

Earned Value and Earned Schedule Management

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Earned Value and Earned Schedule Management

Overview

Sponsors, stakeholders, and finance managers often ask project managers two key questions. “Are we on schedule?” and “Are we on budget?”. The common performance measures tracked for a project are:

- Budgeted costs for the project, by month
- Actual costs for the project, by month
- Percent complete on the work plan

These measures alone do not provide a complete enough picture to answer the key questions. Projects never go quite to plan. Some work takes longer than planned; some work takes less time. Some work is needed which was not originally included in the work plan; some tasks which were planned are found not to be needed. Work is performed by resources costing more or less than planned. So the answer to the questions “Are we on schedule?” and “Are we on budget?” is usually ... “Not exactly”, even if the project manager is still projecting to finish on time and on budget. The reality is that many projects finish past their due date or over budget. In some cases, measurement techniques including Earned Value and Earned Schedule Management can provide analytical information to project managers to help manage project performance, predict outcomes, and take corrective action where needed.

Earned Value Management

CONCEPTS AND MEASUREMENTS

Earned Value Management is a well-established metric for project performance management. Earned value measures performance in dollars and can be useful in predicting final project cost, based on progress to date.

Earned value calculations are based on the following key measures:

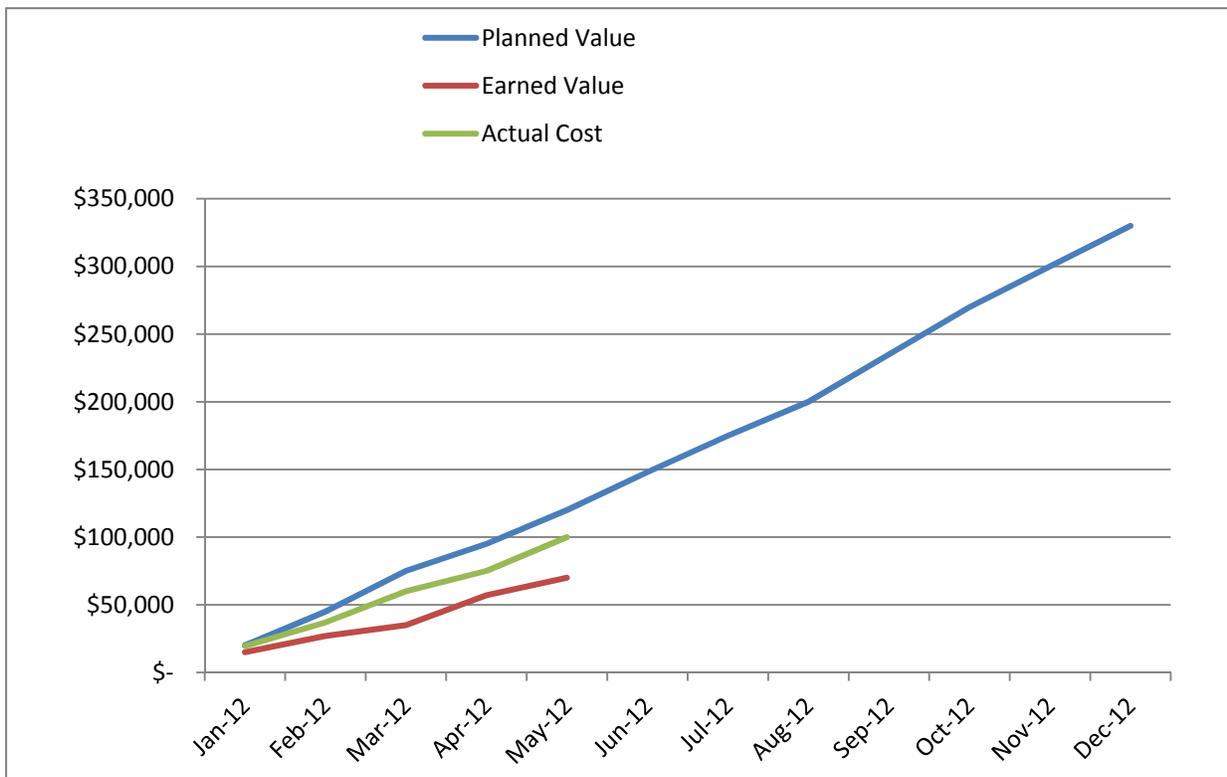
- Planned value (PV). This is the planned value of the work to be completed. It is the baseline for the approved scope, schedule and cost. It is the budget for the entire project at completion, before reserve, broken down into “work packages”, on a time-phased basis. The work package is an agreed-upon level in the work breakdown structure, such as a task, an activity, or a deliverable. Also known as Budgeted Cost for Work Scheduled (BCWS).
- Earned value (EV). This is the value of the work actually performed at a point in time, using the same work packages used to report the planned value. i.e., usually at the task level. The value earned reflects the *budgeted* amount for the tasks actually completed. Also known as Budgeted Cost for Work Performed (BCWP).
- Actual cost (AC). This is the actual cost for the work performed. Also known as Actual Cost for Work Performed (ACWP).
- Budget at Completion (BAC): The original planned budget for the project.

