

Basic Concepts of Earned Value Management (EVM)

Agenda

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- Successful EVM requires...
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Earned Value Management

Earned value management is a project management technique for measuring performance and progress. It combines measurements of the project management triangle:

- Scope
- Schedule
- Costs

Why Earned Value Management?

- EVM can provide:
 - Accurate forecasts of project performance problems
 - Significant positive impacts in the areas of planning & controls
 - Improvements in scope definition

Successful EVM requires...

- A good project plan
- Values identified for planned work
- Earning metrics – performance indicators

Background & Context

- 1900's EVM practices first used in manufacturing
- 1960's Department of Defense (DoD) adopts EVM; establishes 35 criteria
- 1970's & 1980's Cost/Schedule Control Systems Criteria (C/SCSC) analysis grows
- 1979 EVM introduced to Architecture and Engineering professions
- 1987 PMI Includes EVM into PMBOK Guide
- 1990's EVM emerges as PM methodology for managers and executives
- 1998 EVM criteria reduced to 32 and adopted as ANSI Standard EIA 748-A
- 2002 EVM achieves greater attention due to Sarbanes-Oxley Act of 2002
- 2005 EVM becomes part of general federal project risk management
- EVM is now recognized worldwide.

Organizations Practicing EVM...

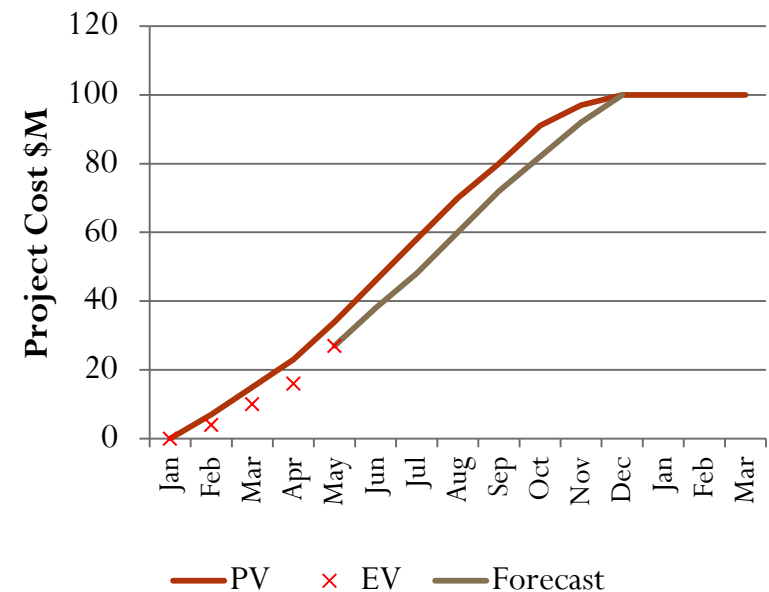
- Some of the more well known organizations include:
 - NASA
 - Project Management Institute (PMI)
 - Society of Cost Estimating and Analysis
 - Defense Acquisition University
 - Association for the Advancement of Cost Engineering (AACEi)
 - Federal Acquisition Institute
 - Acquisition Management (UK)
 - Most large engineering, procurement and construction organizations

Approaches to EVM

- Scalable to fit most every project performance need
 - Simple – spreadsheet based
 - Intermediate – computer programs with WBS, cost & scheduling
 - Advanced - complex programs with extensive capabilities
- All approaches require varying degrees of:
 - Work Breakdown Structure (WBS) to define the work
 - Plan Values (PV) – costs, hours or units of measure
 - Schedule to “earn” credit – “value”
 - Execute the earned value tracking and measurement plan

Cost Forecasting Terms:

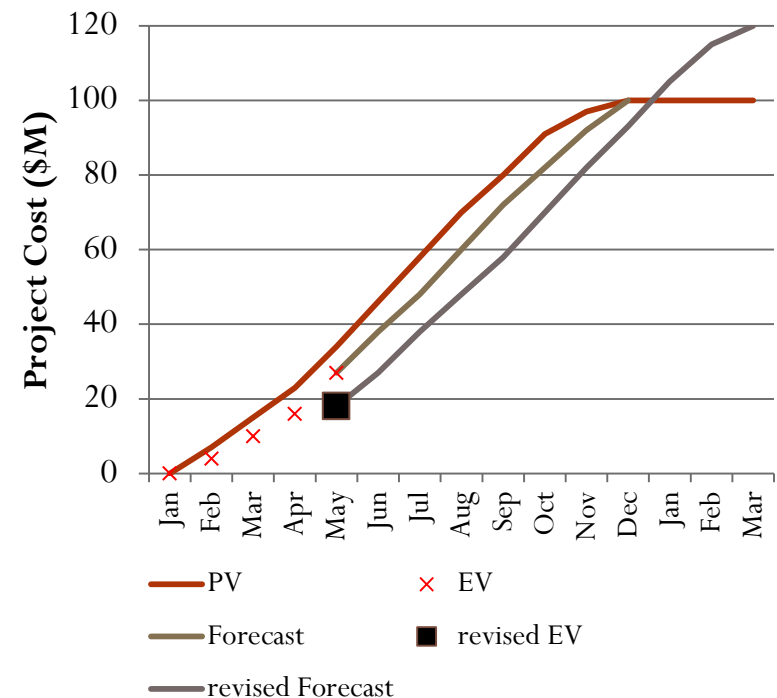
Element	Description
Estimate at Completion (EAC)	<p>The expected TOTAL cost of the completed work.</p> <p>$EAC = BAC / CPI$</p> <p>or $= AC + ETC$</p> <p>or $= AC + ((BAC - EV) / CPI)$ (typical case)</p> <p>or $= AC + (BAC - EV)$ (atypical case)</p>
Estimate to Complete (ETC)	<p>The expected cost to FINISH the remaining work.</p> <p>$ETC = EAC - AC$</p> <p>or $= (BAC / CPI) - (EV / CPI)$</p> <p>or $= (BAC - EV) / CPI$</p>



BAC - Budget at completion. CPI – Cost Performance Index. AC – Actual Cost. EV – Earned Value

Cost Forecasting Variances:

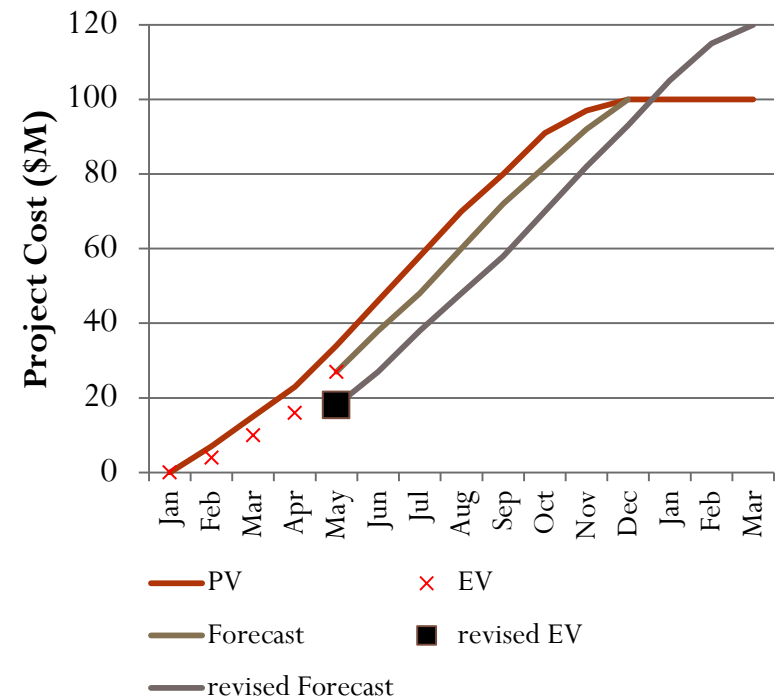
Element	Description
Cost Variances (CV)	How much under or over budget. $CV = EV - AC$ NEGATIVE is over budget, POSITIVE is under budget.
Schedule Variances (SV)	How much ahead or behind schedule. $SV = EV - PV$ NEGATIVE is behind schedule, POSITIVE is ahead of schedule.
Variance At Completion (VAC)	Variance of TOTAL cost of the work and expected cost. $VAC = BAC - EAC$



BAC - Budget at completion. EAC - Estimate at Completion. EV - Earned Value. PV - Planned Value. AC - Actual Costs.

Cost Forecasting Performance Indexes:

Element	Description
Cost Performance Index (CPI)	$CPI = EV / AC$ Over budget (< 1) or under budget (> 1).
Schedule Performance Index (SPI)	$SPI = EV / PV$ Ahead of schedule (> 1) or behind schedule (< 1).



EV – Earned Value. PV – Planned Value. AC – Actual Costs.

Benefits of EVM

- Improves the planning process,
- Fosters a clear definition of the work scope,
- Establishes clear responsibility for work effort,
- Integrates technical, schedule, and cost performance,
- Provides early warning of potential problems,
- Identifies problem areas for immediate and proactive management attention,
- Enables more accurate reporting of cost and schedule impacts of known problems,
- Enhances the ability to assess and integrate technical, schedule, cost, and risk factors,
- Provides consistent and clear communication of progress at all management levels,
- Improves project visibility and accountability.

