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Evaluation of Actual cost and planned cost using Earned value analysis.

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Abstract
Nowadays it is very challenging to complete the project on schedule time in budgeted cost therefore to achieve the maximum utility of resources we need use some of techniques to avoid cost overrun and delays, Earned value analysis is one of them technique. To ensure that project is ongoing on schedule timeline we need to make project report of every week to analyze delay at its initial stages. They are created at the initial planning stage to monitor and control cost and time deviations. Moreover, popular monitoring techniques are, for example, observation of milestones and comparative analysis of actual versus planned costs. Earned Value Management (EVM) is a technique of performance measurement focused on project physical, financial and time progress, indicating planned and actual performance, variations of them and forecasts on final project duration and cost. It takes a step further traditional measurement tools like PERT/Cost.
Keywords: *Earned value method, cost performance index, schedule performance index*

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I. INTRODUCTION

As being project in-charge it's our responsibility to complete the project within budgeted cost and planned time. To avoid cost overrun and delays it is mandatory to do the rightful thing. So as to achieve the efficiency we need some of techniques to avoid unnecessary expenditure. Earned value analysis is of the best technique to fulfil our requirement one of the most important purpose of project management is the monitoring and control of the project process. EVA evaluates the project progress by integrating both cost and time aspects thereby measuring the overall progress. Earned Value Management has widely been used and considered as the best approach to Measure Progress of a Project. The reliability of EVM in measuring project's current cost progress and forecasting its final cost at completion. r. Project control is the activities carried out within the scope of monitoring and updating the project. Within the scope of the control, the differences between the project plan and the actual situation are examined and the current plan is updated according to the actual situation. Thus, the project progress is tried to be controlled. If there is a delay in the project after the update, the project manager may try to prevent the delay by allocating additional resources to future activities. Deviations in the success of the project can be minimized by making healthy decisions as a result of controlling and updating the project. In addition to time changes in the project, substantial measures related to cost and quality should be monitored.

II. LITURATURE SURVEY/BACKGROUND

Construction industry is one of the most booming industry in the whole world. The construction projects creates lots of investment opportunities across various related sectors hence it is an important development indicator of developing countries like India. Construction industry in India plays a vital role in its economic growth, due to which it is necessary to track the construction project's progress. Earned value can provide any project manager with an 'early warning tool' that sends out a signal during 'work in progress'. This signal allows the project manager to forecast the final required funds needed to finish the job within a narrow range of values. If the final forecasted results are unacceptable to management, steps can be taken early to alter the final requirements. Planning, controlling, monitoring progress are key management functions for effective implementation of construction projects. Commonly used instruments enabling performance of these functions include schedules and budgets, often in the form of a cost estimate. They are created at the initial planning stage to monitor and control cost and time deviations. Accordingly, it serves as an adequate method for examining the conditions and results of using EVM in construction projects. Since construction projects are also large scale projects and shows similar degree of complexity the results are likely to be relatable with the above mentioned projects. Earned Value Management has widely been used and considered as the best approach to Measure

Performance of a Project. The reliability of EVM in measuring project's current cost performance and forecasting its final cost at completion has been well appreciated since the concept's inception which is considered as a success area of the concept which is also found to be true in case of construction projects. However, it is being discouraged in measuring current schedule performance of a construction project and forecasting Final project duration

III. BENEFIT OF EARNED VALUE ANALYSIS

It compares the planned amount of work with what has actually been completed, to determine if cost, schedule, and work accomplished are progressing as planned.

- Measure a project's progress,
- Forecast its completion date and final cost.
- Provide schedule and budget variances along the way.
- Work is "Earned" or credited as it is completed.

IV. NEED OF EARNED VALUE ANALYSIS

- Different measures of progress for different types of tasks.
- Need to "roll up" progress of many tasks into an overall project status.
- Need for a uniform unit of measure.
- Provides an "Early Warning" signal for prompt corrective action.
- It provide time to recover.
- Provide time for arrangement of additional funds.

V. Elements of earned value analysis

BCWS: "Budgeted Cost of Work Scheduled"

Planned cost of the total amount of work scheduled to be performed by the milestone date.

