



Earned Value Explained

Earned Value Analysis is the most widely used method for performance measurement of projects. It combines scope, cost and schedule patterns to inform the project management team in determining the true status of their project.

Earned Value calculates three values for every scheduled activity.

- The budget, known as the budget cost of work scheduled (BCWS) in earned value calculations, is that element of the approved estimated cost planned to be spent on the project in a given period of time.
- The actual cost, known as the actual cost of work performed (ACWP), is the total of direct and indirect costs incurred in performing work during a given period.
- The earned value, also known as the budget cost of work performed (BCWP) is a percentage of the total budget equal to the percentage of work actually performed.

These three values are used in combination to provide indications as to whether or not work is being performed as planned. The most frequently employed measures are:

1. Cost Variance (CV) where $CV = BCWP - ACWP$
2. Schedule Variance (SV) where $SV = BCWP - BCWS$
3. Cost Performance Index (CPI) where $CPI = BCWP / ACWP$

The cumulative CPI on a project is widely used to forecast total cost at completion of the project. MS Project in its earned value calculations produces a tabular report that totals the following earned value measures per task giving the total for the project. BCWS, BCWP, ACWP, SV, CV, EAC, BAC and VAC.

EAC stands for Estimate at Completion and in the case of project will total costs incurred to date and expected costs for incomplete tasks to give a projected final figure for a project. If a task is in progress and is over-budget the calculation assumes that the final cost of the task will exceed the budget cost by the same margin. This assumption implies that things will neither improve nor deteriorate further. EAC is calculated as follows. $EAC = ACWP + \{BAC - BCWP\} / CPI$

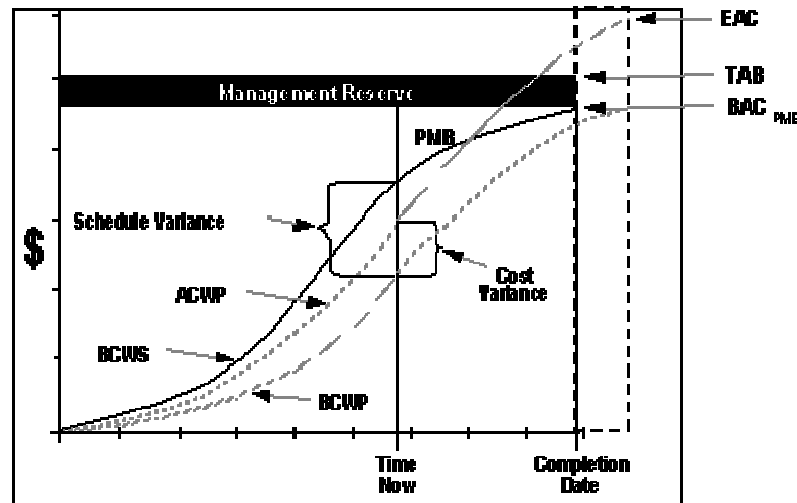
BAC stands for Budget at Completion, the estimated total cost of the project when it is completed.

VAC stands for Variance at Completion and can be a positive or negative value depending on the variances recorded for each task in the project.

The one commonly employed measure used in typical earned value analysis but not featured in MS Project 98 is Project at Completion (PAC). This measurement uses cost information to calculate any variance in time as far as the schedule is concerned, as MS Project calculates the schedule anyhow you may consider this calculation superfluous, however it may be useful to validate the calculated difference in the scheduled completion date of your project. PAC is calculated as follows. $PAC = (BAC / SPI - BAC) / (\text{average } BCWS / \text{Unit time})$.

The value of earned value analysis is dependent on 2 key areas, accurate cost information and realistic progress reporting. If either of these are deficient the benefit of the results of Earned Value Analysis will be significantly devalued.

Where cost reporting systems are well established and robust the results of Earned Value Analysis can provide management with an early indication as to the performance of their project provoking action to resolve problems sooner rather than later.



VARIANCES (Favorable is positive, Unfavorable is negative)

- **Cost Variance** $CV = BCWP - ACWP$ $CV \% = \frac{CV}{BCWP}$
- **Schedule Variance** $SV = BCWP - BCWS$ $SV \% = \frac{SV}{BCWS}$
- **Variance at Completion** $VAC = BAC - EAC$

PERFORMANCE INDICES (Favorable is > 1.0, Unfavorable is < 1.0)

- **Cost Efficiency** $CPI = \frac{BCWP}{ACWP}$
- **Schedule Efficiency** $SPI = \frac{BCWP}{BCWS}$

OVERALL STATUS

- **Percent Complete** $= \frac{BCWP_{cum}}{BAC}$
- **Percent Spent** $= \frac{ACWP_{cum}}{BAC \text{ (or EAC)}}$

TO COMPLETE PERFORMANCE INDEX (TCPI)

• $TCPI_{EAC} = \frac{WORK\ REMAINING}{COST\ REMAINING} = \frac{BAC - BCWP_{cum}}{EAC - ACWP_{cum}}$

ESTIMATE AT COMPLETION (EAC = ACWP + Estimate for Remaining Work)

• $EAC_{CPI} = \frac{BAC}{CPI_{cum}}$ • $EAC_{Composite} = ACWP_{cum} + \frac{BAC - BCWP_{cum}}{(CPI_{cum}) \cdot (SPI_{cum})}$

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