

## EARNED VALUE ALERT!

### *Are You Doing It Right, Wrong, or At All?*<sup>1</sup>

Dr. Kenneth F. Smith, PMP

For the past few years I have only been preaching -- rather than practicing -- the project management tools & techniques I learned in the U.S. Defense Department, and subsequently honed throughout my USAID Foreign Service and international consulting careers. But following a recent discussion on Earned Value Methodology, I decided to go back to basics and revisit **EVM** the modern way -- by 'googling.' **In doing so, I was literally shocked by what I encountered.**

Searching on-line for '**Earned Value**,' the first seven sites from my query revealed the following:

1. <https://sitemate.com/resources/articles/finance/earned-value-formula/>

The earned value formula is a relatively straight forward one. You take the actual percentage of work which has been completed on the project, phase of work or specific task, and you multiply that number by the budget at completion.

$$\% \text{ of work completed} \times \text{BAC (budget at completion)}$$

The output of this formula is our earned value or [budgeted cost of work performed \(BCWP\)](#).

2. [www.projectengineer.net/the-earned-value-formulas](http://www.projectengineer.net/the-earned-value-formulas)

Also known as Budgeted Cost of Work Performed (BCWP), Earned Value is the amount of the task that is **actually** completed. It is also calculated from the project budget.

$$\text{EV} = \text{Percent Complete (actual)} \times \text{Task Budget}$$

For example, if the actual percent complete is 25% and the task budget is \$10,000,

$$\text{EV} = 25\% \times \$10,000 = \$2,500$$

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3. [www.planacademy.com/7-earned-value-management...](http://www.planacademy.com/7-earned-value-management...)

Earned Value is calculated as the Budget At Completion multiplied by the Percent of Work Completed. **EV = BAC x % Complete**

4. [www.indeed.com/.../earned-value-formula](http://www.indeed.com/.../earned-value-formula)

Earned value = (% completed) x (project budget)

Earned value of a project is a metric for tracking and evaluating a project's value and progress.

5. [tensix.com/the-8-earned-value-management...](http://tensix.com/the-8-earned-value-management...)

Formula: **EV = BAC x % complete** Output: You'll get a monetary amount as the earned value, in the currency of your project budget.

6. [study.com/academy/lesson/how-to-calculate-earned ...](http://study.com/academy/lesson/how-to-calculate-earned...)

The formula for earned value (EV) is the percent % of completed work times the Planned Value (PV).

7. [www.aresprism.com/blog/how-to-calculate-earned...](http://www.aresprism.com/blog/how-to-calculate-earned...)

Earned Value (EV): % complete x BAC. That is percent complete from progress measurement multiplied by the budget at completion.

“Why was I shocked?” You ask. Because **1) the definitions were imprecise, and 2) the formula differed from what I learned years ago -- and teach!**

It is often said that practice makes perfect; but that is not always correct. As Hama Yusuf has observed -- “**Practice makes permanent, not perfect. If you practice the wrong thing, you make the wrong act permanent;**” which -- in this instance -- unfortunately appears to be the situation.

I always understood ‘Earned Value’ (EV) was the ‘Budgeted Cost of Work Performed’ (BCWP): i.e. the **pre-planned, agreed-to, cost for the work completed – regardless of the schedule!**<sup>2</sup>

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<sup>2</sup> A quick check of the Project Management Institute’s definition in their **Guide to the Project Management Body of Knowledge (PMBOK 6<sup>th</sup> Edition)** as “*the budget associated with the authorized work that has been completed*” and the formula “*EV= sum of the planned value of completed work*” reconfirmed my understanding.

Thus, EV is *the cumulative budgeted amount in the pre-recorded project plan to be 'looked up'* whenever those work 'packages' are completed.<sup>3</sup> On the other hand, **all seven sources – and doubtless others – were consistent, but their 'quick & easy' % complete x BAC computation would only be accurate when the percentage ratio of the 'cost for work' was LINEAR<sup>4</sup>** -- i.e. when the percentage of the budgeted **cost** was equal to the percentage of the **work** planned – which is almost never, if ever the situation!

