

## MONITORING & ANALYZING PROJECT COSTS: *PMBOK+PLUS Tools & Templates to Facilitate Financial Analysis*<sup>1</sup>

Dr. Kenneth F. Smith, PMP

The traditional financial management practice of assessing Project Cost Performance by comparing ‘Burn Rates’ vs cumulative baseline budgets is *fatally flawed*; resulting in *erroneous assessments* most of the time! This is a shocking assertion and situation -- *to say the least* – deserving of further explanation; and even more importantly, *Rectification*.

The ‘root cause’ – *to cite a contemporary catchphrase* -- is because the traditional practice is *only valid for analyzing PROJECT expenditures when Projects are ‘On Schedule,’*-- *which is not very often.*

Indeed, during implementation, changes in both work accomplishment rates and related costs are frequent, and **thirteen (13) possible combinations of work performance vs. the project schedule, budget and actual cost exist.** Of these 13, *only three* are when the project is ‘*On Schedule.*’<sup>2</sup> Thus, in most situations (77%), traditional financial analysis reports ‘False Positives,’ ‘False Negatives’ or incorrect amounts!

For instance, **if project work is delayed**, the project will most likely not incur the costs budgeted for its accomplishment when scheduled. Cumulative costs vs. the scheduled budget would thus be reported -- *incorrectly* -- as ‘*under budget.*’ Moreover, even if the project did incur additional costs, *until the cumulative budget was exceeded,* costs would still be **incorrectly reflected as ‘under,’ or ‘on’ budget.**

Similarly, **if project work is performed ahead of schedule**, even if ‘*on budget*’ it would usually necessitate utilizing the budget *earlier* than scheduled. However, **cumulatively, that would be incorrectly reflected as “over budget;”** i.e. ‘*A False Negative.*’

Consequently any ‘corrective’ action indicated by the accounting profession’s conventional analytical protocol would only lead to *counter-productive management decisions!*

---

<sup>1</sup> How to cite this article: Smith, K. F. (2022). MONITORING & ANALYZING PROJECT COSTS: PMBOK+PLUS Tools & Templates to Facilitate Financial Analysis, *PM World Journal*, Vol. XI, Issue VI, June.

<sup>2</sup> Highlighted in my June 2019 PMWJ article: *Understanding & Applying Earned Value: A ‘Quick & Easy’ Approach for Monitoring Project Implementation*, *PM World Journal*, Vol. VIII, Issue V. [For the reader’s convenience, those 13 conditions are outlined again in this article.]

Obviously, a significantly different approach to financial analysis of Project Cost performance is warranted to determine the project's true status.

### **HOW THEN SHOULD PROJECT COST PERFORMANCE BE ANALYZED?**

Well, actually a procedure already exists, *but – unfortunately --* MOST FINANCIAL MANAGERS, ACCOUNTANTS AND AUDITORS ARE OBLIVIOUS TO IT.

In the face of numerous **project cost overruns**, during the early-1960's<sup>3</sup> – *i.e. almost 60 years ago* -- the US Department of Defense (DOD) created a **PERT/Cost** system to track project costs **with a unique new variable**. Instead of measuring *the rate of spending against the schedule*, costs were compared to *how much had been planned to be spent at intermediate stages for the work completed – regardless of the schedule*. This new indicator reflected the *dynamic cost performance, enabling the project manager to estimate the 'cost to complete' much earlier than hitherto, and note the difference*; rather than simply the percentage expended to date vs. the budget.

---

<sup>3</sup> Early in 1964, pursuant to US Secretary of Defense Robert McNamara's edict requiring PERT/CPM & PERT/Cost be utilized for planning and managing US defense contracts, the **PERT Orientation & Training Center (POTC)** was established to teach -- and assist -- US government officials and contractors in their concepts, methodology and application. Conceived as a US DOD "Interagency" service organization, the POTC was established under the direction of Guy Best within the office of Ron Fox, Secretary of the Air Force for administration and management. I had already had on-the-job training and experience in PERT/CPM with the Navy Department, and was appointed as one of several POTC itinerant civilian faculty. Before starting to deliver training and consulting assistance to others, we ourselves were all re-oriented and "baselined" with a Management Information Systems (MIS) training program. Our facilitators & mentors were several members of Ron Fox's former consultancy firm – Management Systems Corporation (MSC) – notably Bill Mulcahy and an Australian, Peter Bowden. At the POTC I also learned about **Value** from Hans (Whitey) Driessnack -- the '*Father of PERT/Cost*' – when he was an Air Force Major working for Bud Buschman (*sp?*) in the SecDef Office. [*I was concurrently an Air Force Reserve Lieutenant.*] As part of my POTC program outreach, in August 1965 I authored an article: "**WHAT IS THE VALUE OF VALUE?**" which the Navy Department published in their Navy Management Review, NAVSO P910 Vol X No. 8, Office of Management Information. [*Years later I encountered Whitey at a PMI conference in Washington. He was then a three-star Lieutenant General, and Comptroller of the Air Force; while I had attained the rank of Colonel.*]

The new measure -- dubbed '*Value of Work Performed*,' or simply "Value" – unfortunately conferred a **new meaning** on a familiar term. [Conventionally, the **value** of an item is whatever you are *willing to pay* for it, and the higher the cost, the better the perceived value.

But now value was being used to mean whatever you *planned to pay* for it, and actual cost conferred no value!] This misnomer of an otherwise innovative artifact sowed the seeds of confusion, and led to subsequent misinterpretation, misuse and endless concerns regarding its utility. Consequently, later, "Value" was elucidated as '*Budgeted Cost of Work Performed (BCWP)*'<sup>4</sup> -- distinct from the traditional '*Budgeted Cost of Work Scheduled (BCWS)*.' But aficionados were unwilling to relinquish their hold and persisted with the preeminently erroneous "Value" designation.

Subsequently, as one of its first orders of business, in 1969 the Project Management Institute (PMI) promoted '*Earned Value*' Methodology (EVM) as a 'best practice' for *integrated work & cost performance monitoring & analysis*. Still later BCWP was eponymously renamed 'EV' – i.e. **Earned Value**, and BCWS was redesignated 'PV' **Planned Value**.'