ACWP: "Actual Cost of Work Performed"

Cost incurred to accomplish the work that has been done to date.

SV: Schedule Variance (BCWP-BCWS)

A comparison of amount of work performed during a given period of time to what was scheduled to be performed.

A negative variance means the project is behind schedule

CV: Cost Variance (BCWP-ACWP)

A comparison of the budgeted cost of work performed with actual cost.

A negative variance means the project is over budget.

SPI: Schedule Performance Index

SPI=BCWP/BCWS

SPI<1 means project is behind schedule

CPI: Cost Performance Index

CPI= BCWP/ACWP

CPI<1 means project is over budget

CSI: Cost Schedule Index (CSI=CPI x SPI)

The further CSI is from 1.0, the less likely project recovery becomes.

VI. PROPOSED WORK/SYSTEM

The tables mentioned below is driven from actual site. In table no one contain actual planned value, second table contains Actual cost of work performed, Budgeted cost of work, Budgeted cost of work scheduled. The calculation is drive from compression between planned value verses actual cost performed. EVM provides information about both the actual implementation progress and costs of a project. The calculated indicators also allow for proposing further steps in project development. Owing to observation of trends in the systematically recorded implementation progress, calculating the final cost and completion date of the project are possible.

	Description	Predecessor	Dependency	Quantity	With material Cost/m3,m2	Duration
	Excavation	–				
A	Excavation in soft soil	–		498.9 m3	₹ 148.00	9
B	Excavation in hard soil	A	SS	340.81 m3	₹ 236.60	14
C	Footing	B	FS	36.69 m3	₹ 144.69	16
D	Backfilling	C	FS	140.65m3	₹ 36.36	2
E	Beam	D	FS	24.07 m3	₹ 151.50	16
F	Slab	D	SS+2d	121.66 m3	₹ 266.26	23
G	Column	C	SS+2d	14.07 m3	₹ 94.07	14

H	Beam	G	FS	24.07 m3	₹ 151.50	16
I	Slab	C	SS+5d	121.66 m3	₹ 266.26	26
J	Brickwork	I	FS	468.59 m2	₹ 2,965.20	3
K	Dual Internal Plaster	J	FS	816.26 m2	₹ 406.54	7
L	Dual External Plaster	J	FS	855.81 m2	₹ 714.36	9
M	Tiles	L	FS	364.63 m2	₹ 1,082.00	15

Table No 1 Planned values.

	Description	Predecessor	Duration	ACWP	BCWP	BCWS
A	Excavation in soft soil	–	9	₹ 79,856.30	₹ 68,651.20	₹ 73,837.20
B	Excavation in hard soil	A	14	₹ 86,965.20	₹ 72,354.65	₹ 80,635.65
C	Footing	B	16	₹ 5,810.36	₹ 3,841.43	₹ 5,308.68
D	Backfilling	C	2	₹ 7,569.30	₹ 3,192.11	₹ 5,114.03
E	Beam	D	16	₹ 5,326.61	₹ 23,074.09	₹ 3,646.61
F	Slab	D	23	₹ 42,400.00	₹ 661.78	₹ 32,393.19
G	Column	C	14	₹ 1,323.56	₹ 0.00	₹ 1,323.56
H	Beam	G	16	₹ 0.00	₹ 0.00	₹ 0.00
I	Slab	C	26	₹ 0.00	₹ 0.00	₹ 0.00
J	Brickwork	I	3	₹ 0.00	₹ 0.00	₹ 0.00
K	Dual Internal Plaster	J	7	₹ 0.00	₹ 0.00	₹ 0.00
L	Dual External Plaster	J	9	₹ 0.00	₹ 0.00	₹ 0.00
M	Tiles	L	15	₹ 0.00	₹ 0.00	₹ 0.00
				₹ 2,29,251.33	**₹ 1,71,775.26**	**₹ 2,02,258.92**

Table no 2 planned value, Earned value, Actual cost.

