

Once More on Earned Value: A Third Dimension ¹

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I read Patrick Weaver's History of Earned Value ² and Paul Giammalvo's follow-up ³ 'Treatise' in the recent issues of the PMWJ with great interest, as they filled in some voids regarding Earned Value's genesis, evolution, issues & applications that arose during my early project management career and after I left the US Defense Department (DOD) establishment; as well as from different perspectives. I initially learned PERT/CPM – *the Program Evaluation & Review Technique / Critical Path Method* – on the job as a Management Intern in the U.S. Navy's Special Projects Office (the Polaris Project) during the early 1960's. Later I had further exposure as a Management Analyst in the Navy Management Office (NMO), and subsequently was a full time practitioner & faculty member of DOD's PERT Orientation & Training Center (POTC) under the direction of Guy Best – promulgating both PERT/CPM & PERT/COST as "**Best's Practices**" as well as assisting contractors in their application. I left DOD in December 1965 to apply Critical Path methodology for the US Agency for International Development (USAID) on a variety of international infrastructure, economic and social/humanitarian development type projects, worldwide.

Patrick and Paul viewed and reviewed Earned Value Methodology (EVM) from two different vantage points in the Commercial sector; Patrick primarily as an **Owner-manager**, and Paul as a hands-on **Contractor manager to Owners**; but nevertheless, both as **engineering professionals** applying EVM to infrastructure projects. Therefore, I'd like to add to their observations a couple of comments from my perspective -- as a **generalist (i.e. non-engineer) planner and more 'remote control' manager, monitor & evaluator as a representative for Government Owners.**

First, as Patrick pointed out, although schedules and costs were intended to be aggregated in Work Packages for analysis, they were widely estimated – and attempted to be monitored -- at the Activity level. That was simply because – wherever feasible -- 'bottom-up' estimating by those closest to -- and more knowledgeable about -- the work environment was preferable to broad brush 'top-down' guesstimates.

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² Weaver, P. (2022). The Origins and History of Earned Value Management; *PM World Journal*, Vol. XI, Issue VIII, August. Available online at <https://pmworldlibrary.net/wp-content/uploads/2022/08/pmwj120-Aug2022-Weaver-origins-and-history-of-earned-value-management.pdf>

³ 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. Available online at <https://pmworldlibrary.net/wp-content/uploads/2022/09/pmwj121-Sep2022-Giammalvo-origins-and-history-of-evm-a-contractors-perspective.pdf>

For well-established activities in various trades, reasonable time and cost approximations could be made with ‘rules-of-thumb’ based on the materials to be used, skills to be applied and level-of-effort required. However, reporting that level of detail to the government ‘Owner’ was excessive!

Regarding the lack of Standards that Patrick noted, other than the foregoing well-defined types of activities, **it simply was not feasible to establish standards for many other activities.** Although contract objectives – *particularly for R&D type contracts* – could be well defined, and process phases & stages articulated, the details were inherently subjective and obscure, giving rise to imprecision in both duration and cost for execution. A weighted PERT formula:

$$\frac{\text{optimistic time} + 4(\text{Most Likely time}) + \text{pessimistic time}}{6}$$

was the recommended pseudo-scientific approach **for estimating such subjective activity ‘expected time’ durations**; although on the job I encountered several other intuitive variations – *such as Forrester’s function (best guess x 3), and Murphy’s magnitude (best guess x 10)*– used to factor-in risk impact from predictable but uncontrollable dynamic negative feedback loops, as well as unpredictable events; each presenting a wide range for ‘ceiling’ estimating. We did our best in DOD relying on concurrent separate in-house ‘*should take*’ (duration) and ‘*should cost*’ technical estimates, as well as comparative macro-analysis of time & cost estimates in contractors competitive proposals; but it was a far cry from objective standard setting.

Therefore – like a work of art, or an expensive brand-name product – a project’s ‘Value’ was whatever the project’s Owner (i.e. the customer) was willing to pay for it!

I’m still curious how these types of uncertainties were apparently eventually bridged to establish deterministic project values.

Subsequently, after leaving DOD – in addition to infrastructure, many of the international economic and social / humanitarian development-type projects with which I was involved were oriented to addressing the needs of hitherto-disadvantaged communities. That invariably meant overcoming prevailing attitudes of vested interests and the entrenched elite, then making changes to long-established national & local government rules, regulations, bureaucratic organizations and procedures; often requiring new legislation. As such, AID contracts were heavily-loaded with ‘personal service’ *level-of-effort* activities. Like DOD R&D projects, the ‘road map’ could be defined, but the schedule was indeterminate, replete with ‘*hurry-up-and-wait*’ processes; as the duration of activities involved was beyond the control of project personnel. Again, somewhat similar to estimating the time to obtain permits for infrastructure, or ‘right of way’ access for road construction projects. While mindful of Parkinson’s predilection that work expands to fill the time available for its completion, in an attempt to abate the prevailing project schedule slippage mode and ensuing opprobrium, I nevertheless modified the PERT formula by adding two estimated standard deviations to the expected time – thus:

$$\text{PERT}_{te} + \frac{(\text{pessimistic time} - \text{optimistic time})}{3}$$

in order to create more ‘**realistic**’ time estimates for implementation (i.e. @ 95% probability of meeting or beating the schedule – rather than ‘expected’ times @ 50% derived from the classic PERT formula.