***My concern now is why these sources are consistently wrong!***

Realistically, the 'cost for work' relationship is unique for every work package, so instead of linear assumptions, **S-Curve graphs** are widely used to depict '**Work vs. Schedule**' and '**Cost vs. Schedule**' plans; as well as measuring & monitoring the percentage variance to subsequently track performance.

However, **while perhaps useful for cost accounting** – monitoring the '**Cost vs. Schedule**' in terms of percentages **is the wrong approach** to accurately determine integrated performance status. That is why the 'Earned Value' (EV) indicator **without reference to the schedule** -- aka (Budgeted Cost of Work Performed) -- was created in the first instance.

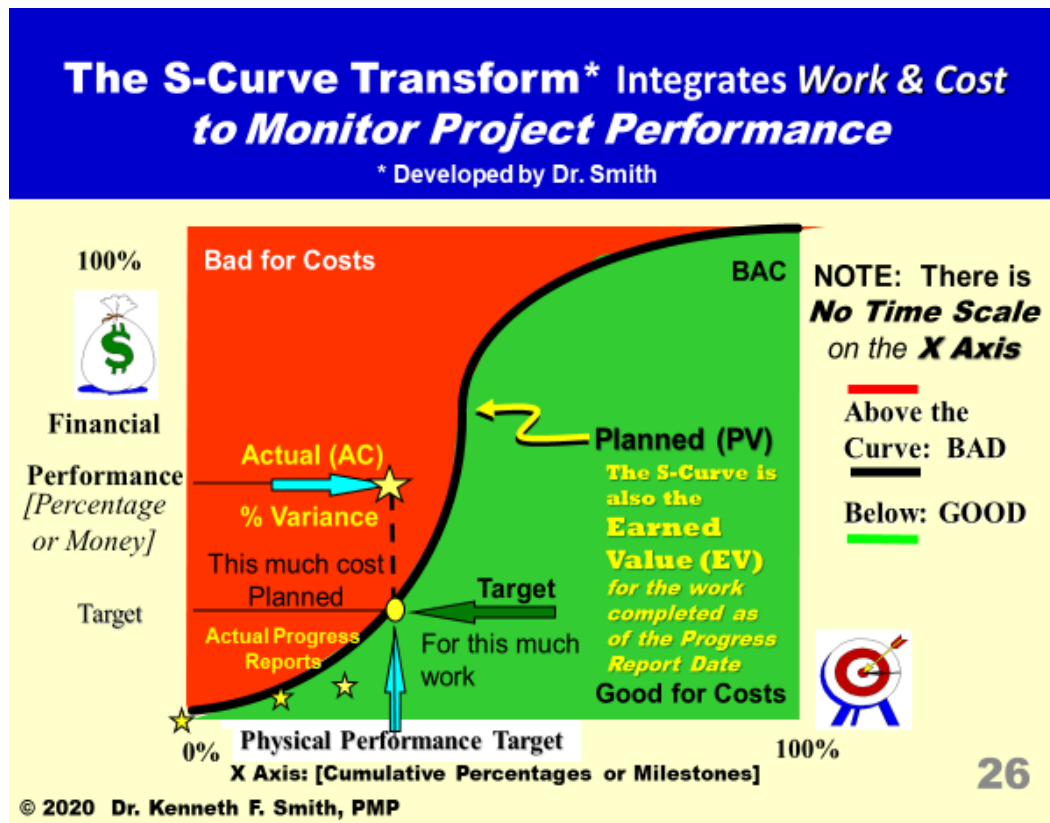
**With EV**, rather than the *percentage* of work completed vs. the total budget, **actual costs for the cumulative increments of actual work completed are – or should be -- compared against the planned cost for that work. An S-Curve 'Transform' -- such as illustrated in Figure 1-- highlights this, depicting the cumulative planned 'Cost for Work' which is designated the 'Earned Value' as each unit of work is completed – regardless of the Actual Cost incurred.**

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<sup>3</sup>As a percentage of the total project budget the EV would then be the *cumulative BCWP* divided by the project's Budget at Completion (BAC) – i.e. **Cumulative BCWP/BAC**.

