EVA – Your Best Friend in Measuring Project Performance

Sometimes the simplest questions are the hardest to answer.

A few years ago, as a stressed and overloaded Professional Services Manager, I remember one of my biggest headaches was trying to get a realistic view of how well my staff's projects were progressing. Every month I'd sit down with my project managers and review the performance of each project but when I asked the question, of course, I got a very subjective answer. Tony was a born optimist and fiercely proud of his reputation, so the answer was invariably 'Everything is fine and I'm ahead of schedule and under budget' while Chris was a confirmed pessimist and his answer was 'Everything is going wrong, the schedule isn't worth the paper its written on and the budget was never adequate in any case'. In both cases, the reality was never quite as good or as bad as it was presented, so I always adjusted their reports to take the 'human factor' into account. Despite that, I was always painfully aware that I was basing decisions on a very subjective assessment of reality.

What I needed was an objective measure of each project that would strip out the personalities, politics and other factors that distorted the real picture. I needed a consistent way of assessing projects that would be the same irrespective of the type of project, when it was measured and who the assessment was intended for.

How I wish I'd known EVA

EVA, or Earned Value Analysis to use her full name, could have got me out of trouble. She would have ignored the distractions and focused on what was important; scope, cost and schedule performance. She would have helped me pin down the problem projects and take a back seat on the projects that were going well. Together we could have painted a consistent picture of project performance to all our stakeholders; customers, senior management and staff alike.

If only we'd met earlier!

All about EVA

If you have a 12 month project with a budget of $1,000,000 and at the six-month midpoint you've spent $600,000 you're over-budget right?

Well, not necessarily.

You see, it depends on what work has been accomplished. If you've only completed 50% of the work (as you may have assumed from the scenario) then yes, you've spent more than you'd planned but what if you've actually completed 75% of the work? Then, you're under budget and things are looking much more positive.

SGK Consulting Ltd
Pine Trees, Dark Lane
Tiddington
Stratford upon Avon
Warwickshire CV37 7AD

Phone: 0845 858 8000
Mobile: 07967 559375
E-mail: info@sgkconsulting.co.uk
Web: www.sgkconsulting.co.uk

This is the fundamental problem with just using actual cost to measure project performance; it doesn't take into account what work has actually been completed. And this is the fundamental responsibility of the project manager; to get the work described in the project scope completed, on time and on budget. So why do we accept actual cost as a single legitimate measure of performance?

What you need is a measure of the work actually completed. This can be in terms of the number of hours or days effort expended but the usual convention is to express the value of the work done in monetary units. In particular, we use the budgeted cost of the work to represent the value. For example, a task to test a software application may be budgeted to cost $10,000 and so we consider the value of the task to be $10,000; if the task is 50% complete, the value of the work completed is $5,000. In shorthand terms, we call this the **earned value (EV)**.

But does the cost really represent the value of the work done? In some cases one task that costs $10,000 is far more critical to the project than another of the same cost, so you could say it has a greater value. That's an interesting debate but would introduce a degree of subjectivity that we're trying to avoid, so the standard procedure is to stick with budgeted cost; all tasks are considered equally important.

Once we know our earned value at a specific point in time, we can make a much more meaningful analysis of our project performance; we can compare it to the **planned value (PV)** or budgeted work at the same point in the project to see if we are ahead or behind schedule and we can compare it with the **actual cost (AC)** incurred to that point to see if we are under or over budget.

Armed with these figures we can really start to measure how well our project is performing.

EVA in action

With any kind of performance reporting system, consistency is critical so there are a number of standard ratios and variances that are used to compare performance at different points in time or between different projects.

Schedule variance (SV) is simply the difference between the earned value and the planned value. In other words, is the value of the work accomplished more or less than the value of the work we'd planned to complete at this point in the project? As we are using the same cost budget to measure both earned and planned value, they can only differ if we are behind or ahead of our schedule, as the name implies. In mathematical terms:

$$SV = EV - PV$$

Cost variance (CV) is the difference between the earned value and the actual cost. Or, is the value of the work accomplished more or less than the actual money spent to carry out the work at this point in the project. In this case, we are using the same scope and schedule to measure both earned value and actual cost so they can only differ if we have over spent or under spent on a particular task, as implied by the name. The formula in this case is:

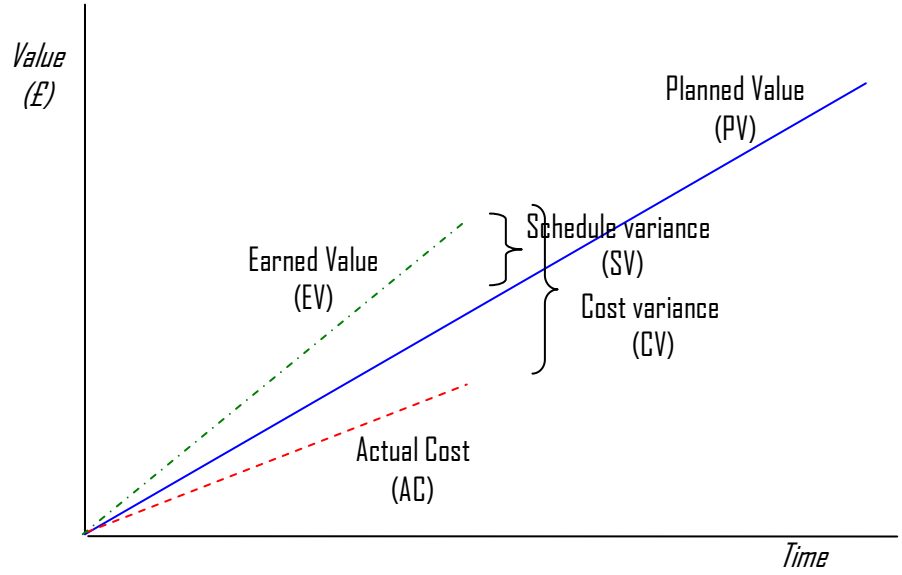
SGK Consulting Ltd
Pine Trees, Dark Lane
Tiddington
Stratford upon Avon
Warwickshire CV37 7AD

Phone: 0845 858 8000
Mobile: 07967 559375
E-mail: info@sgkconsulting.co.uk
Web: www.sgkconsulting.co.uk

CV = EV – AC

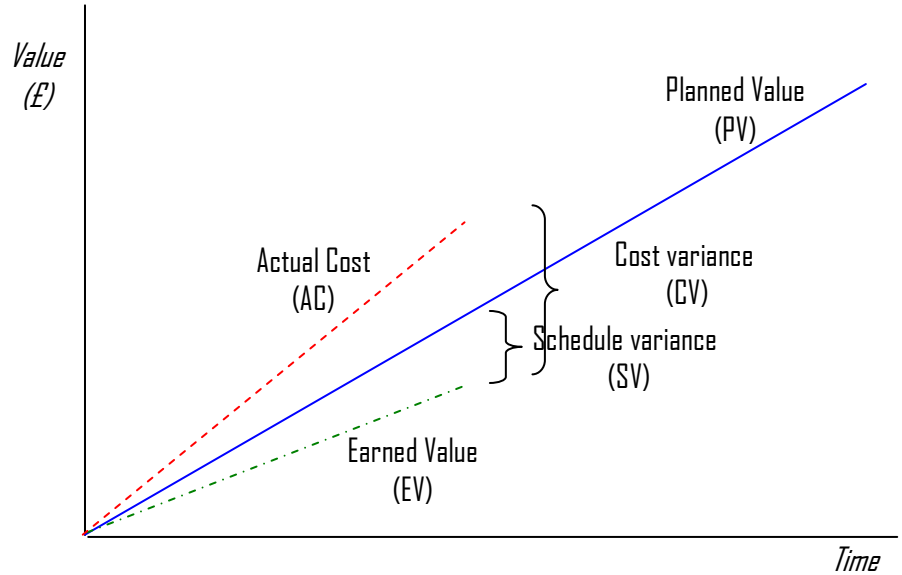
In both cases, what you are hoping to find is a positive variance for each. In other words, the work done is greater than what had been planned and the budgeted cost of that work is greater than what had actually been spent.

