text{BCA}) \times \% \text{ Completed work}$$

- **Actual cost (AC):-** Actual cost is the overall cost actually incurred for work performed to date. Actual cost is called as actual cost of work performed. The actual cost is the total cost that is taken to complete the work in specified date. The formula for Actual cost,

$$\text{Actual cost (AC)} = \text{overall cost spent to date}$$

d. Earned value performance indicators

Project performances in the conditions of cost and duration, and it is resolute by differentiating the planned value, earned value and actual cost, product will be the subsequent performances.

- **Schedule variance (SV):-**

Schedule variance is the difference between the planned work and the actually executed work or it is the comparison between earned value and planned value. By schedule variance we can clearly know whether the project is on the schedule or behind the schedule.

The schedule variance is computed by following formula,

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

Schedule variance is positive then the project is ahead of planned schedule and if it is negative then the project is behind the planned schedule.

• **Cost variance (CV):-** Schedule variance is comparing the money that is spent to the finished work to the amount of budget that was actually planned to do it. It is the distinguished between the earned value and actual cost.

Mathematically cost variance is represented as,

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

If the cost variance shows the project is +ve then it under run from the planned cost and if the project shows -ve cost variance then it is overrun from the planned cost and loss may occur.

• **Schedule performance index (SPI):-**

Schedule performance index is the ratio between the costs of work performed to the cost approved for the work that was planned before or it is the ration the earned value and planned value.

Schedule performance index can be represented as,

$$\text{SPI} = \text{Earned value} / \text{Planned value}$$

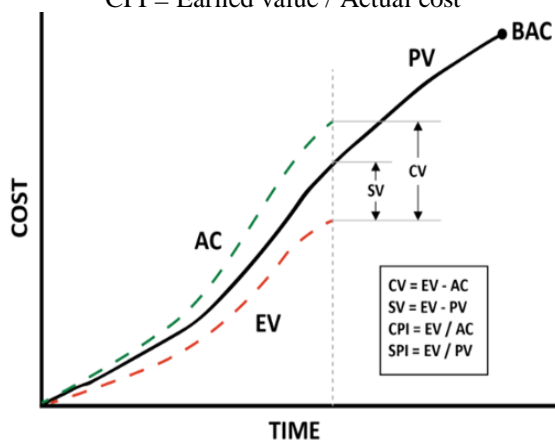
If the ratio of schedule performance index is greater than one then the project is ahead than the planned schedule, if the SPI is less than one than the project is behind than the planned schedule and if SPI is equal to one than the project is on schedule.

• **Cost performance index (CPI):-**

It is the ratio of cost approved for the performed work to the actually spent cost. It is also distinguished as the ratio between earned values by actual cost.

Cost performance index can be represented by consecutive formula,

$$\text{CPI} = \text{Earned value} / \text{Actual cost}$$



Graph.1 Earned value graph

VI. METHODOLOGY

a. Data collection

Initially basic data is collected,

- Drawings: plan and sectional elevation drawings.
- Bill of quantities (BOQ): A detailed documents prepared by quantity surveyor which provides specific quantities of materials to the work along with cost and discription as per tender certification.

b. Opening the MS project and create new project

- Open MS project
- Click on new project and open it

c. Organising of work break down structure

Work break down structure is hierarchial representation of tasks and sub tasks to the project. It is dividing the project works into easily manageable elements. WBS is the sequencing the structure and sub dividing the project working components. It is simply known as breakdown of a complex project into smaller components. WBS provides essential structure for detailed cost estimation and guidance for schedule expansion and control. WBS is done after the planning of the project.

d. Assigning of activities in the project

Activities are planned in a systematic way. They should be executed and completed within the planned duration. It involves adding the activities in the task column. To create the activities for the project click on activity option in guidance button afterwards click on the option add the activities in command bar button and enter the different activities. Then by indent and outdent option activities are grouped.

b. Defining activity duration

Activity duration will represent the time that is required to complete the activity. After adding the activity assign the required time for each activity in the activity duration column.

c. Adding relationship to the activities

It is the foundation of the complete project and project objects should be correctly defined. It is done to identify the relationships among the activities.

d. Resource allocation

The main factor for successful project depends on availability of resources each activity in project execution needs resources and should complete in limited duration. Time and cost are dependent on resources. To create resource select resource option then select the type of resource labour, equipment and materials.

e. Baseline creation

It is the standard based on the performance of the project. To create baseline select project option in activity tool bar and then select baseline. After setting baseline assign baseline to the project.

f. Tracking of project

After setting the baseline we can get the complete duration of the project with the help of critical path. The progress of the project can be ensured by tracking. The two important analyses that are performed during tracking are:

➤ Variance analysis

Any variance between an actual and planned data is called variance analysis

Example:

1. Actual start date Vs Planned start date.
2. Actual duration Vs Planned duration.
3. Actual cost Vs Planned cost etc.

➤ Earned value analysis

An advanced method to check the entire project performance in terms of cost and schedule and forecasting MS office project following steps are.