As Patrick also observed, during my DOD days **cost-estimating was essentially a one-shot approach**, related to the project’s **expected** time schedule. However, later -- in the Fall of 1969 – while a Systems Analysis Fellow at the Massachusetts Institute of Technology (MIT) Center for Applied Engineering Study (CAES), I had an enlightening experience. Epitomizing the quantitative aspects of the CAES program, my faculty-directed ‘term paper’ assignment for a “Reading Program in Social Science” course was to develop a generic **FORTRAN-4** program (*which we were learning*) that could:

- 1) **calculate a Critical Path Schedule** for a sample project, as well as
- 2) **Optimize the Cost aspects** for successively Crashing the project’s Schedule!

While already well-versed in CPM concepts and skilled in **manual** computations, after developing and constructing the FORTRAN program’s logic for a project, I found it difficult to accurately compute a cumulative critical path -- until I hit on *sequentially re-coding all the milestones* in a draft paper network, before preparing milestone and activity punch cards for the computer. After that -- *by contrast* – assigning Activity Costs and computing the Total Costs aspects, as well as **subsequent Cost optimization priorities for successive step-by-step schedule compression was relatively easy**, with a *cost per unit-time* formula based on **incrementally crashing** the schedule, as follows:

$$\frac{\text{Crash Cost} - \text{Expected Cost}}{\text{Expected Time} - \text{Crash Time}}$$

As it had not taken me very long to solve this latter issue, I wondered why the PERT COST concept and applications -- *developed by Bud Bushman, Whitey Driessnack, et. al. in the Office of the Secretary of Defense (SECDEF) for the Defense Contracting industry, aided & abetted by us at POTC under Guy Best* -- had been so difficult to implement, faltered, and ultimately failed to take hold.

Then it struck me; we had overlooked a critical variable -- *the Perspective of the Contractor!* In essence, Defense Contractors were *not interested* in optimizing for schedule efficiency and cost effectiveness – at least in so far as we (as the Owners) were concerned. Rather, as contractors, **Profit was their primary objective**. This was a significant variable which the Government’s PERT/COST approach did not optimize. From the contractor’s perspective “**Cost Plus**”-type contracts were more desirable for maximizing profit⁴ than Cost Optimization for the DOD project Owner, as once contracts were obtained, slipped schedules were routinely extended -- together with related cost increments -- through numerous change orders.

⁴ at least up to an internally-established threshold for diminishing profit (especially when cost plus % of cost contracts were banned).

Just another instance of ‘*Follow-the-money*’!

Patrick also emphasized that EVM was a performance management tool, rather than a cost management accounting function. The verity of this assertion was subsequently brought home to me for USAID, and other international donor agency projects.

Unlike DOD where PERT/CPM and PERT/COST practices were being imposed on contractors, there was no such mandate for application in the USAID developmental project environment. I instituted **Critical path methodology** for planning, scheduling, budgeting, monitoring and evaluating projects -- *as well as concurrently fostering and assisting both agency project managers and would-be contractors to apply CPM* in many different sectors and countries; with reciprocal appreciative acceptance by project managers. Unfortunately, all my attempts at *instituting earned value concepts and collateral work package cost account coding for financial billing, reporting and performance management analysis were rebuffed.*

A standard objection to incorporating Earned Value methodology I received from USAID management -- and subsequently other international donor organization (IDO) agencies during my post-AID consulting career -- **was that cost management was the contractor’s concern, rather than the Agency’s**, since – within budgetary ceiling limitations -- their contracts were on either a cost plus, or fixed price basis.

However -- just as noted earlier with DOD contracts -- once contracts were awarded, their scope and schedules were almost always routinely extended through numerous change orders, together with related cost increments.

Consequently, Government and IDO Owner-level project manager performance monitoring with EVM was stymied.

Furthermore, despite time-phased project cost needs based on a laboriously-planned cumulative s-curve milestone baseline schedule, conventional ‘trickle down’ practices for making project funding available persisted -- subject to availability of funds allocated to the country Mission from its share of annual appropriations by Congress to the Agency headquarters. Even these allocations, in turn, were often curtailed -- as well as delayed -- at different stages in the bureaucratic fund dispersal chain. Eventually -- after approval by the Mission program office - - quarterly increments from the Mission accounts office were made available to the Agency project manager for project-related expenditures – without regard for the actual amount needed.

Meanwhile the contractor would submit invoices for reimbursement based on their on-going work, level of effort incurred and other authorized costs in accordance with the project’s contract terms – but without any identification of the work packages or activities involved.

Thus – *in earned value terms* -- although the BCWS (PV) was known to all parties, **ACWP was only known by the contractor**, but the Agency project and finance managers had only ‘*an AC*’ awareness, unrelated to the AC’s WP. The BCWP (EV) could also be known to the contractor (*if they elected to adopt EVM*), but -- without ACWP related to specific activities or work packages -- **performance, per se** could only be wildly guessed at by the Agency project manager!