A diagram may help to make this clear:



In this case, we are measuring project performance at the mid point of the project. Our earned value is greater than the planned value at this point in time, so we have a positive schedule variance and it is also greater than the actual cost, so we have a positive cost variance. In other words, we are ahead of schedule and below budget; an encouraging position to be in,

Compare to this situation:



SGK Consulting Ltd
Pine Trees, Dark Lane
Tiddington
Stratford upon Avon
Warwickshire CV37 7AD

Phone: 0845 858 8000
Mobile: 07967 559375
E-mail: info@sgkconsulting.co.uk
Web: www.sgkconsulting.co.uk

In this case, the earned value is less than the planned value at this point in time so we have a negative schedule variance. It is also less than the actual cost, so we have a negative cost variance. In other words, we are behind schedule and over budget; we need to take steps to get our project back on track as soon as possible.

When comparing different projects, especially if they have very different budgets, a variance isn't always the most helpful way to present the figures; a variance of $1000 on a $10,000 budget is likely to be a much bigger problem than a $1000 variance on a $1,000,000 budget. So instead, we express the variances as a ratio, namely **schedule performance index (SPI)** and **cost performance index (CPI)**. For the mathematically minded:

$$SPI = EV/PV$$

and

$$CPI = EV/AC$$

Now, what you are hoping for is a value greater than one for both indices, as simple comparison with the variance formula should make clear.

These pairs of variances and indices can be used in multiple ways during the project to home in on specific problems or successes. You can apply them on a period by period basis for the work done during that period or for the project to date. You can also apply them for the whole project or for a particular work stream or task. It's you decision, based on how large and complex your project is and how long it will last for.

Predicting the future

So far, we've been looking at how to measure past performance and, useful as this is, what most project sponsors want to know is what the final cost of the project is forecast to be.

The most accurate way to answer this question would be to ask your project team to re-estimate all the remaining work on the project, total this up and add the actual cost to date. But in most cases, this is impractical; it would delay project activity and add more cost, as well as be highly unpopular with your staff!

A more practical approach is to extend the use of EVA by adding some extra measures. The **budget at completion (BAC)** is simply the total budget for the whole project, **estimate to completion (ETC)** is the estimated cost of the remaining work to be done and **estimate at completion (EAC)** is the estimated cost for the whole project including costs incurred to date. Using this terminology, you are being asked the question, what is your EAC? And you have two choices as to how you calculate an answer.

You have no doubt seen those financial services adverts that always carry the disclaimer 'Past performance doesn't guarantee future returns'. In a project management sense, you need to decide if the past is irrelevant to future performance or if your past performance (good or bad) actually does imply things will continue as before.

SGK Consulting Ltd
Pine Trees, Dark Lane
Tiddington
Stratford upon Avon
Warwickshire CV37 7AD

Phone: 0845 858 8000
Mobile: 07967 559375
E-mail: info@sgkconsulting.co.uk
Web: www.sgkconsulting.co.uk

If you believe the first case, then our EAC is equal to our actual cost to date plus the cost of remaining work, or mathematically

$$EAC = AC + ETC$$

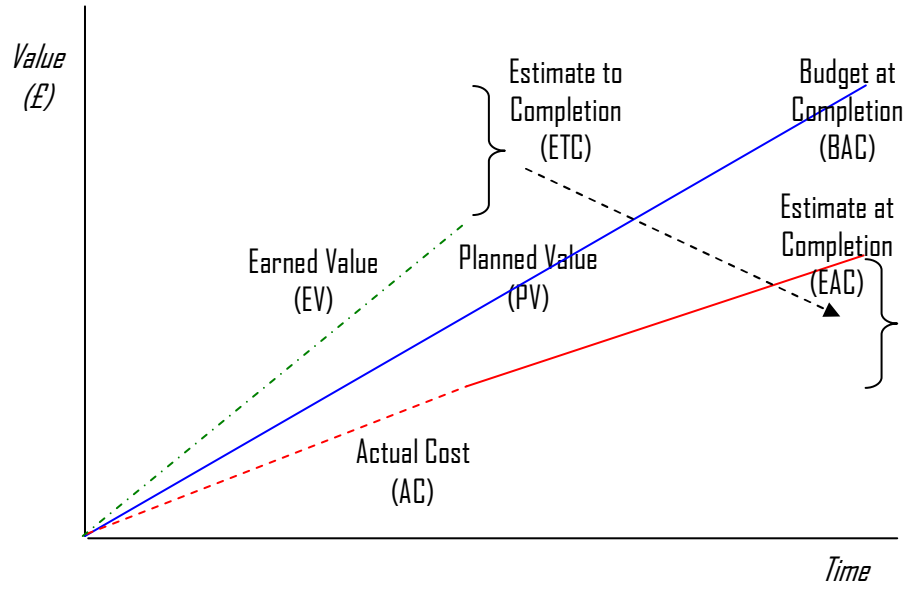
The cost of the remaining work is equal to the budget for the whole project minus the value of the work done so far or:

$$ETC = BAC - EV$$

And putting these together:

$$EAC = AC + BAC - EV$$

If all these formula are all becoming a bit overwhelming, another diagram may help to make it clear:

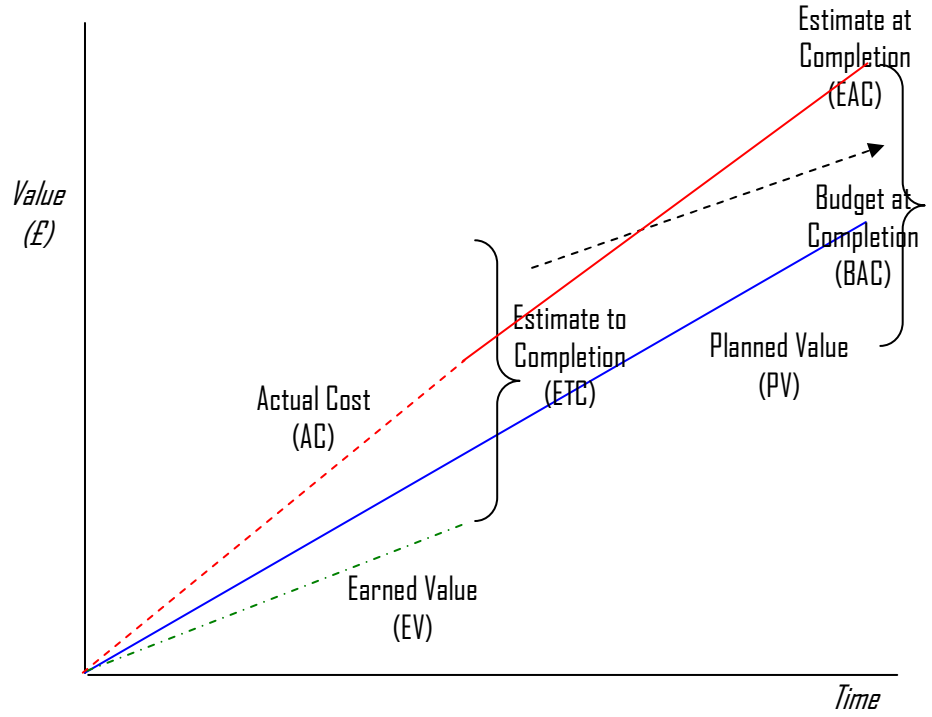


In this scenario, our project is ahead of schedule and below budget so as you would expect, the EAC is below the BAC or in other words, we expect to complete the project below budget.

But in this scenario, the project isn't performing so well:

SGK Consulting Ltd
Pine Trees, Dark Lane
Tiddington
Stratford upon Avon
Warwickshire CV37 7AD

Phone: 0845 858 8000
Mobile: 07967 559375
E-mail: info@sgkconsulting.co.uk
Web: www.sgkconsulting.co.uk



Here the project is behind schedule and over budget so as you would expect, the EAC is above the BAC or, in other words, we expect to overspend on the project

But if you believe the second case is more likely to happen, then we need to adjust our estimate of our remaining work to take into account if we are consistently over or under budget, in just the same way I'd adjust my project managers reports to reflect my experience of how optimistic or pessimistic they were. We use the cost performance index to do this:

EAC = AC + (BAC-EV)/CPI

Now you have an objective estimate for the cost of your project that you can defend in front of your project sponsor and use to compare different projects impartially and consistently.

What does 'almost finished' actually mean?

The key to using EVA to help you report project performance is that you need to be able to assess accurately how much work has actually been completed for each task. If it hasn't been started (0% complete) or it's already complete (100% complete), that's not a problem but what about work in progress? There is an old project management saying that 'the first 90% of the task takes 90% of the time and the remaining 10% of the task takes another 90%'. Which makes the point that it's important to distinguish between actual cost and actual achievement in completing the task.