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Earned value reporting focuses on the following variances and metrics:

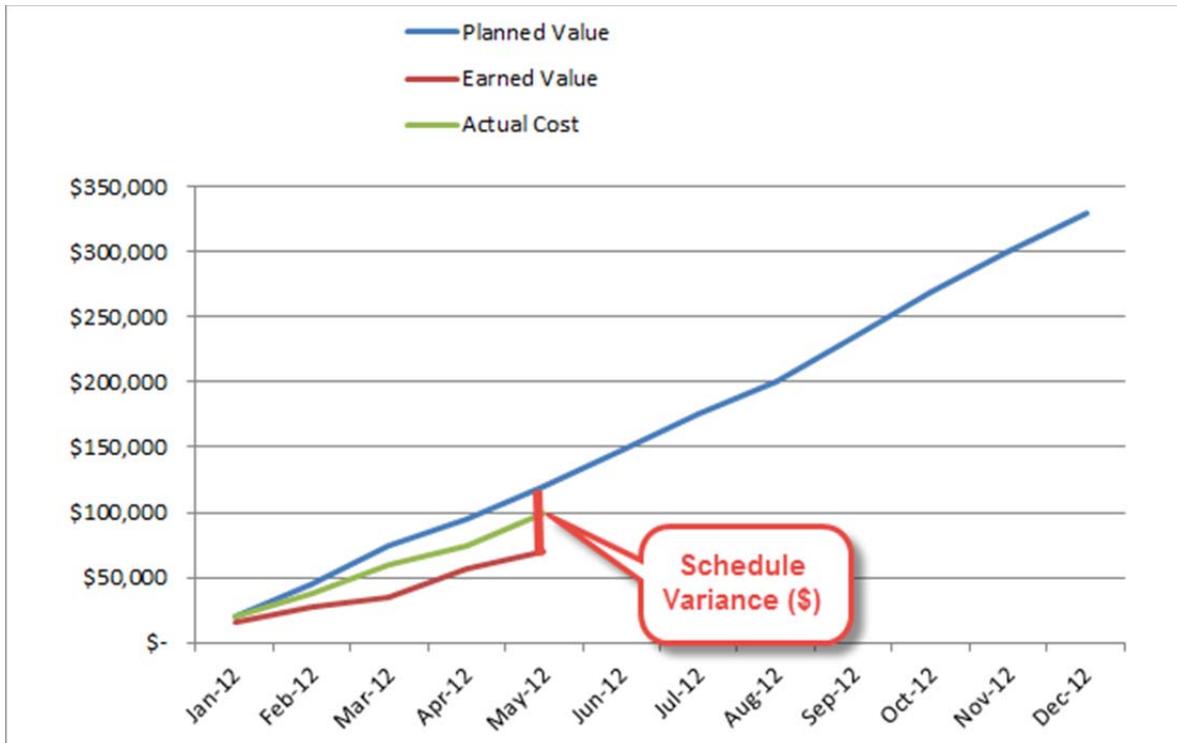
- Schedule Variance (SV \$): Earned value less planned value (EV-PV), measured in dollars.
- Schedule Performance Index (SPI \$): Earned value/planned value (EV/PV). An SPI under 1 indicates that the project is running behind schedule. An SPI greater than 1 indicates that the project is running ahead schedule
- Cost variance (CV): Earned value less actual cost (EV-AC).
- Cost Performance Index (CPI): Earned value/actual cost (EV/AC). A CPI under 1 indicates that the project is running over budget. A CPI over 1 indicates that the project is running under budget.
- Estimated (forecasted) total cost at completion (EAC): BAC/CPI.