**And that is a continuing challenge we have to live with today.** The Earned Value Method is replete with numerous unique formulas as indicators for measuring & analyzing different aspects of integrated project work and cost performance. For example, to illustrate just a few:

$$\begin{array}{ll}
 \mathbf{CV = EV - AC} & \mathbf{SV = EV - PV} \\
 \mathbf{CPI = EV/AC} & \mathbf{SPI = EV/PV} \\
 \\
 \mathbf{VAC = BAC - \frac{BAC \times AC}{EV}} & \mathbf{EAC1 = AC + \frac{BAC - EV}{EV/AC \times EV/PV}}
 \end{array}$$

Despite its cryptic variable acronyms & myriad formulas -- *which we won't delve into here* -- **comparisons between PV, AC (Actual Cost) & EV are the Essence of analyzing cost performance with the Earned Value Method.** This new variable **highlights the errors in cost performance assessment by traditional financial management** in ten of the aforementioned thirteen implementation states, as illustrated on the following page.

<sup>4</sup> Without regard for when the work was completed (i.e. whether *On, Ahead of, or Behind* the Planned Schedule).

**Figure 1**

<b>EARNED VALUE ANALYSIS is ESSENTIAL because Traditional Financial Analysis is WRONG MOST OF THE TIME!</b>				
<b>Traditional Financial Analysis (TFA) Incorrectly Assesses the DIRECTION of SIX PPI Cost Combinations as "Over" instead of "Under," or "Under" instead of "Over;" or "On" BUDGET. That is a 46% ABSOLUTE ERROR RATE!</b>				
<b>For Example:</b>				<b>AS well as the AMOUNT of Underrun or Overrun in FOUR other Combinations for an additional 31% ERROR RATE, and a TOTAL 77% ERROR RATE!</b>
PPI	PV	AC	EV	
1	\$100	\$70	\$120	TFA Incorrectly Assesses the Amount of this Cost Underrun as \$30 instead of \$50
2	\$100	\$100	\$120	TFA Incorrectly Assesses this Combination as On Budget instead of an Underrun of \$20
3	\$100	\$80	\$100	
4	\$100	\$120	\$150	TFA Incorrectly Assesses this Combination as a Cost Overrun of \$20 instead of an Underrun of \$30
5	\$100	\$120	\$120	TFA Incorrectly Assesses this Combination as a Cost Overrun of \$20 instead of "On Budget"
6	\$100	\$100	\$100	
7	\$100	\$60	\$80	TFA Incorrectly Assesses the Amount of this Cost Underrun of \$40 instead of \$20
8	\$100	\$120	\$100	
9	\$100	\$80	\$80	Traditional Financial Analysis Incorrectly Assesses this Combination as a Cost Underrun
10	\$100	\$140	\$120	TFA Incorrectly Assesses the Amount of this Cost Overrun as \$40 instead of \$20
11	\$100	\$80	\$60	TFA Incorrectly Assesses this Combination as a Cost Underrun of \$20 instead of an Overrun of \$20
12	\$100	\$100	\$80	TFA Incorrectly Assesses this Combination as On Budget instead of a Cost Overrun of \$20
13	\$100	\$130	\$80	TFA Incorrectly Assesses the Amount of this Cost Overrun as \$30 instead of \$50

**NOTE: Traditional Financial Analysis is only accurate in three situations – PPI #s 3, 6 & 8 - when the project is On Schedule – i.e. when PV = EV.**

**ALSO NOTE: Earned Value (EV) – or *Budgeted Cost of Work Performed*<sup>5</sup> if you will – is not real money, but rather a *performance variable* in monetary terms.**

<sup>5</sup> Trimming the terminology and adding ‘Value’ to the variables *added ‘value’* in name only, and has unnecessarily increased the level of confusion by laymen about the Earned Value Method. Hence, today, although those ‘before & after’ acronyms are interchangeable, they must constantly be clarified for diverse stakeholders; as younger generations are largely unfamiliar with either or both sets.

**To REITERATE:**

Project Baseline Budget **Schedules** are based on the **WORK PLANNED**, *i.e.* the **PV**. Therefore, **TO DETERMINE TRUE COST PERFORMANCE**, the **ACTUAL COST (AC)** to date should be compared with the **BUDGETED COST** of the **WORK PERFORMED**, *i.e.* the **EV**

**WITHOUT REGARD WHEN THE WORK WAS ORIGINALLY SCHEDULED TO BE DONE;**  
**NOT the CUMULATIVE BUDGET AMOUNT SCHEDULED (PV) to be Disbursed To Date!**

**“Earned Value” is thus the original Cumulative Estimated Cost to perform Project Activity Work – i.e. the PV of the Work Breakdown Structure “Packages,” Components -- &/or cost of the level of effort planned to be incurred to Reach their completion Milestones.**

Four “Drivers” are the **KEYS** to Understanding “Earned Value Analysis:”