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Setting before project tracking

- Scheduling of project should be complete with all consent related to cost estimated and resource.

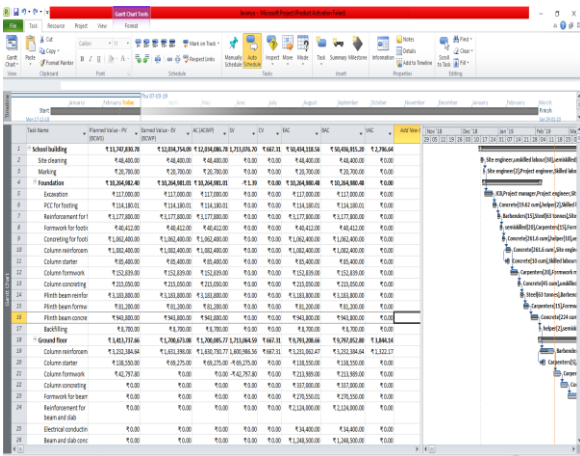


Fig.2 project tracked on 17th February 2019

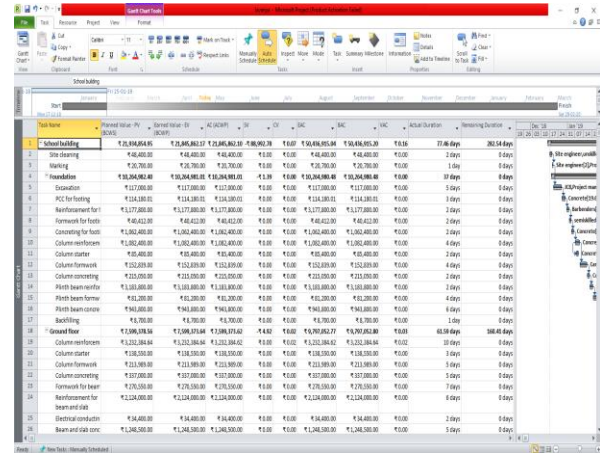


Fig.3 Project tracked on 15th April 2019

Table.1 Tabulation of tracked project to forecast the problems in order to face the remaining project

EVM Parameters	Tracked on 17-Feb-19	Tracked on 15-Apr-19
Actual duration	48 days	77 days
Remaining duration	312 days	282 days
Planned value	13,747,830.78	21,934,854.95
Earned value	12,034,754.09	21,845,862.17
Actual cost	12,034,754.09	21,845,862.1
Schedule variance	1,713,076.7	-88,992.78
Cost variance	667.31	0.07
CPI	1	1
SPI	0.875	0.99

- variance analysis during tracking command – tracking – set baseline.
- Select the set baseline option and select entire project and click ok.
- Go to tracking Gantt select view using the view bar.
- In the tracking Gantt if we notice the bar chart area, the bar in black colour and it is at the bottom indicates the frozen planned data.
- For better understanding, actual start and finish of the work is indicated by providing vertical lines. After selecting an identical colour for the project status, project data and critical path of the project is updated.
- By tracking with the help of variance we can know the project is within the schedule or behind the schedule and over cost or within cost, this variance can be entered in Microsoft project.

VII. CONCLUSION

Tracking of construction project using EVM is useful in recognizing the risk factors of the construction project and

- work. It also helps the project team in decision making.
- As per study Project progress is 13% of total work had been completed in the time period of 21.389% of the total project duration.
- SPI is 0.99 say the project is 99% rate had been done as originally planned.
- CPI is 1 indicates the progressing is good.
- Project is within the budget.

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AUTHORS PROFILE



Lavanya C S, pursuing in M.Tech Infrastructure Engineering and Management, SJCIT, Chickballapur.



Rajeeva S J, Assistant Professor, Department of civil Engineering, SJCIT, Chikballapur. He has wide range of knowledge in highway technology.



Dr G Narayana, Professor and Head of the Department of Civil Engineering, SJCIT, Chickballapur. He has wide range of knowledge and experience in teaching as well as researches in Structural Engineering.