The following graph shows cumulative metrics over the duration of the project, assuming a total project budget of \$330,000 over 12 months. Five months of the project have been completed. The actual costs are less than budget for the period to date. However, it would be inaccurate to describe the project as being “under budget”.



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The following graph shows the schedule variance *measured in dollars*. Although actual costs are less than budget for the period to date, the actual work performed is significantly less than the work planned at the 5-month point.



Refer to the PMI *Practice Standard on Earned Value Management* (PMI, 2011) for more information.

POTENTIAL BENEFITS

Earned value management can be useful in predicting final project cost, based on progress to date. It can provide an early warning system of cost and schedule problems and trends, allowing the project manager to take corrective action early. It starts to be useful when the project is 15%-20% complete and there is some track record to measure.

ASSUMPTIONS

Earned value management techniques assume that there is a defined project scope, that the work breakdown structure is well-defined, that work effort and timing are reliably estimated, and that there is a project management system which can provide these measures. It assumes that scope is not being “mortgaged” – pushed out into the future. Earned schedule management uses past performance to predict future performance.

LIMITATIONS: FIXED PRICE CONTRACTS

Earned value reporting is not often used with fixed price contracts. In a true fixed price contract, at any point in time, Earned Value = Actual Cost, so there is no cost variance to report. There may be schedule variances at any point in time but, in theory, the vendor would absorb cost variances and would make

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up any schedule variances by assigning more resources. As long as the vendor is in compliance with defined milestone dates, there is often no need for the client to track earned value on the contracted work. It would be expected that the vendor is performing its own earned value reporting to ensure they are on track and meeting their own profitability goals; this is an internal management issue for the vendor. In practical terms, there are exceptions and times when a client might want to take on tracking earned value for the vendor. For example, if the client has more mature PMO measurement processes or if there are concerns that the vendor is running into schedule problems. Fixed price contracts with incentives can be a hybrid and might require the client to take on earned value reporting.

LIMITATIONS: PREDICTIVE LIMITATIONS

Earned value management can help predict forecasted costs by the end of the project. Although it can indicate schedule problems at various points in the project, it does not help to predict project completion dates. At the end of the project, earned value = planned value and the SPI = 1. This is the case *even if the project actually ended late*. While earned value can be helpful in cost management, the SPI \$ measurement becomes less useful approximately 2/3 of the way through the project. Earned schedule measurements were developed as an extension of earned value management to help predict project completion dates, as described in the following section.

Earned Schedule

CONCEPTS AND MEASUREMENTS

Earned schedule management was developed by Walt Lipke (US) and Kym Henderson (Australia) as an extension to earned value management. In contrast to earned value, earned schedule measures performance in increments of time and can be useful in predicting the project completion date, based on progress to date.

Earned schedule calculations are based on the following key measures:

- Planned value (PV). The same measure used in EVM.
- Earned value (EV). The same measure used in EVM.
- Earned schedule (ES): The point in time that the *current earned value* should have been earned.
- Actual time (AT). The current point in time.
- Planned duration (PD): The original planned duration of the project.