<sup>4</sup> Such as when incremental work packages are similar, as in a repetitive-type project.

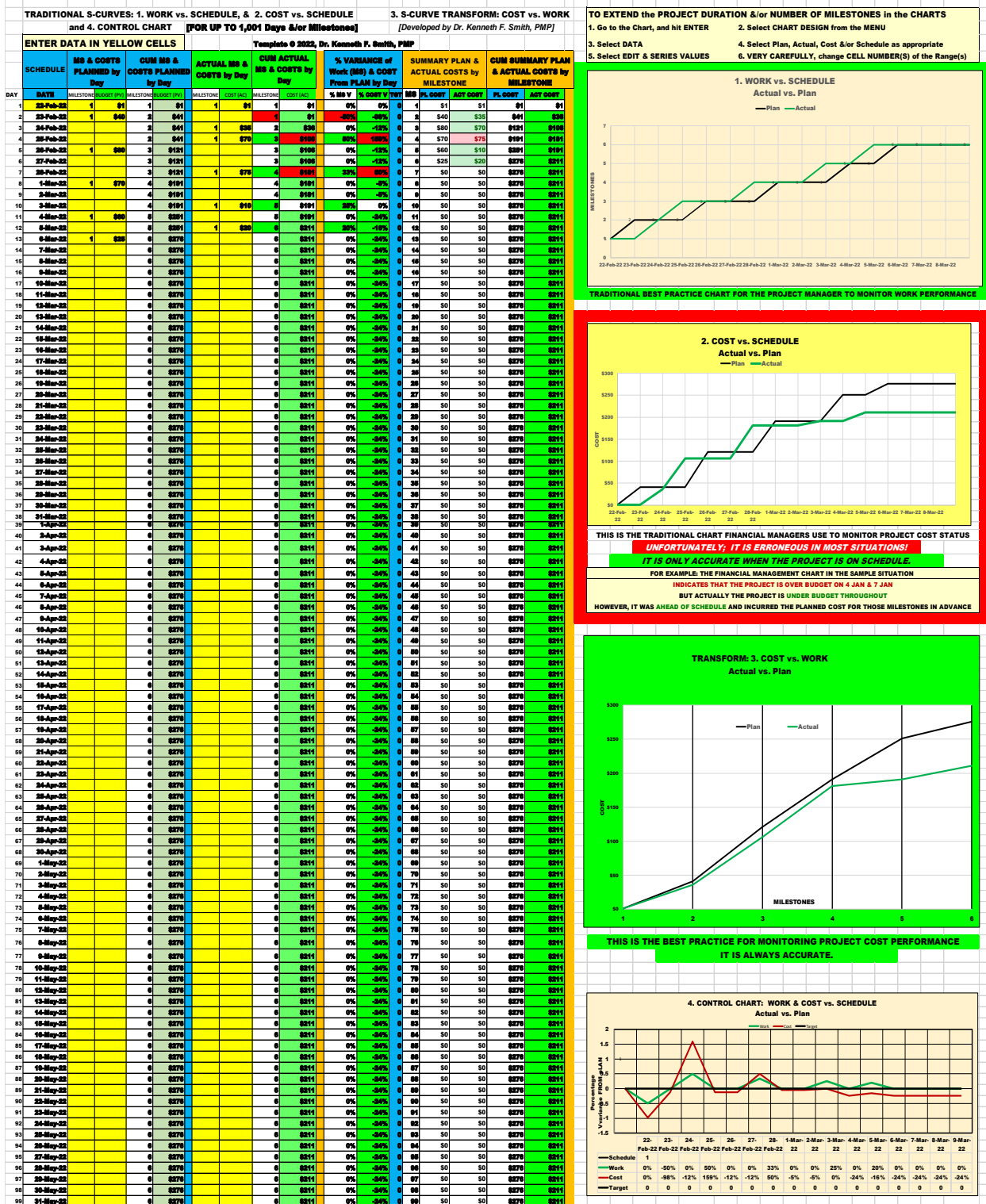
Figure 1



The S-Curve ‘Transform’ depicts the cumulative cost planned for the cumulative increments of work – regardless of the schedule – i.e. the cumulative ‘Earned Value’ for the entire project life. To reiterate: There is no ‘formula;’ there is no ‘EV formula’ to ‘compute’ after the fact. It was a pre-determined ‘Constant:’ the pre-planned budget. Look it up! [The Actual Cost at any point in time is depicted in the graph by the stars.]

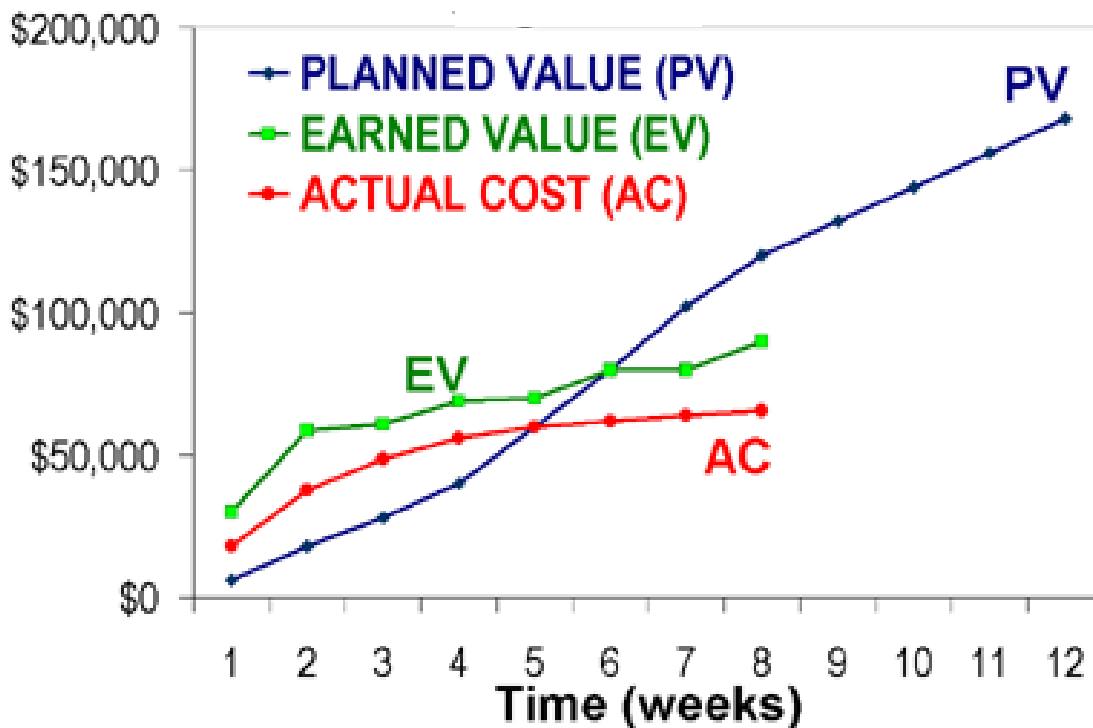
I developed another excel template to record planned & actual work (milestones) and related costs, then calculate performance and display the results by all three S-Curves, plus a Control Chart, as summarized in Figure 2.

Figure 2



Typically, though, the **PV**, **EV** and **AC** S-curves are combined in one S-Curve chart, with the Schedule on the X-Axis and either the percentage, or monetary value, on the Y-Axis as depicted below:

**Figure 3**



**NOTE:** Although in monetary terms, this example shows the **physical work** at week 8 is **behind schedule** (*EV is less than PV*), but also **under budget** (*AC is less than EV*).