Key Take Away Items

- Recognize EVM terminology when used.
- Know that EVM is a set of guidelines by which your project can be more effectively monitored and managed.
- Understand the benefits of utilizing EVM.

Questions?

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provide their PMI member ID with the notification

What is EVM?

- The basic concept of EVM is more than a unique project management process or technique.
- It is an umbrella term for 32 guidelines that define a set of requirements that must be met.
- The objectives are to:
 - Relate time phased budgets to specific contract tasks and/or statements of work.
 - Provide the basis to capture work progress assessments against the baseline plan.
 - Relate technical, schedule, and cost performance.
 - Provide valid, timely, and auditable data/information for proactive management action.
 - Supply managers with a practical level of summarization for effective decision making.

Terminology

- Earned value management does introduce a few new terms.
 - Budget vs. Actual
 - Budgeted cost for work scheduled (BCWS), sometimes called the planned value.
 - Budgeted cost for work performed (BCWP) or earned value.
 - Actual cost of work performed (ACWP).
 - Budget at completion (BAC).
 - Estimate at completion (EAC) which is comprised of the cumulative to date actual cost of work performed plus the estimate to complete the remaining work.
 - Variance
 - Cost variance (CV) which is calculated as $BCWP - ACWP$. A result greater than 0 is favorable (an underrun), a result less than 0 is unfavorable (an overrun).
 - Schedule variance (SV) which is calculated as $BCWP - BCWS$. A result greater than 0 is favorable (ahead of schedule), a result less than 0 is unfavorable (behind schedule).
 - Variance at completion (VAC) which is calculated as $BAC - EAC$. A result greater than 0 is favorable, a result less than 0 is unfavorable.

32 Guidelines

- The 32 guidelines in the ANSI-748 Standard for EVMS are divided into five sections:
 - Organization
 - Planning, Scheduling and Budgeting
 - Accounting Considerations
 - Analysis and Management Reports
 - Revisions and Data Maintenance

Organization

Element	Description
Work Breakdown Structure (WBS)	Extended down to a level that describes the tasks that will be performed as well as their relationship to product deliverables.
Organizational Breakdown Structure (OBS)	Defines who is responsible for the work effort in the WBS
Control Account	Where the WBS (what) and OBS (who) intersect
Responsibility	The person responsible for the work effort (scope, schedule, and budget) is the project manager
Integration	of the planning, scheduling, budgeting, work authorization, and processes

Planning, Scheduling and Budgeting

Element	Description
Integrated master schedule	Resource loaded to determine the budget for the work as scheduled. Forms the basis for the monthly budget, or BCWS, for each task and the project. Creates the time phased budget for the performance measurement baseline (PMB). The total budget for each task, control account, or the entire project is defined as the budget at complete (BAC).
Schedule Uncertainty	Managed with Management Reserve (MR) or Net Estimate Uncertainty
EVM Methodology	Work classification: discrete, apportioned effort, or level of effort (LOE). Earned value technique e.g. 50/50, 0/100, rules of credit or percent complete.
Authorization to complete	Work only begins when there is formal authorization to proceed. This requirement is a disciplined approach to clearly define work, schedule, and budget before work commences and actual costs begin to accrue.

Accounting Considerations

Element	Description
Actual costs (ACWP)	Actual costs must be captured in a manner consistent with the way work is planned and budgeted
Timeliness	Schedule an important project resource, material, and to accrue performance data correctly
Accrual Timing	Common sense practice to accrue the costs for the material in the same month as the BCWP was taken (earned) to avoid a very misleading cost variance, also known as “booking lag.”

Analysis and Management Reports

Element	Description
Human Attention	To cost and schedule variances, documenting cause, impact, and correction action, and determining a new estimate at complete (EAC), if warranted.
Variance Calculations	Done at the control account level which provides the ability to summarize the data up through the WBS and/or the OBS. The ability exists to drill down from the control account level into the detail data to identify the root cause of a variance, determine the impact of the variance on future work effort, and identify correction actions.
EVM Data Analysis Indices	Consider their past performance and their future performance to complete the work within the approved EAC and estimated completion date (ECD).
Cost & Schedule Indices	Featured in commercial off the shelf project management toolsets such as MS Project and Primavera and should be carefully reviewed during each reporting cycle. They serve as a valuable validity test to the estimate at completion.

Revisions and Data Maintenance

Element	Description
Disciplines and Timely	Incorporation of customer directed changes, including stop work orders.
Baseline Control	Schedule and budget baseline is essential to be able to assess work accomplished for each reporting period.
Proactive & Meaningful	The Revision and Data Maintenance section is a must for proactive, meaningful earned value management when there is a constantly changing baseline.