If you are lucky enough to be working on a tangible task like building a wall or laying a floor, it's possible to measure how much progress has been made; in fact, quantity surveyors have made a profession out of exactly that. But if you are working on an intangible task like gathering requirements or supporting users it's not as straightforward.

SGK Consulting Ltd
Pine Trees, Dark Lane
Tiddington
Stratford upon Avon
Warwickshire CV37 7AD

Phone: 0845 858 8000
Mobile: 07967 559375
E-mail: info@sgkconsulting.co.uk
Web: www.sgkconsulting.co.uk

One simple rule is to consider the task as not started until it's complete, in other words it's either 0% or 100% complete; simple, but not really an accurate reflection of reality as its really side-stepping the problem. Alternatively, the 50% rule considers any partially complete task as 50% complete and so it's either 0%, 50% or 100% complete; this at least distinguishes between not-started and partially completed tasks. Most importantly, if you adopt this approach, make sure the tasks are short in duration and cost, so that this approximation doesn't skew your analysis too much.

EVA can be such a demanding friend

It may already have occurred to you, that there are some pre-requisites that are needed for EVA to work for you.

First, you need to have a well defined scope and time baseline that you can compare your performance to. Typically this will be a Work Breakdown Structure (WBS) in the first case and a project schedule in the second. Without this, your project team won't know what activity they are working on and will report time and cost to the wrong task or ignore it altogether. It's an important discipline to instil, that work is only recorded against valid project tasks. And following on from this, there has to be a good change control process in place so that as the scope changes, the baseline is adjusted accordingly. Clearly, expecting your staff to report against out-of-date tasks and activities will just confuse and frustrate them.

Just as importantly, there needs to be a good system for recording actual time and cost incurred against each project task. What I mean by this is a simple but comprehensive timesheet system to capture your staff's efforts and a project coding system that means materials and other purchased items are allocated to the right activity when the invoice is received. And don't forget to make sure travel expenses are also added to the right project task. If there is ambiguity or disagreement about what the actual project costs are, you aren't going to be able to present EVA information with confidence or credibility.

And as discussed, there needs to be agreement on how you will measure partial completion of each task as this will have a direct impact on the calculation of the earned value. Will you use a subjective estimate or will you apply the 50% rule, for example.

Finally, all this is of academic interest only, if your stakeholders don't have a clue what EVA is all about. All this talk of EV, CPI and EAC will result in glazed expressions and glancing at watches in meetings, unless you take the time to introduce them to EVA and agree it will be used for measuring your project performance.

Why you'll get along with EVA

As all project managers know, measuring project performance is all about tracking our progress against the triple constraint of scope, time and cost; are we doing the right activities to produce the right outputs within our time and cost constraints? The beautiful thing about EVA is that she answers all these questions for us within one set of calculations:

SGK Consulting Ltd
Pine Trees, Dark Lane
Tiddington
Stratford upon Avon
Warwickshire CV37 7AD

Phone: 0845 858 8000
Mobile: 07967 559375
E-mail: info@sgkconsulting.co.uk
Web: www.sgkconsulting.co.uk

- Because you are comparing planned and actual performance based on the tasks in your WBS, you are aligning your reporting with the **scope** of your project.
- Because you are comparing earned value and planned value for each task or for your whole project, based on the same cost rates and assumptions, you are aligning your reporting with the **time** dimension of the project.
- Because you are comparing earned value and actual cost for specific activities or for your whole project, you are aligning your reporting with the **cost** of your project.

No other performance reporting approach gives you all these answers, in a systematic approach that allows direct comparison of different projects at different stages in their lives. That's why organisations like the US Department of Defence (DOD) mandate its use with their contractors.

She's certainly a sophisticated friend, is EVA, but don't be put off by her formulae and terminology. Like all friendships it takes time to get to know each other but when you and your stakeholders get acquainted, she will be with you for life and never let you down. Just mention my name when you work with her.

SGK Consulting Ltd
Pine Trees, Dark Lane
Tiddington
Stratford upon Avon
Warwickshire CV37 7AD

Phone: 0845 858 8000
Mobile: 07967 559375
E-mail: info@sgkconsulting.co.uk
Web: www.sgkconsulting.co.uk