However, to obtain the value in order to plot the **EV** necessitates **computing** the **EV** data **somehow**. (Whereas with my S-Curve Transform the values could simply have been **looked up to plot** on the graph!)

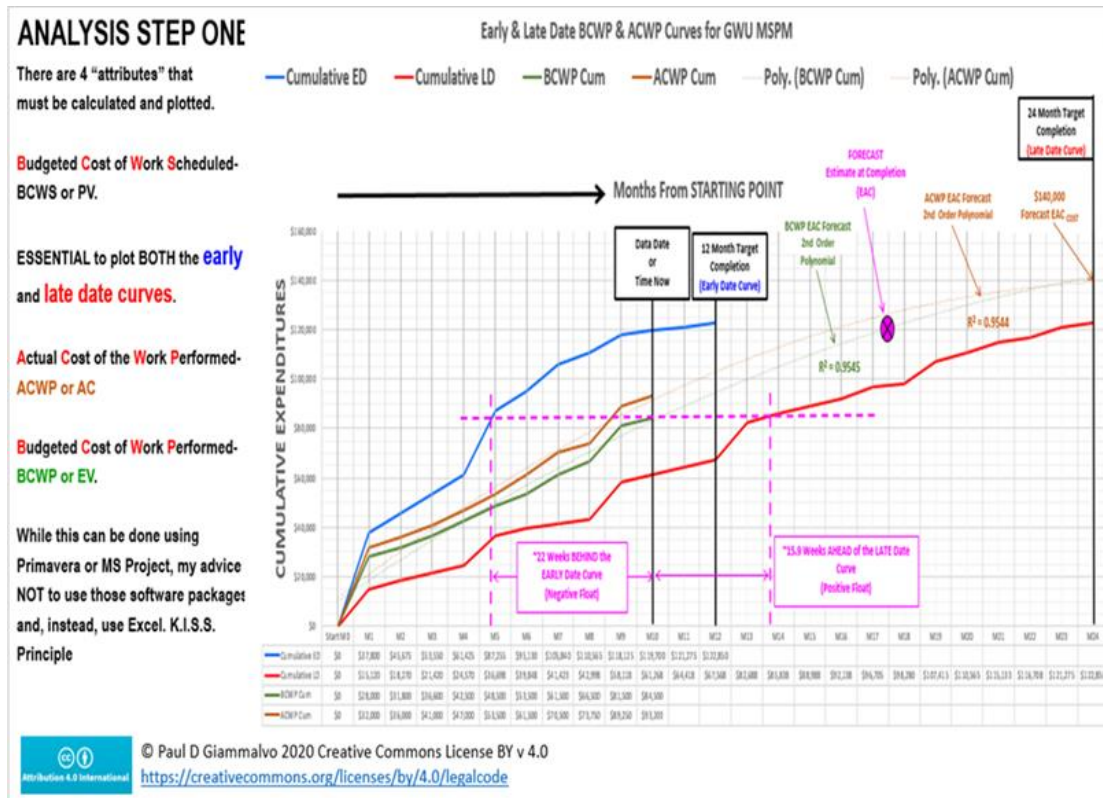
One possible explanation for using the **'percentage of completed work times the Budget at Completion (BAC)' formula** (instead of the **Planned Value** for the Work completed as a percentage) is that since PMBOK's 6<sup>th</sup> edition was published in 2017, **the U.S. Defense Department's guardians of EIA-748 EVM Standards, and/or other EVM gurus already know the formula is only an approximation** -- like a 'rule of thumb' -- but nevertheless have subsequently adopted & institutionalized it because it is 'quick & easy' to apply; and 'close enough for government work'<sup>5</sup> as we jokingly used to say.

