

Basics of Earned Value Project Management

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Project Management is often defined as the integrated management and control of Time, Cost, Resources and Quality for the successful on time and on budget completion of projects. Traditional approaches to PM ranged from simple Gantt Charts which help in representing the work to be done on a time scale to techniques like CPM and PERT that address the needs of deterministic and probabilistic scheduling. All of these techniques tend to be used primarily for managing time. Cost is often measured independently by the accountants. This separation between cost and time is often the cause of project failure because the executing team is often unable to detect cost overruns until they are well past the point where they can change the outcome of the project.

Earned Value Project Management (EVPM) is a concept that helps Project Managers seamlessly link Time and Cost for more effective control. Despite the difficult sounding title and the typical jargon associated with EVPM the basic idea is very simple and can be used effectively in a wide variety of situations. The best way to understand EVPM is to walk through a sample project, so I am going to take you through a building project. Let's say we are working on the renovation of an office building that has 10 floors each to be completed in one month with a budget of 10 Million Rupees each. The total project span works out to 10 months at a budget cost of Rs. 100 Million.

We are at the end of the first three months and the Project Manager is busy preparing his project report. He starts up by reviewing progress and finds that two floors are fully complete while the third floor is 80% complete. He checks with accounts and finds out that a total of Rs. 28 Million have been spent so far. With this information he is ready to assign values to the three basic variables required to perform EVPM. These are as follows-

1. BCWS – Budget Cost for Work Scheduled in the amount of money that should have been spent at this point in the life of the project if the project was proceeding as per plan. In our case we had planned to complete three floors in three months so we should have spent Rs. 30 Million. A word of caution here, most projects don't proceed in a linear fashion (i.e. total budget/total duration in months). Correct BCWS values can be obtained from

- a resource loaded project plan that takes in account the actually work to be done in each period.
2. ACWP – Actual Cost for Work Performed is the amount of money that we have actually spent on the project. Accounts have told us that we have spent Rs. 28 Million.
 3. BCWP – Budget Cost for Work Performed is the assessment of the value of work that we have completed. Think of this as the worth of the work that we have completed, so if we had completed three floors we would have completed 30 Million Rupees worth of work. But we have only fully completed two floors so we have Rs. 20 Million and we have 80% of the third floor. Partial completion is a tricky issue, because partial estimates generally vary from person to person depending on how optimistic or pessimistic they are. There are rules of the thumb (Heuristics) to deal with this situation. The common ones are 0-100 (give no credit till the task is complete), 20-80 (give 20% credit when the task is underway and the remaining 80% when it is completed), 50-50 (give 50% credit for starting the task and the balance on completion). The selection of method is up to you, but you need to ensure that you will use the same measure across the project for all tasks. In our case lets say we go with the 50-50 rule, so we'll give Rs. 5 Million credit for the third floor which brings the BCWP to Rs. 25 Million (20+5). Note that BCWP is also referred to as the Earned Value (EV).

Lets start by calculating the two basic measures of performance SPI and CPI –

1. SPI – Schedule Performance Index is an indicator for accessing our performance relative to the plan. $SPI = BCWP/BCWS = 25/30 = 0.83$. We know we are behind schedule, what SPI is telling us is that we have only completed 83% of the work that we originally planned to complete.
2. CPI – Cost Performance Index shows us how much value we are getting for each Rupee that we spend on the project. $CPI = BCWP/ACWP = 25/28 = 0.89$. We are over budget because, for producing Rs. 25 Million of work we have spent Rs. 28 Million. So we are only getting 89 Paisas of value for each Rupee that we spend.

Just looking at SPI and CPI we know that we have a problem in that we are both over budget and behind schedule. A lot of work has been done on the use of SPI and CPI early in the project to predict the final

outcome. Most of the work has been done in the US defense industry where researchers have looked at dozens of completed projects and tried to correlate their outcome with the status of their SPI and CPI early on during the project. Most studies show that the value of SPI and CPI when the project is only 20% complete can very accurately predict the final outcome. Using heuristics developed from these studies we can predict the following-

1. Projected Project Duration = Planned Duration / SPI = 10 / 0.83 = 12 Month. So we are expecting that the project will be completed two month behind schedule.
2. Projected Project Cost = Planned Cost / CPI = 100 / 0.89 = 112 Million. We are expecting a Rs. 12 Million overrun on the budget.
3. Recovery Cost – This is the cost that we will incur if we need to complete the project within the originally specified time by adding additional resource to the project. Projected Project Cost = Planned Cost / CPI*SPI = 100 / 0.89*0.83 = 135 Million Rupees. We should be ready to exceed the budget by 35% if we want to complete the project in time.

Conventional wisdom says that your ability to change the outcome of a project is maximum at the start of the project and minimum near the end of the project. So it makes good sense to detect problems early and take action when you have room for maneuver. If you think about the 20% point intuitively, you'll note that the any estimation errors that are leading to low CPI (i.e. budget overrun) are likely to effect the remaining activities of the project at the same rate, similarly the performance of your resources in execution is unlikely to get any better than what they have proven capable of in the first fifth of the project.

Given the importance of early detection, think about conventional project management and how little it can tell you from the fact that you have completed two floors and 80% of the third and spent 28 Million Rupees. Because of this, problems often evade early detection and by the time someone detects the problem its too late in the project to do much about it i.e. in a stage where the project is controlling the project manger instead of vice versa.

One final point on EVPM, typically the presentation that you use with EVPM reporting is to plot SPI and CPI at periodic intervals i.e. fortnightly, monthly. This gets you a very clear view of the project - where you stand now and the trend. You can use the trend display to

access the reaction of the project to your actions and revise the plan in response to the direction and intensity of the trends. Professional project management software packages (i.e. Primavera Project Planner) give you the ability to calculate and monitor EVPM parameters, in fact they can let you set alerts that will identify groups of activities that have moved beyond the pre set upper and lower limits for CPI or SPI, liberating your time from calculations so that you can spend your time in planning and controlling activities to keep the project on track.

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