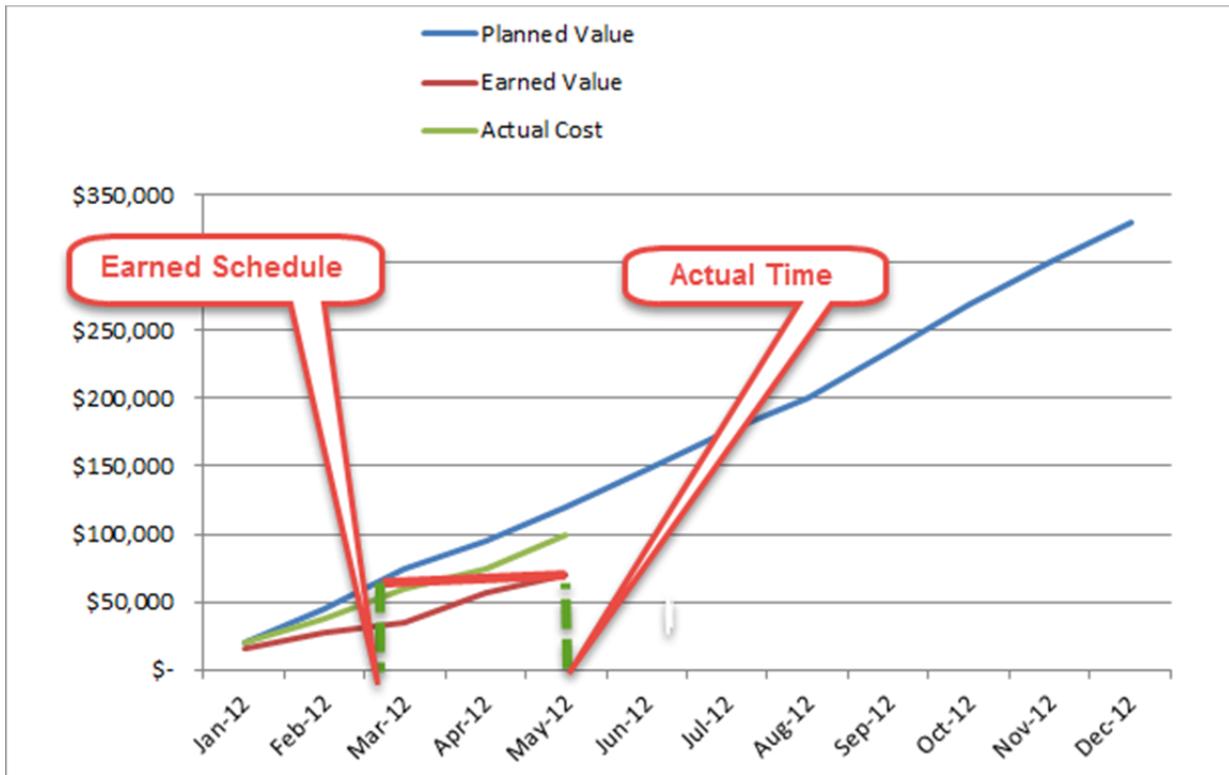
Earned value reporting focuses on the following variances and metrics:

- Schedule Variance (SV t): Earned schedule less actual time (ES-AT).
- Schedule Performance Index (SPI t): Earned schedule/actual time (ES/AT).
- Forecasted duration: Planned duration/SPI.

The following graph shows the schedule variance *measured in time*. It uses the same information as earned value, shown in a different dimension. It does not require actual costs. The schedule variance in

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time is the difference between the actual time and the earned schedule. Earned scheduled is measured by finding the point on the PV curve that is on the same horizontal line as the current earned value.



Appendix D in the *PMI Practice Standard on Earned Value Management* (PMI, 2011) provides information on Schedule Analysis Using EVM Data.

POTENTIAL BENEFITS

Earned schedule management can be useful in predicting project delays and schedule risks, based on progress to date. It starts to be useful when the project is 15%-20% complete and there is some track record to measure. It can provide an early warning system of schedule problems and trends, allowing the project manager to take corrective action early.

ASSUMPTIONS

Earned schedule management techniques assume that there is a defined project scope, that the work breakdown structure is well-defined, that work effort and timing are reliably estimated, and that there is a project management system which can provide these measures. . It assumes that scope is not being “mortgaged” – pushed out into the future. Earned schedule management uses past performance to predict future performance.

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