<sup>5</sup> i.e. within an acceptable margin of error



However, Paul Giammalvo’s graphic – exemplified in figure 4<sup>6</sup> – is more effective for *integrated progress analysis; and especially for forecasting within Early & Late bounds.*

**Figure 4**



Furthermore, the Earned Value *Methodology* has two key indicators for monitoring project performance variance from plan:

1. **Cost Performance Index (CPI)** = EV / AC

*The relative worth (or “value”) of each \$1.00 spent for work actually completed.*

2. **Schedule Performance Index (SPI)** = EV / PV

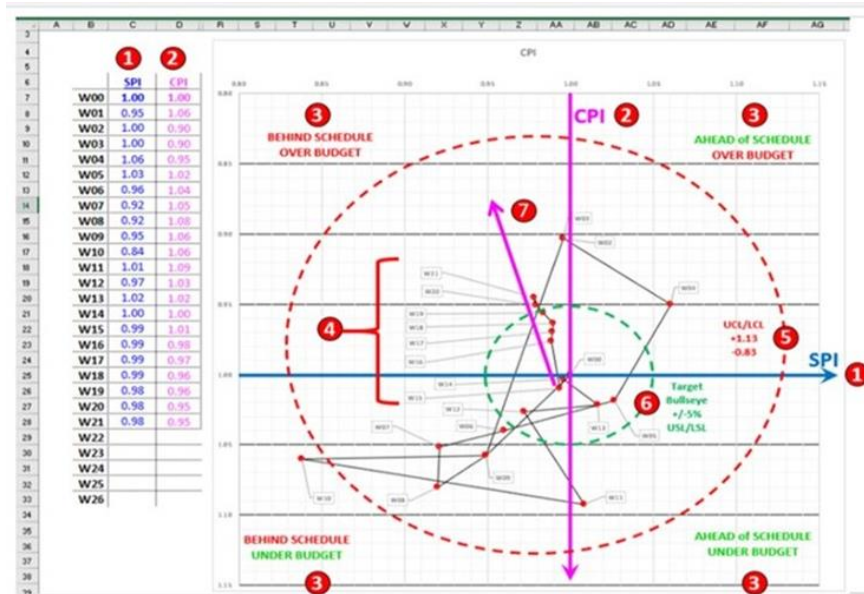
<sup>6</sup> Source: Giammalvo, P. D. (2022). The Origins and History of Earned Value Management – “A Contractor’s Perspective”; featured paper, PM World Journal, Vol. XI, Issue IX, September. <https://pmworldlibrary.net/wp-content/uploads/2022/09/pmwj121-Sep2022-Giammalvo-origins-and-history-of-evm-a-contractors-perspective.pdf>

***A ratio of the cumulative budget for the work actually completed, compared to the cumulative amount for the work planned to be completed.***

These indicators are extremely useful because the ***coordinate of their indices*** provides significant additional information for project performance analysis.

Paul’s SPI/CPI “Bullseye” Chart – *while more complex* – among other things, addresses the ***margin of error issue*** as a ***circular error probability***<sup>7</sup> as illustrated below; and described in more detail in the footnote.<sup>8</sup>

**Figure 5**



<sup>7</sup> A ‘cep’ in military targeting jargon

<sup>8</sup> Somewhat akin to a military Target Intelligence Analyst’s post-strike bomb damage assessment (PS/BDA), this “Bullseye” chart shows how close to, or far from, the ‘*on-schedule, on-budget*’ target the **CPI (1)** and **SPI (2)** are. Calculated every week, the chart also reveals successive information about **five additional ‘need to know’ aspects of the project’s implementation**. Clockwise, from upper left, **(3)** tells us whether our project is: **3.1 Behind Schedule & Over Budget; 3.2 Ahead of Schedule & Over Budget; 3.3 Ahead of Schedule & Under Budget, or 3.4 Behind Schedule & Under Budget**. **(4)** provides important information about the **work-flow process**; i.e. whether it is producing **consistent or erratic results**, and also **(5)** whether the work-flow process is within +/- three sigma, and **(6)** also whether the work-flow process is within the targeted specifications. [For contractors, working on single-digit “bottom-line profit margins, the acceptable range is +/-5% or SPI & CPI values between 0.95 and 1.05.] Finally, **(7)** indicates any **trends** that may be developing (for example, this information illustrates 5 weekly readings in a row heading in a Northwesterly direction – i.e. **Behind Schedule & Over Budget, and getting progressively worse**). **Source:** Giammalvo, P. D. (2022). The Origins and History of Earned Value Management – “A Contractor’s Perspective;” featured paper, PM World Journal, Vol. XI, Issue IX, September.