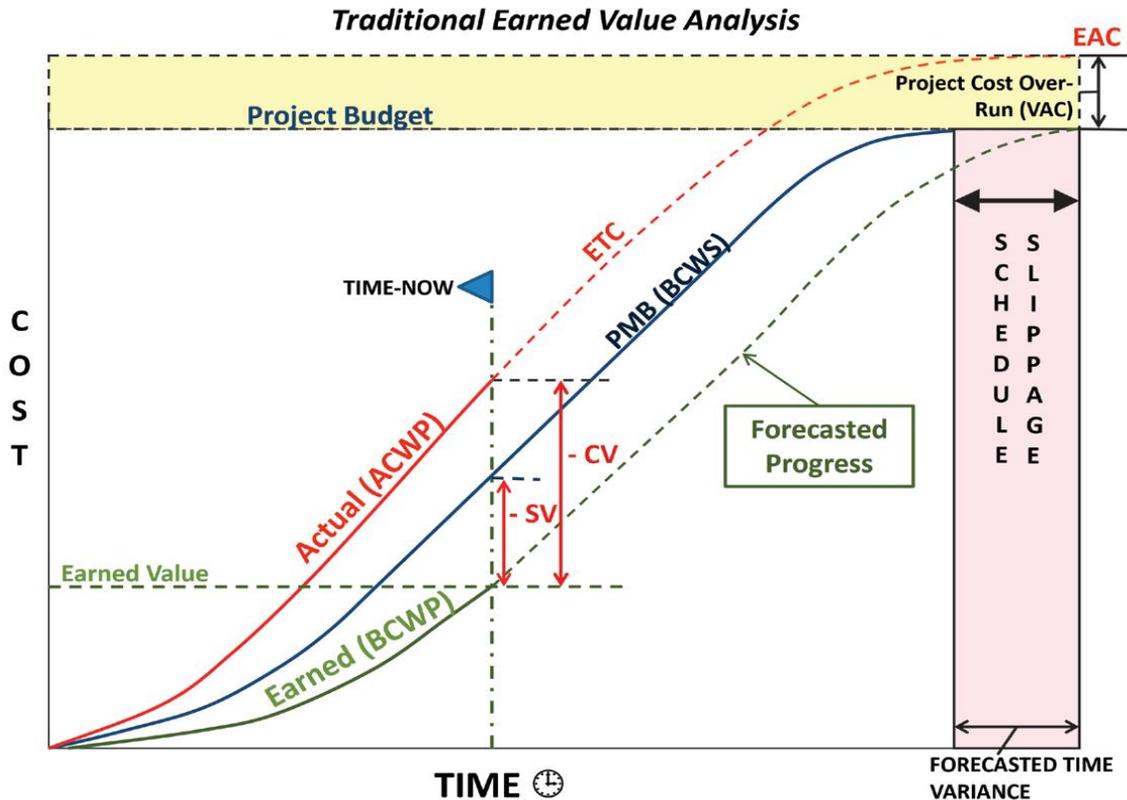
1. **PV = Planned Value** [Also known as the **Budgeted Cost of Work Scheduled**, **BCWS** or **BS** ] **The Amount originally Planned to be Spent for the Work originally Scheduled to be Done to Date**
2. **AC = Actual Cost of Work Performed**, **ACWP** or **AP** **The Amount Actually spent or ‘Committed’ for the Work Actually Done to Date**
3. **EV = Earned Value** [Also known as the **Budgeted Cost of Work Performed**, **BCWP** or **BP** ] **The Original Amount Planned to be Spent for the Work Actually Done to Date. Derived from the PV -- the Baseline Work Budget -- EV is thus *Unique to the Earned Value Methodology*]**
4. **BAC = Budgeted Cost at Completion.** **The Amount originally Planned to be Spent for the Total Project**

This revolutionary analytical approach boosted the esoteric expertise and mystique of the project management practitioner cognoscenti. **Unfortunately, despite the 50+ year passage since its existence, the paradigm shift in project cost performance analysis embodied in the Earned Value Method is still not widely appreciated, recognized or taken into account by traditional accountants, auditors, or organization executives.** EVM is not a component of their academic accounting or business degrees, on-the-job training or subsequent professional certifications. Consequently, **most accountants and auditors have never even heard of EV – or think it is something obscure to do with benefit/cost discounting.** MBA programs also rarely – if ever -- include Project Management and EVM in their curriculum as required courses.

Furthermore, many project management practitioners I’ve encountered in conferences who should know better and do use EVM – *usually embedded in software as a contractual reporting requirement – admit they don’t know how to derive EV*, but merely apply it in a perfunctory manner without fully understanding its **real value.**

Moreover, although **VALUE** is only **‘EARNED’ when the work is COMPLETED without regard for when it was originally scheduled**, the dysfunctional traditional Cost vs. Schedule S-Curve – **which focuses on time** and overshadows **cumulative cost performance vs. completed work** -- was the initial graphic of choice to display and analyze the data; and continues today as the ‘flagship’ graphic for monitoring and analyzing cost performance.

**Figure 2**

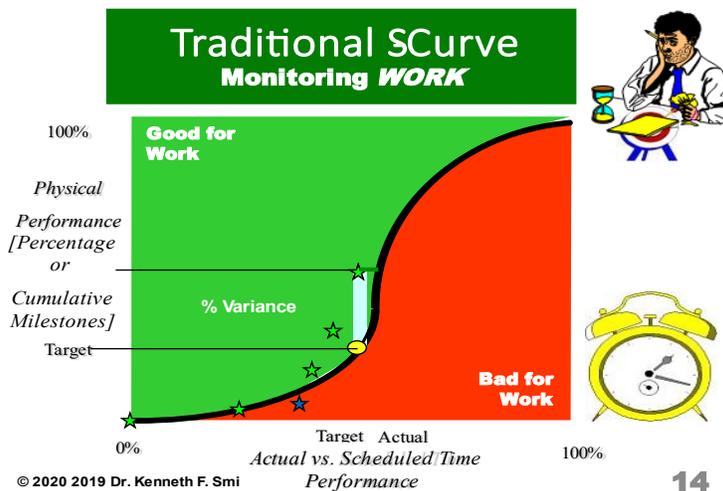


Despite the traditional Cost vs. Time S-Curve’s glaringly dysfunction format, it is great for analysts and technical wonks, as it integrates a plethora of concepts in an ‘all-in-one’ graphic. However, thus encumbered, **that graphic is excessively complex**. It tends to induce MEGO – *My Eyes Glaze Over* – in most audiences to whom it is exposed and who attempt to discern the variety of its implications during briefings; especially Executives at the board room level and others removed from the project analyst’s alcove! Thus cluttered, the traditional S-Curve is consequently the basis for much of the misunderstanding regarding EV, Cost Variance (CV) and Schedule Variance (SV).

Instead of a **‘one-chart fits all’ for analysis**, each professional stakeholder deserves a separate graphic, highlighting their particular area of expertise and interest. Monitoring and analyzing **Work performance vs Schedule** (*the technical aspect*), **Cost performance vs Schedule** (*the accountant’s aspect*), and **Cost performance vs Work** (*the essence of Earned Value*), are

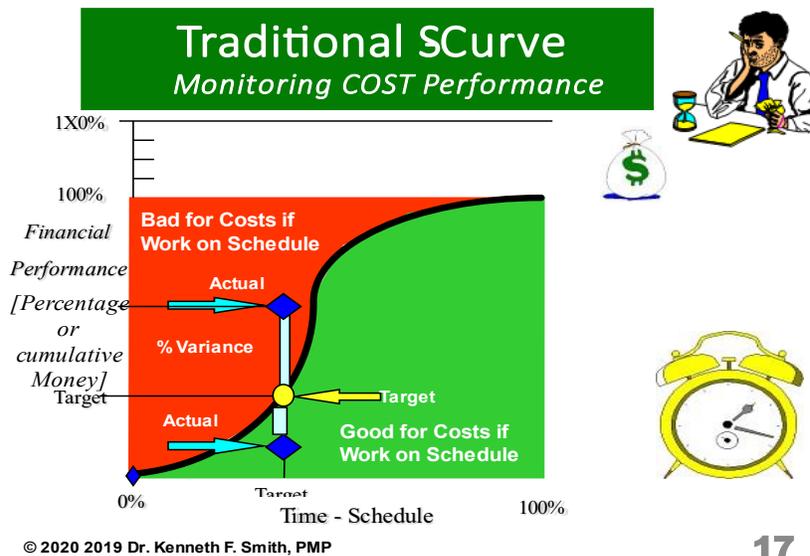
distinctly different, and should not be displayed in the same Traditional S-Curve chart for diverse audiences. To that end, I decluttered the Traditional Earned Value Analysis chart, disaggregating its key components into **stand-alone** charts more suited to highlighting their particular aspects, as follows:

**Figure 3**



14

**Figure 4**

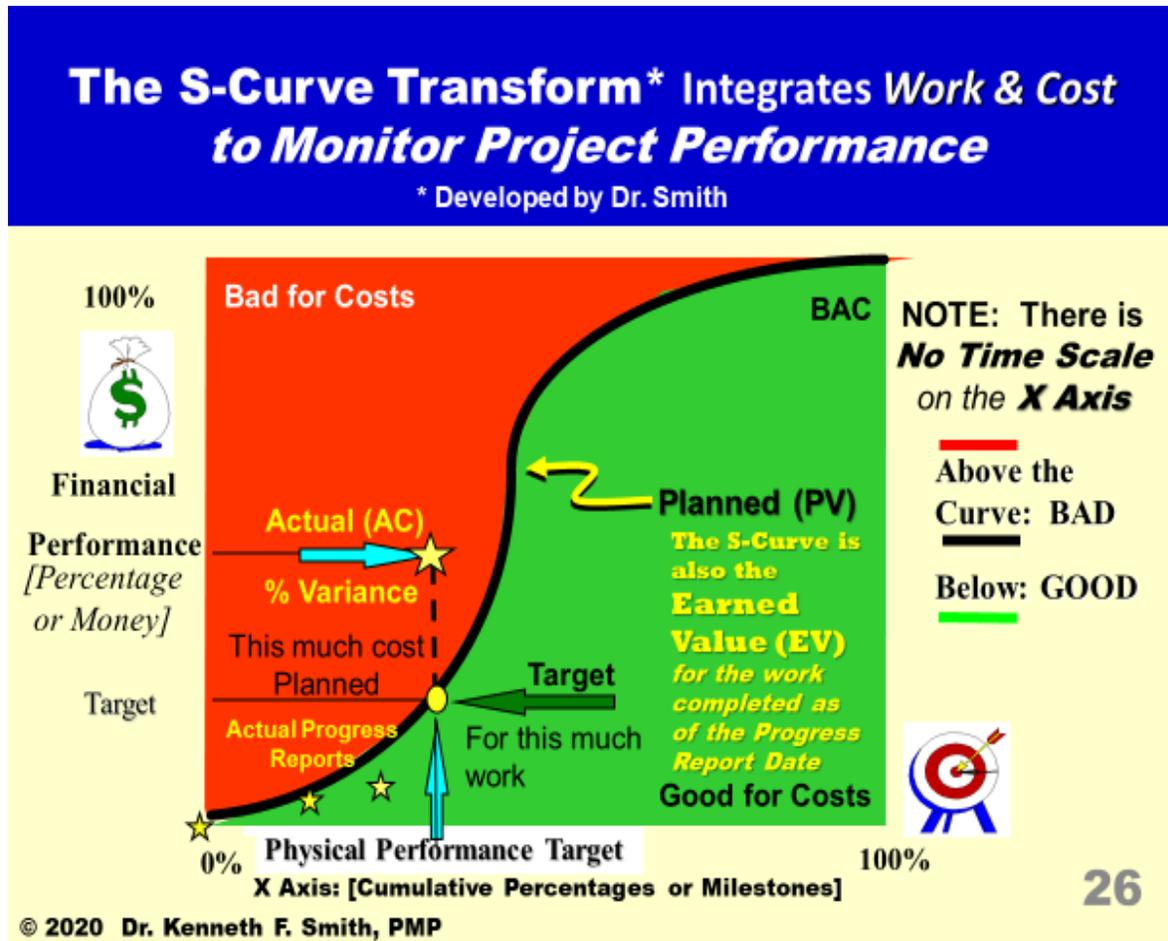


17

**NOTE:** Figure 4 reflects the planned and actual ‘burn rate’ so has the caveat that Variance from the Planned Budget Schedule is only Bad (or Good) if the work is ‘on schedule.’ Otherwise, the apparent variance may be spurious. [As indicated earlier, there are 13 possible combinations of work and cost during project implementation, of which only three are “on schedule.”]

To supplement these traditional S-curves, I created a totally new ‘S-Curve Transform’ which accurately depicts cumulative Cost vs Work (as either milestones or percentages) *for the life of the project*, compared to the Planned Value (PV) -- which effectively is the EARNED VALUE (EV) whenever the work is completed.

