What Is Earned Value Management? And How to Make It Work on Your Project

Project planning and management are important tools used by professionals of every stripe to help their companies reach the goals they've set. But even the best laid plans can go astray, and sometimes project performance doesn't quite match the budget or schedule you've set.

By using an *earned value management* (EVM) system as part of your overall project management plan, however, you can not only track ongoing project performance and the actual costs of your total project, but of each task within it. Even better, when it's properly applied, earned value management gives you real-time visibility and insight into your projects. Running the numbers can provide early warnings when things are about to take a costly turn, and allow you to take

corrective action before the entire project collapses or generates excess cost, waste, or delays.

How Earned Value Management Works

At its simplest, earned value management is a basic set of calculations you can use as a control system in tracking two variables—cost and time—to monitor two statuses critical to every project: budget and scheduling.

Compare this to traditional methods of tracking progress, and you'll quickly see why taking both project scheduling and budget into account is better than simply relying on either.

For example, if a project is scheduled to take five months, and the project manager's only looking at elapsed time as a project completion metric, they might consider the project to be 20% complete after a month has passed, *even if only 10% of the work required has been completed.* Without a clear understanding of current project status and where it's heading, disaster awaits.

EVM addresses this by formalizing processes and assigning value to every task, to be assigned only once that task is completed. EVM standards used by the United States Department of Defense (DOD) and set by the National Defense Industrial Association (NDIA) have been codified since 1998 under the American National Standard Institute Electronic Industries Association 748 Standard, also known as the ANSI/EIA 748 standard.

A common approach is to break the total project into tasks that each receive a value expressed as a percentage, with all the tasks and subtasks adding up to 100%.

If your project is, for example, updating the procurement department's computers and software, you might break it out like this:

- 70% Primary Hardware Replacement
- 20% Software and Licensing Updates
- 10% Peripherals

Each completed task is added to the total earned value (EV) as it's completed. So, going back to our five-month timeframe, if you've managed to replace both hardware and peripherals by the end of month four, you've completed 80% of the work, producing earned value of 80% in 80% of the time allotted.

The percentages used to establish earned value are based on each task's percentage of the total project budget, or *budget at completion* (BAC). If, for example, you have a project with only one task, and the budget for that task is $7500, then the project's BAC is also $7500.

Alternatively, if you had three tasks (like in our computer upgrade scenario), the breakdown might look more like this:

- 70% Primary Hardware Replacement ($70,000)
- 20% Software and Licensing Updates ($20,000)
- 10% Peripherals ($10,000)

Total BAC: $100,000

Of course, the EV formulas alone aren't quite enough to help you transform your project management. They're best executed within an earned value management system (EVM system), which is a well-developed, focused application of the formulas and their analyses to monitor and optimize your project as it happens, ensuring optimal performance and lowest total cost in real time.

After all, hindsight may be 20/20, but knowing what went wrong is never quite as satisfying, or profitable, as stopping it from happening altogether.

Once you understand what you're looking for and how to measure progress,

you'll be ready to perform the actual calculations that determine specific components of earned value—and manage your projects accordingly.

Earned Value Management Glossary

In order to successfully manage earned value as part of your project planning, you need to be familiar with the terminology used.

Planned Value (PV): The total budgeted costs for the project. PV is also known as *budgeted cost of work scheduled* (BCWS) and is expressed as the portion of the planned spend at any given point in the project.

Actual Costs (AC): The amount actually spent to complete tasks within the project. Also known as *actual cost of work performed* (ACWP).

Earned Value (EV): Also called *budgeted cost of work performed* (BCWP), EV is measured by multiplying the percentage of work completed by the total project budget.

Earned Value Management System (EVMS): The framework of calculations and analysis used to monitor, maintain, and improve project performance and budget adherence in real time.

Performance Measurement Baseline: The benchmarks for approved budget, performance, and scope set during project planning and monitored and maintained by EVMS.

Work Package (WP): A task, or set of tasks, within a project.

Work Breakdown Structure (WBS): A method of organizing and prioritizing tasks within a project in order to ensure the project completes all deliverables within the required budget.

Critical Earned Value Calculations

Once you understand what you're looking for and how to measure progress, you'll be ready to perform the actual calculations that determine specific components of earned value—and manage your projects accordingly.

Let's take a look at the four essential calculations involved:

Cost Variance (CV): A measurement of the difference between earned value and the actual amount spent at any given point in the project. A negative CV value indicates a task is over budget, a CV of zero indicates a task that's on budget, and a positive CV indicates a task that's under budget.

Expressed as **EV – AC = CV**

Schedule Variance (SV): A measurement of the difference between earned value and planned value. If the SV value is negative, a task is behind schedule. If the SV is zero, the task is on schedule, and if the SV value is positive, the task is ahead of schedule.

Expressed as **EV – PV = SV**

Cost Performance Index (CPI): A ratio illustrating actual earned value as compared to actual spend. A CPI value of one or lower, accompanied by a negative CV, indicates the project's cost performance is below what was planned.

Expressed as **EV ÷ AC = CPI**

Schedule Performance Index (SPI): A ratio illustrating actual earned value as compared to planned work completed. If the SPI value is greater than one **and** accompanied by a positive SV, then the project is exceeding its scheduled performance.

Expressed as **EV ÷ PV = SPI**

It's important to note that these equations require analysis beyond crunching the numbers. For example, a project could have several tasks ahead of schedule, but over budget. Or the SPI for a given project could indicate more work has been completed than planned, but all of the work completed so far is made up of non-critical tasks that won't necessarily carry the project to the finish line.

Project managers can use these calculations as the foundation for more complex ones that reveal deeper insights into why (for example) a project is ahead of schedule but over budget. This process is known as *earned value analysis*, or EVA.