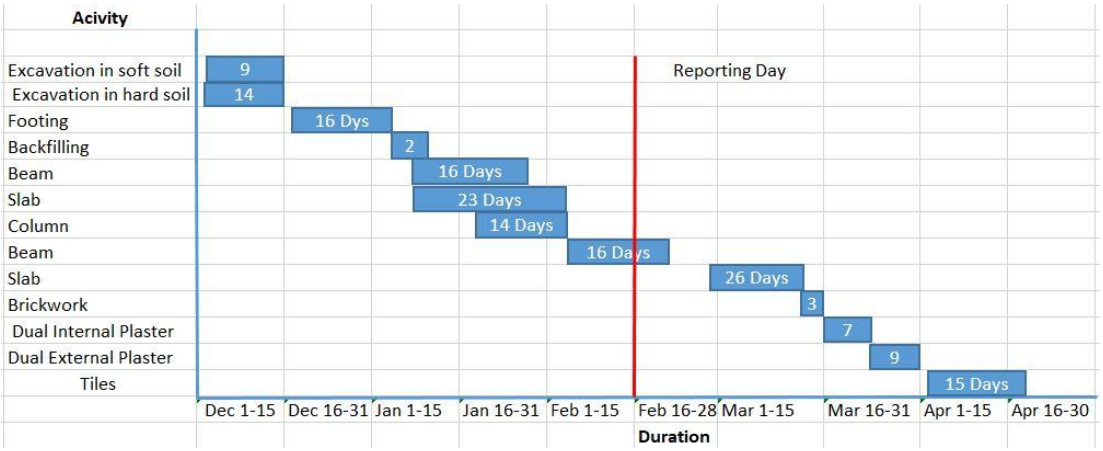

Fig no 1 Gantt chart

A Gantt chart is a bar chart that provides a visual view of project tasks scheduled over a period of time. A Gantt chart mention above is prepare to give clear idea of project progress. As mentioned above red line represent reporting day. As Gantt shows report is made after completion of 2.5 months and the consequences are discussed below.

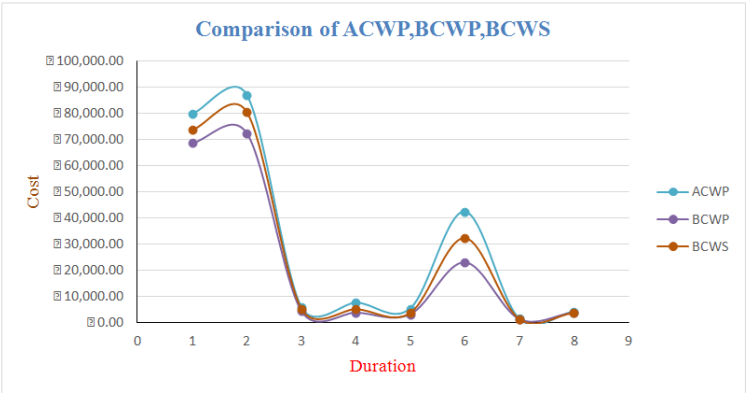

Chart no 2. Comparison of ACWP, BCWP, BCWS

Above mentioned graph represent the difference between actual cost performed vs Budgeted cost of work performed vs budgeted cost of work schedule.

VII. RESULT AND DISCUSSIONS

$$\text{Cost performance index (CPI)} = \frac{\text{Budget cost of work performed}}{\text{Actual cost of work performed}}$$

$$= \frac{171775.26}{229251.33}$$

=0.74

CPI<1 means project is over budget

$$\text{Schedule performance index (SPI)} = \frac{\text{Budget cost of work performed}}{\text{Budget cost of work schedule}}$$

$$= \frac{171775.26}{229251.33}$$

=0.849

SPI<1 means project is behind schedule

The above given calculation shows that project is behind of schedule and above the budgeted cost in other terms we can say that project is over budget.

VIII. CONCLUSION

Forecasting variability was very high, what makes EVM doubtful as a management tool to help decision making. In particular, prediction variability was at its highest at earlier stages or work both in terms of total project cost and duration. Doubtful information might potentially cause an overload on manager's activities, as they try to reschedule work based on alarming forecasts. It provide an efficient management control system. Earned value analysis gives an intimation to acknowledge that the project is behind from planned duration.

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