Figure 5

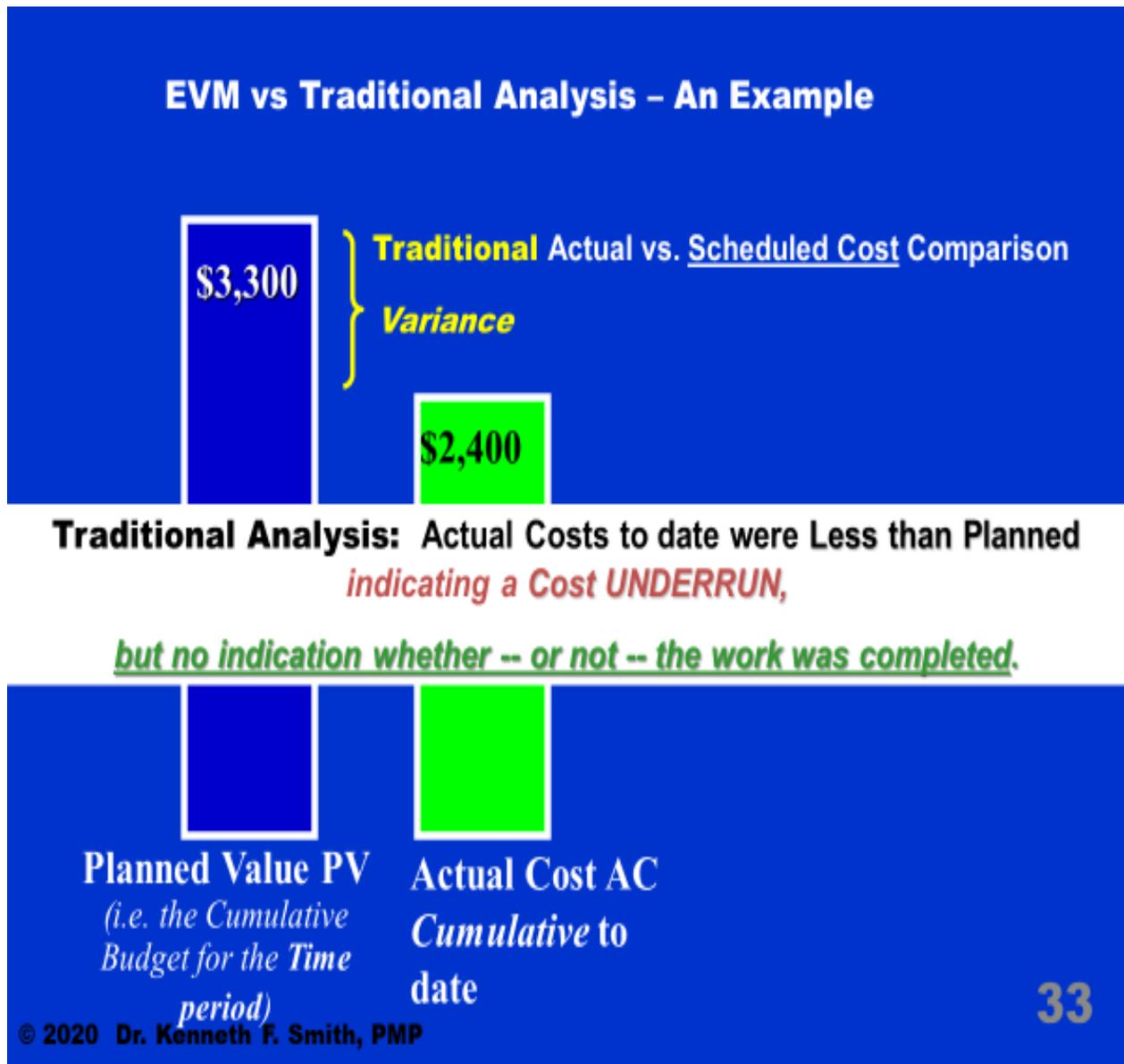


As indicated in Figure 5, the significant difference is that with the S-Curve Transform, the cumulative Planned Value for Work (PV) is depicted without a timeline for the life of the project, which in turn becomes the Earned Value whenever the work is completed -- resolving my erstwhile conference cohorts' concerns how to derive the EV each time period – and clearly highlights the true cost variance.

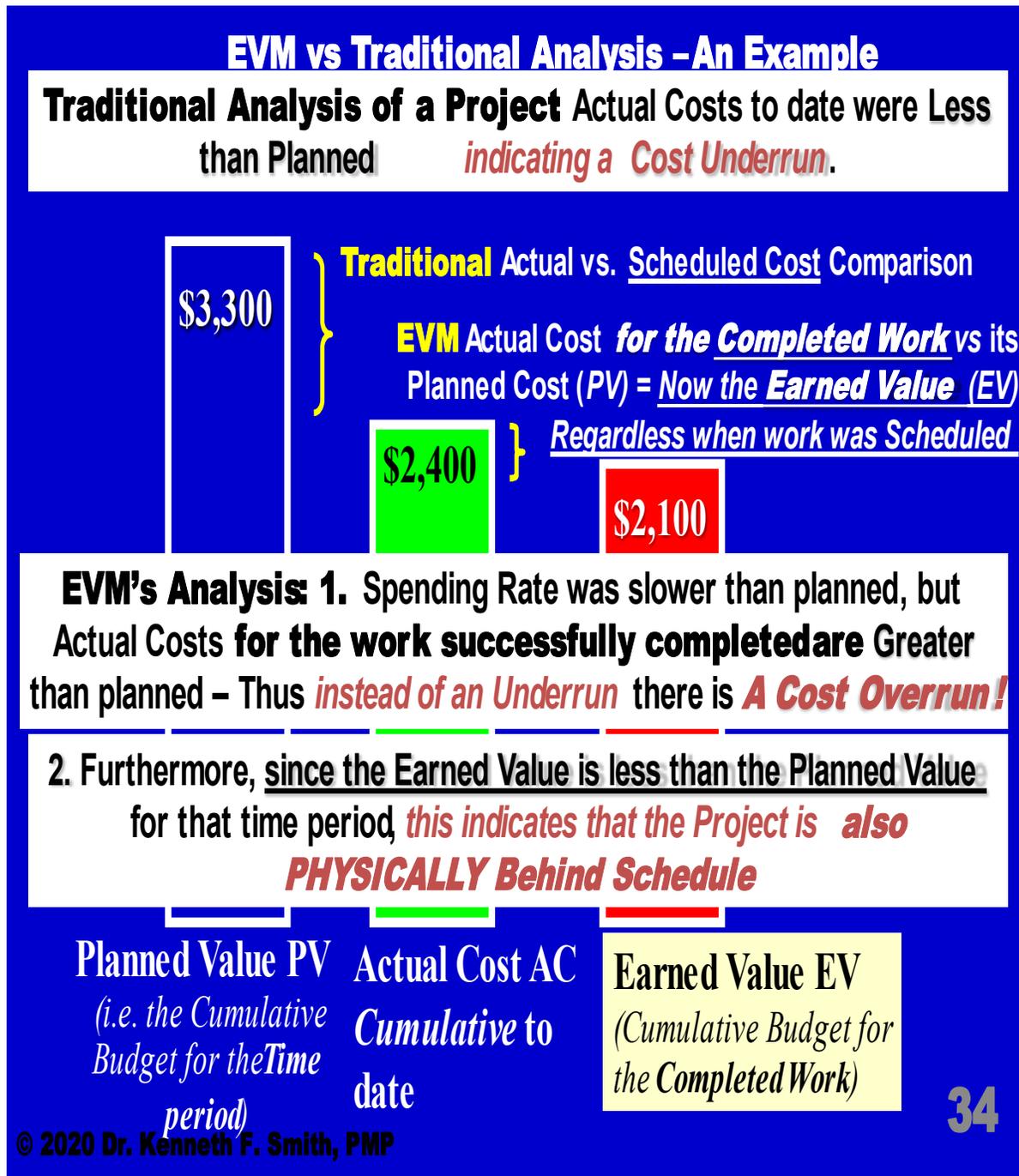
The next step in Earned Value analysis is to draw from the respective data to distinguish between and discern the project's current overall performance status.