These advanced equations include:

Estimate at Completion (EAC): An extrapolation of the final total budget (either project budgets or task budgets) will be, provided everything else proceeds as initially planned.

Expressed in different ways depending on the factors involved.

If, for example, the project is experiencing an ongoing variance that will most likely continue (e.g., supply chain disruption due to political conflict, disease, etc.): **BAC ÷ CPI = EAC**

On the other hand, if the project is experiencing a one-time variance (e.g., a weather event, unexpected equipment failure, etc.) and performance levels are expected to return to normal: **AC + (BAC – EV) = EAC**

Finally, to take another example, if the budget was incorrectly estimated at the beginning of the project: **AC + ETC = EAC**

Let's say the peripheral replacement task of our computer update project experiences a cost overrun of $2500 in month four of the five-month schedule. The actual percentage of work completed is only 60% instead of the expected 80%

in month four. This creates a CV of less than one, due to a one-time event such as supply chain disruption caused by severe weather. Fortunately for the project, that event can only affect performance and cost once.

An overrun of $2500 at month four, when the project should be 80% complete (and therefore the peripheral task should have an EV of $8,000 based on ⅘ x $10,000), but an actual EV of only $6,000 would result in an AC of $8,500.

So, to calculate the task EAC, you'd use

$8,500 + ($10,000 – $6000) = EAC

$12,500 = EAC

Assuming no other delays or changes, the estimated actual cost of the peripheral replacement portion of this project will be $12,500.

Estimate to Completion (ETC): A calculation of how much money is required, from the point of calculation, to finish the project as planned. This formula is very useful if project scope or assumptions have been modified from their originals, and a new estimate is required to determine remaining work and new costs.

Expressed in one of two ways:

If the project will most likely continue to perform as it has up to this point: **EAC – AC = ETC**

If the parameters have changed significantly, a new estimate is required and ETC is equal to the new estimate determined by the changes made.

Variance at Completion (VAC): Allows project managers to forecast cost variance at the end of the project. It is based on EAC.

Expressed as: **BAC – EAC = VAC.**

A negative VAC indicates the amount of money required to finish the project as planned.

A positive VAC indicates the surplus funds available after completing the project as planned.

To continue our peripheral replacement example:

$10,000 – $12,500 = -$2,500

You'll need $2,500 more than originally planned to complete the peripheral replacement.

To Complete Performance Index (TCPI): The CPI required to complete the project on budget and as planned. It can help project managers identify how much extra efficiency will be needed to make up for negative variances.

Expressed in one of two ways:

If the project must meet its original budget: (**BAC – EV) ÷ (BAC – AC) = TCPI**

If the project budget can be modified to accommodate negative variances: **(BAC – EV) ÷ (EAC – AC) = TCPI**

If our project team doesn't have access to additional funds, they need to find a way to makeup the negative cost variance by improving efficiency.

(**BAC – EV) ÷ (BAC – AC) = TCPI**

($10,000 – $6,000) ÷ ($10,000 – $8,500) = TCPI

2.6 = TCPI

In order to catch up and meet their budget and performance goals at the end of month five, the peripheral replacement task will need to more than double its

current efficiencies (260%).

Putting Earned Value Management to Work on Your Project

Mastering EVM formulae is important, of course, but no matter what calculations you use, the goals remain the same: setting cost, performance, and scope goals for a project (and each of its tasks), and then making sure you meet them as closely as you can. And in reaching those goals, having a roadmap and real-time monitoring in place will help you go the distance much more effectively than winging it.

If you're focused on baking EVM into your project management, start with a checklist of project essentials that will make it easier to track and manage tasks, costs, and overall project performance.

1. **Project Needs Analysis:** Clearly and completely define the problem to be addressed.
2. **Work Breakdown Structures:** The "how" to the "what" of project needs analysis.
3. **Change Management:** Plans within the overall project management plan for addressing both recognized and unrecognized changes, and develop contingencies as required.
4. **Task and Project Scope and Performance Benchmarks:** At this stage, a project estimate is prepared, with detailed granulation of work packages within the WBS. Matching schedule and estimates to the WBS ensures full integration between schedule and budget.
5. **Project Schedule and Budget Benchmarks:** Establish milestones for both, guided by quality control and frequent review by the project manager(s).

6. **Contingency Planning (Budget and Schedule):** Develop complementary schemes to ensure task and project completion, with an emphasis on minimal disruption or additional cost.
7. **Ongoing Contingency Management:** Monitor and extrapolate schedule and cost contingency values in real time to ensure sufficient resources are in place.
8. **Actual Cost Calculations:** Calculate AC using not only cost system data, but estimated values from outstanding invoices (accruals).
9. **Accurate EVM Reporting:** EVM is only as effective as the techniques used to monitor performance, budget, and scope. EVM works best when reported progress is expressed quantitatively; peripherals installed, total offices completed, etc.
10. **Management Buy-in and Engagement:** It's essential to educate and engage management and the C-Suite to trust the EVM process and focus on the importance of accuracy and completeness in gaining useful insights and improving decision making.
11. **Plan to Succeed by Investing in the Right Software:** A cloud-based, versatile solution like PLANERGY helps ensure total data transparency, easy contingency management for all your processes and workflows, and deep analytics powered by artificial intelligence to ensure your earned value management system is complete, accurate, and accessible.

Make Sure Every Project Reaches the Finish Line

Effective project management takes more than a knack for maths. But by mastering EVM formulae, developing a strong project plan that supports value creation and monitoring, and using powerful software tools, you can set, adjust, and, most importantly, *achieve* all your project management goals while keeping costs low and performance high.

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