Then -- *to add insult to injury, and everlasting frustration* -- Agency project managers were harassed by the program office about the performance variances reported and displayed in the financial manager's periodic 'pipeline' *Cost vs. Schedule* report! I often disputed 'AC vs PV' reports as fundamentally flawed -- *and encouraged other project managers and their counterparts to prevail against them* -- elucidating the essence of the ACWP vs BCWP (i.e. AC vs EV) earned value concept; but to no avail.

To make matters worse, unused funds were reprogrammed or de-obligated at the end of each fiscal year (*initially June 30, but later – 1977 -- moved to September 30*), and a hiatus ensued until appropriations for the subsequent year were received. To avoid project and funding disruptions in this incongruent situation we made every effort to 'forward fund' activities -- or otherwise cajole contractors to continue working during the lacuna, and accept delayed reimbursement in order to keep the project moving in the absence of available funds.

Under these circumstances, empathizing with the contractor's plight -- and in the absence of interest from the Agency -- **I concentrated on introducing and applying critical path for project planning and monitoring** -- while continuing to explain the benefits of EVM to assisted counterpart government Agency managers, expat & host country contractors, and urging them to utilize it in-house to their advantage, if not to ours.

Which brings me to a couple of additional observations regarding Paul Giammalvo's comments from his perspective as a Contractor for Owners.

From warfare in DOD to welfare in AID-assisted projects, my dual role as a **government Owner's project representative-cum-consultant** was to proselytize best practices for other AID & host government project managers and their commercial contractors; as well as apply them directly on projects assigned to me. In that regard, AID-assisted projects were host government projects, although USAID provided most of the funding for technical, managerial and materiel resources. Although designated 'project managers' or 'project officers,' USAID PMs were really USAID contracting officer's 'technical representatives' (CoTRs) for supporting, coordinating, monitoring and reporting on project progress -- in essence, intermediary back-stoppers of the commercial contract's chief of party (CoP) who was actually the prime mover for managing project implementation.

USAID personnel were also reassigned periodically -- *usually every 2 to 4 years* -- so relinquished responsibility for 'their' projects on transfer, and -- often with an interim hiatus -- 'inherited' on-going projects at their next post. Furthermore, beginning in the 1970's and accelerated during the 1980's, AID technical subject matter experts (SMEs) were phased out to be replaced by generalists, who -- due to downsizing of Missions -- were often designated CoTR's for several concurrent projects.

Being a generalist myself -- rather than a technical SME of any of the projects in which I was involved -- I quickly learned how essential it was to work closely with project CoPs to gain a 'Reader's Digest' understanding of their project's aspects; and rely on them for technical guidance. It was also important for me to make an initial site visit for 'ground truthing' as well

as frequent field follow-up ‘ocular inspections’ thereafter to ascertain project status and obtain feedback on the issues being encountered, for me to facilitate unblocking bureaucratic and logistical obstacles; rather than relying on ‘remote control’ from the CoP’s monthly progress reports.

While utilizing MS Project⁵ for schedule planning and monitoring, and still advocating the Earned value methodology for my contractors, I concentrated on physical progress, and supporting the CoP to make things happen. Although in no position to contradict Paul’s assertion of utility from his perspective, for me, **a summary critical path chart – particularly an ‘as planned’ time-scaled one with a vertical ‘snake-line’ representing current status -- prominently-displayed in the AID Mission and counterpart Government Agency offices was an invaluable tool; both for briefing other stakeholders and for tracking implementation progress.**

Therefore, **I was startled by Paul’s assertion *most contractors do not use CPM networks as a serious execution tool*; as well as his utilizing Excel for scheduling, rather than dedicated scheduling software.**

Although data entry and validation in dedicated software scheduling is cumbersome, and IMO even less useful for costing, my experience was they were preferable to Excel for scheduling and monitoring -- particularly the ‘leveling’ function in MS Project for updating implementation schedules, as well as the ability to switch between logic network and Gantt bar chart presentations. [Although Excel produces admirable bar charts and other graphics, it lacks linkages between activities and milestones.] Successive upgrades of various packages have facilitated CPM network development for me. Nevertheless, I still mourn the loss of ‘**Project Partner**’ software’s ability to prepare time scaled networks., so – *if/when desired for display* -- these still have to be re-drafted manually.

Because of the aforementioned difficulties in introducing earned value, I never got into the ‘dirty details’ of the contractor’s budgeting and billing process, so defer to Paul’s superior experience. **Feedback from participants at conferences and my seminars also supports Paul’s contention that very few project managers still actually use EVM.**

I was also impressed with the unique charts Paul presented for project implementation performance analysis -- particularly the graphics emphasizing monitoring and managing by Efficiency, rather than Cost.

In conclusion, thank you for continuing the discussion to extend awareness and understanding of these long extant, but still largely underutilized project management best practices.

⁵ After surviving several antecedents!

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 on proof of purchase of PRAXIS.

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