As well as an S-Curve format for the incremental status over the life of the project, a snapshot of the situation at any time is most clearly depicted in a histogram, as illustrated in Figures 6 & 7 below and on the following page; and further highlights the difference between Traditional and Earned Value analysis.

**Figure 6**



**Figure 7**



## TO SUMMARIZE,

### The Key to Applying EVM is Knowing the Difference Between PV & EV

**PV = Planned Value** *Planned Cumulative Cost to date for the Work Scheduled*

**EV = Earned Value** *Planned Cumulative Cost for the Work Completed to date*

1. The Key Cost Performance Measure is the Variance of the Actual Cost (AC) of the Work successfully completed to date from the Budgeted Cost (EV) for that same Work  
 $AC - EV$  Actual Cumulative Cost to Date *minus* the Planned Cumulative Cost for the Work Completed to Date

2. The True Cost Performance Status

$EV - PV$

The Planned Cost for the Work Completed to Date *minus* Planned Cost for the Work Scheduled to Date [*Regardless whether it was completed On, Ahead or Behind Schedule*]

3. Schedule Performance Status [NOTE: In terms of monetary drawdown, NOT Physical Work]

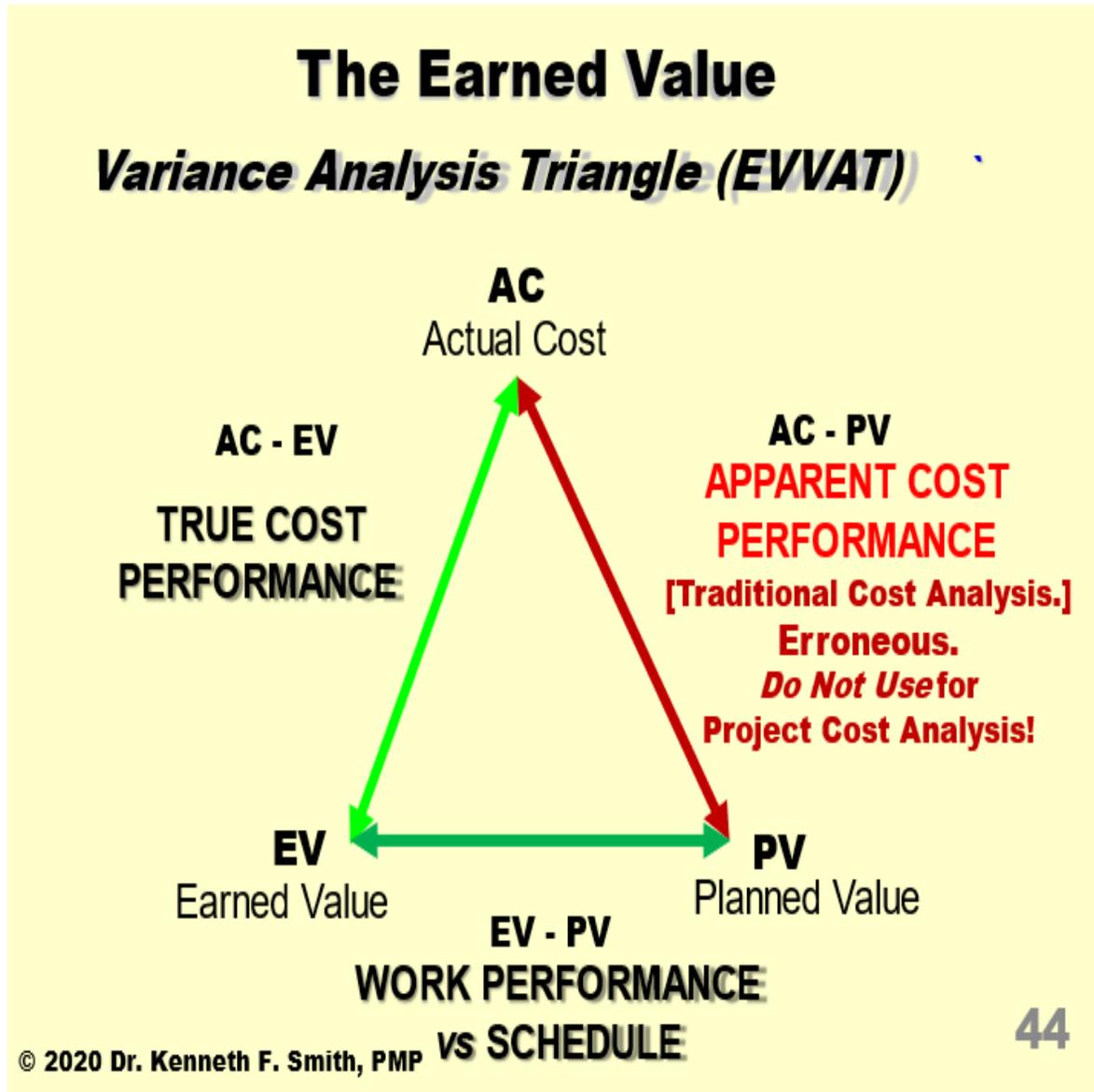
$AC - PV$  Actual Cost to date *minus* Planned Cost for the Work Scheduled to date

Apparent Cost Performance Status Typically used by Financial Managers to Monitor Project Budget utilization

**DO NOT USE!!!** IT IS Erroneous in most circumstances, Misleading and the root of all problems between the Financial Manager and the Project Manager!