I commend these tools to your attention as additional aids for monitoring and managing your project's status.<sup>9</sup>

My prime focus in this article however, is to highlight the need for accuracy of the EV formula, rather than subsequent analysis. Nevertheless, since computation of the **CPI & SPI** are both dependent on **EV**, **my immediate concern here is that – rather than simply a quick & easy ‘rule of thumb’ -- the aforementioned ‘on-line’ EV formula is fatally flawed -- consequently rendering any subsequent analyses consistently wrong.**

**Thus, I'd appreciate any feedback from other purveyors &/or practitioners regarding the etymology, current usage and utility of ‘% (of work) complete x BAC’ to derive EV; subsequently leading to a concerted effort by ‘the powers that be’ to initiate steps to correct the prevailing situation.**

Other than ‘**how to obtain an Earned Value**’ correctly, a crucial related issue -- for me to pass on to my participants is:

**“How best to obtain timely, accurate, data on work-package-related ‘Actual Costs’ during implementation?”**

But in the meantime, still shell-shocked from my encounter of the first kind with contemporary EVM literature, I hesitate to see what else is being bandied about; so will take a respite and wait for further feedback before delving deeper.

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<sup>9</sup> As usual, **my templates** and many others are available for free on proof of purchase of my book **Project Management PRAXIS**, available from Amazon. Contact Dr. Paul D. Giammalvo; [pauldgphd@gmail.com](mailto:pauldgphd@gmail.com) for further information about his graphics.

## About the Author



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Initially a US Civil Service Management Intern, then a management analyst & systems specialist with the US Defense Department, Ken subsequently had a career as a senior foreign service officer -- management & evaluation specialist, project manager, and in-house facilitator/trainer -- with the US Agency for International Development (USAID). Ken assisted host country governments in many countries to plan, monitor and evaluate projects in various technical sectors; working 'hands-on' with their officers as well as other USAID personnel, contractors and NGOs. Intermittently, he was also a team leader &/or team member to conduct project, program & and country-level portfolio analyses and evaluations.

Concurrently, Ken had an active dual career as Air Force ready-reservist in Asia (Japan, Korea, Vietnam, Indonesia, Philippines) as well as the Washington D.C. area; was Chairman of a Congressional Services Academy Advisory Board (SAAB); and had additional duties as an Air Force Academy Liaison Officer. He retired as a 'bird' colonel.

After retirement from USAID, Ken was a project management consultant for ADB, the World Bank, UNDP and USAID.

He earned his DPA (Doctor of Public Administration) from the George Mason University (GMU) in Virginia, his MS from Massachusetts Institute of Technology (MIT Systems Analysis Fellow, Center for Advanced Engineering Study), and BA & MA degrees in Government & International Relations from the University of Connecticut (UCONN). A long-time member of the Project Management Institute (PMI) and IPMA-USA, Ken is a Certified Project Management Professional (PMP®) and a member of the PMI®-Honolulu and Philippines Chapters.

Ken's book -- **Project Management PRAXIS** (available from Amazon) -- includes many innovative project management tools & techniques; and describes a "**Toolkit**" of related templates available directly from him at [kenfsmith@aol.com](mailto:kenfsmith@aol.com) on proof of purchase of PRAXIS.