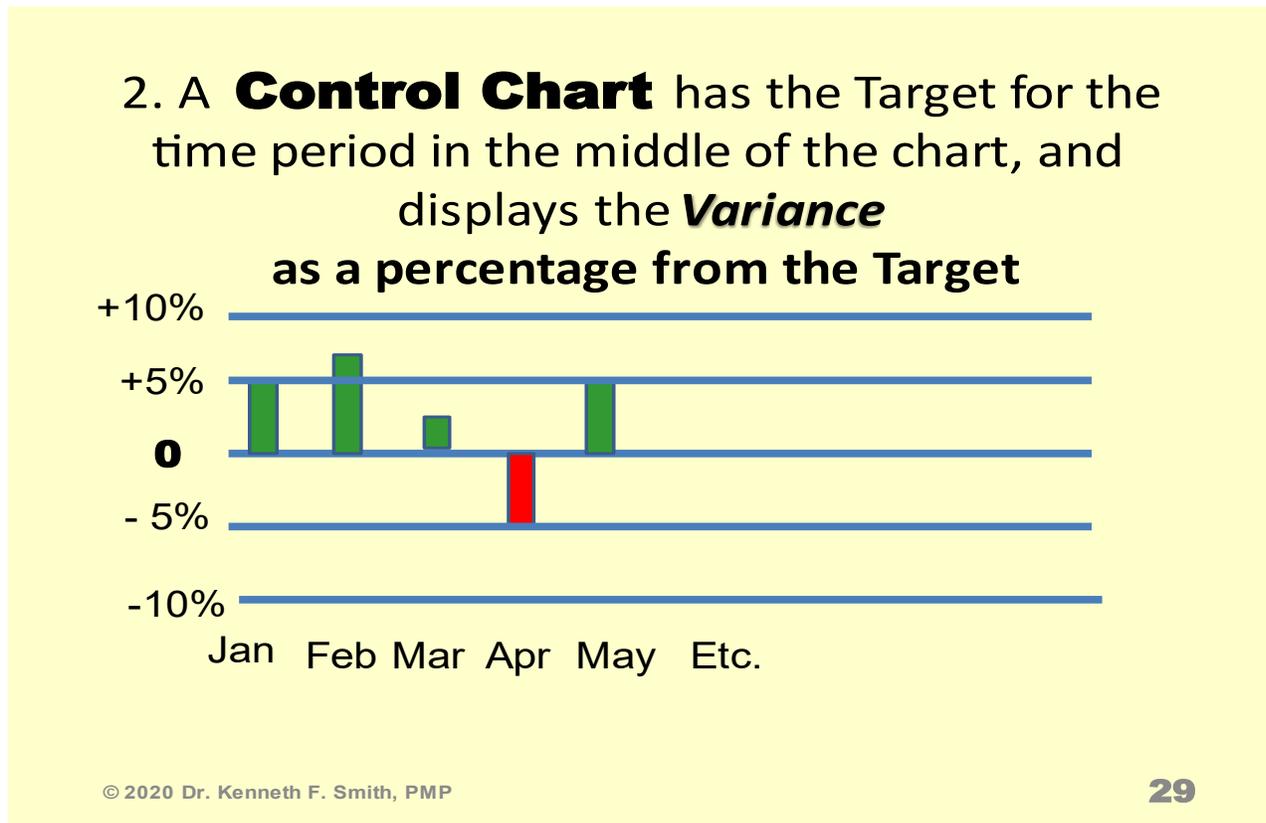
These relationships are also captured for ready reference in a Earned Value Variance Analysis Triangle (EVVAT), depicted in Figure 8 on the following page.

Figure 8



A Control Chart is also useful to track and highlight work &/or cost variance during implementation, as illustrated in Figure 9, below:

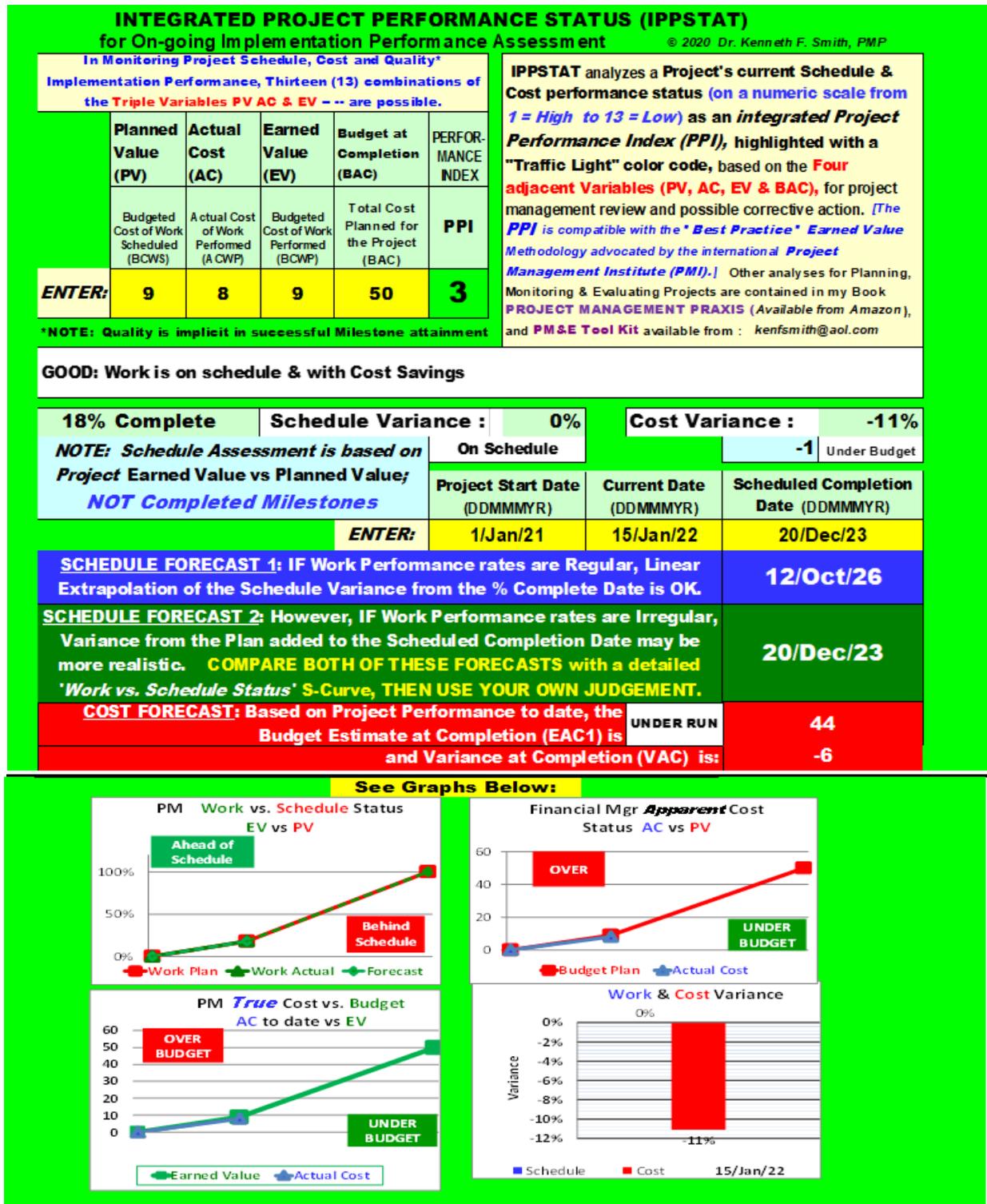
**Figure 9**



To facilitate Earned Value Analysis for project, program and portfolio monitoring, I have developed several interactive Excel templates, such as those illustrated in Figures 10, 11 & 12:



**Figure 11**



Finally, for Program and Portfolio Performance Analysis, the template in Figure 12, compares the PV AC EV and BAC of multiple Projects:

Figure 12

PROJECT PORTFOLIO & PROGRAM PERFORMANCE SYSTEM										Thirteen (13) different combinations of the Triple Threats to Project Implementation Performance -					
for On-going Operational Performance Assessment										i.e. "Schedule, Cost and Quality - are possible.					
Enter EV data in the Yellow Cells B3, B4, B5 & H5 Below, and in Columns C through H & K for up to 500 Projects. Check IPPSTAT Template for details on individual projects.										43%	GOOD	This system evaluates each project in the portfolio based on these three Threat criteria, and assigns an Integrated Project Performance Index (from 1 = High to 13 = Low) then highlights them with a color-coded "Traffic Light" for management review and possible corrective action. [NOTE: The system is compatible with the "Best Practice" Earned Value Analysis Methodology advocated by the International Project Management Institute (PMI). Other Earned Value analyses for individual projects are also available from kantsmith@aol.com			
"Organization Name"					PORTFOLIO PERFORMANCE INDEX					29%	MIXED				
Location					AVERAGE					29%	BAD				
14 = Number of Projects in the Portfolio or Program					As of: July					MIXED -					
										©2020 2012 Dr. Kenneth F. Smith, PMP					
TOTAL Portfolio/Program COST										1,118	1,171	1,138	6,060	19%	Total Budget Spent to Date
To change the number of projects, Enter the number of Active Projects in cell B-5, above. You can then OVERWRITE Columns C-10 to H-509. If you need FEWER lines, DELETE Cells from the UNUSED rows in Column C through I-509. HOWEVER, DO NOT DELETE THE ROWS!! ALSO You must adjust the number of active projects in Cell B-5.										19%		Work Accomplished to Date			
Line #	Project #	Project Title	Planned Value (PV)	Actual Cost (AC)	Earned Value (EV)	Budgeted Cost at Completion (BAC)	PERFORMANCE INDEX	WARNING IF RED	TOTAL COST OVER-RUN	PROJECT MANAGER	PERFORMANCE STATUS				
1	101	Anoyan	50	55	45	50	13	RED	BILL	BAD: Work behind schedule, cost overrun and possible cash flow problem if funds are released incrementally					
2	102	Bulwa	100	100	90	500	12	RED	JUAN	BAD: Spending as planned, but value is low, indicating a cost overrun and the work is also behind schedule					
3	32	Lasa hiway	100	80	90	300	7	YELLOW	BERT	MIXED - Good & Bad: Saving money on the work performed, but the work is behind schedule					
4	56	Bono Bridge	44	66	56	600	10	YELLOW	WILL	MIXED - Good & Bad: Work ahead of schedule, but a cost overrun has been incurred, and may have a cash flow problem if funds are released incrementally					
5	231	Maram Ed	80	89	89	500	5	YELLOW	PAT	GOOD: Work is ahead of schedule, with costs as planned for the work done, but may have a cash flow problem if funds are released incrementally					
6	945	Tang School	44	43	45	110	1	GREEN	MAY	GOOD: Work is ahead of schedule & with Cost Savings on the work done, as well as an apparent cost overrun on the budget					
7	654	Wana Water	80	80	80	500	6	GREEN	JAN	GOOD: "IDEAL" Everything going according to plan. On Schedule & On Budget [Extremely Rare]					
8	243	Rag Dam	80	100	70	500	13	RED	MARY	BAD: Work behind schedule, cost overrun and possible cash flow problem if funds are released incrementally					
9	342	Suava Fish	80	89	88	500	10	YELLOW	MAX	MIXED - Good & Bad: Work ahead of schedule, but a cost overrun has been incurred, and may have a cash flow problem if funds are released incrementally					
10	22	Aida San Waste	80	100	70	500	13	RED	CHON	BAD: Work behind schedule, cost overrun and possible cash flow problem if funds are released incrementally					
11	222	Hland Terracing	80	80	85	500	2	YELLOW	ABDUL	GOOD: Work is ahead of schedule & with Cost Savings even though the budget has been spent as planned					
12	432	Your Own	130	100	120	500	7	YELLOW	JEN	MIXED - Good & Bad: Saving money on the work performed, but the work is behind schedule					
13	145	Exec Pet	90	89	90	500	3	YELLOW	ALVER	GOOD: Work is on schedule & with Cost Savings					
14	33	Whatever	80	100	120	500	4	YELLOW	RAY	GOOD: Work is ahead of schedule, with cost savings, but may have a cash flow problem if funds are released incrementally					
15									#N/A						

## **CONCLUSION**

The Earned Value Methodology has been a ‘Best Practice’ for monitoring and evaluating project cost performance for over fifty years. **In my opinion, it is high time the Project Management Institute – and other professional project management organizations -- undertake a concerted effort to get awareness, understanding and knowledge about the Earned Value Method disseminated and incorporated in undergraduate & graduate & university business management program curricula --** as well as professional accounting and auditing certification and licensing exams.

Given the additional perspective, tools & techniques presented in this article, it is my hope that more project management stakeholders will now understand, apply and benefit from the **Earned Value Method**.

-----

These templates – *and many others* – are yours for free on proof of purchase of my book **Project Management PRAXIS** (available from Amazon).

## About the Author



### **Dr. Kenneth F. Smith**

Honolulu, Hawaii  
& Manila, The Philippines



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, AFDB, DFID, the World Bank Group, UNDP as well as USAID.

Ken 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.

To view other works by Ken Smith, visit his author showcase in the PM World Library at <https://pmworldlibrary.net/authors/dr-kenneth-smith/>