

EARNED VALUE ANALYSIS:

The only tool required for project management

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How important is it to deliver the project on time? Know project progress in real time? Identify schedule and cost issues before they become problems? Put your time into project management, not your tracking tools.

Earned Value Analysis is the solution: it is the only project management tool that can objectively status schedule and cost performance in real time. EVA creates a *"dollars in time"* paradigm tracking costs and schedule in an objective, reliable and easy to use model replacing the complex and confusing project deliverables dependent-milestone-antecedent subjective model. EVA creates a *"project at a glance"* paradigm with readily understood visual display of quantitative information.

What is EVA?

EVA compares the calculated value of work performed, what you have earned, to the actual cost and to a projected cost of work performed. Deviations are cost, time, or both, and can be expressed in dollars, time or calculated further as progress, per cent complete or a performance index. EVA is primarily a schedule tracking tool, determining schedule from cost and earned value of individual WBS tasks performed in time: the project management trinity of scope, cost and schedule.

Who uses EVA?

EVA is very common in architecture, engineering, construction and contract administration companies as well as large design-manufacturers such as aerospace companies. Typical projects are large, multi discipline and location and subject to schedule performance bonus, penalty or consequential damage clauses. On some of these projects invoicing is driven by EVA calculation: that takes a real commitment!

Three fundamental concepts to effective EVA:

1. Understand the difference between the value of work performed and the cost of work performed.
2. Tracking *"dollars in time"* is more effective and predictable, simpler and objective than the traditional project deliverables precedent-milestone-antecedent hierarchical model as it unlinks tracking subjective assessment of technical deliverables from tracking the cost and time to perform that work.
3. Take a long view while also being aware of short term anomalies or early problem identifiers: believe it when the data looks bad.

EVA creates new paradigms:

Dollars in Time

Project at a Glance

20% Effort for 80% Results

Getting started: the EVA 5 point list

Costed work breakdown structure.

More budgeted WBS tasks increases objectivity minimizing subjective error. Broken down to task level, no rolled up activity should exceed 30% of the total.

Schedule of projected costs that matches the costed WBS.

Establish a best guess; often it's an S shaped graph line.

Regular project financial reporting period.

Weekly are best, longer periods can mask early problem identification, especially on large projects. Actual financial costs must be available.

Estimate % completes of the WBS tasks.

Gleaned from discussions with the team members to ensure objectivity.

Believe it when the data looks bad.

EVA immediately and graphically shows project performance. Human nature explains away developing problems as anomalies. They're not, and the EVA tool is pointing it out.

What does EVA look like & how does it work?

The costed WBS in Figure 1 includes a summary list of actual costs and earned value for a project to date. Each WBS task % complete multiplied by its line budget gives earned value: the dollar amount of work performed. The % complete shown in the earned value green column includes the four week sample excerpt shown in Figure 2, which should be gleaned from discussions with project team members to ensure objectivity.

The WBS task % complete assessment per reporting period is the total work input once the EVA spreadsheet is properly set up, creating another paradigm: a Pareto ***20% effort for 80% results***; other common project management tracking tools' ratio often is reversed.

The three figures of earned value, budgeted and actual cost of work performed allow numerous comparison calculations: Figure 1 shows "early/late" status and overall project 54% complete. Other common comparison calculations are cost to complete and an over/under 1 performance index.

Presented in a tabled list or multi-line graph of Figure 3, a fundamental benefit of EVA is ***project at a glance***: every savvy executive can understand such visual display of quantitative information with minimal or no explanation from the project manager in control. No other project management tracking tool has such robust data readability.

Work Breakdown Structure		Budget	Actuals		Earned value		
			Cost to date	Weeks of 12/Mar to 19/Mar	% complete	Earned value	Status
1	Phase 1 - Requirements	\$17,280	\$16,470		100%	\$17,280	early
1.1	meetings, site visits and interviews	\$7,200	\$7,110		100%	\$7,200	early
1.2	market and cost analysis	\$3,600	\$3,960		100%	\$3,600	late
1.3	patent search	\$1,440	\$810		100%	\$1,440	early
1.4	competitor analysis	\$1,440	\$1,350		100%	\$1,440	early
1.5	documentation	\$3,600	\$3,240		100%	\$3,600	early
2	Phase 2 - Design concepts	\$36,000	\$36,720		100%	\$36,000	late
2.1	concept 1 - instrument	\$7,200	\$7,470		100%	\$7,200	late
2.2	concept 2 - instrument	\$7,200	\$7,290		100%	\$7,200	late
2.3	concept 3 - instrument and accessories	\$7,200	\$7,290		100%	\$7,200	late
2.4	concept 4 - instrument and accessories	\$7,200	\$5,850		100%	\$7,200	early
2.5	concept 5 - instrument derivatives	\$7,200	\$8,820		100%	\$7,200	late
3	Phase 3 - Assessment and review	\$19,440	\$15,570		100%	\$19,440	early
3.1	prepare presentation packages	\$5,400	\$3,960		100%	\$5,400	early
3.2	arrange meetings	\$1,440	\$810		100%	\$1,440	early
3.3	focus group, needs analysis	\$3,600	\$4,050		100%	\$3,600	late
3.4	marketing, engineering risk analysis	\$3,600	\$2,430		100%	\$3,600	early
3.5	documentation	\$5,400	\$4,320		100%	\$5,400	early
4	Phase 4 - Concept refinement and definition	\$32,400	\$19,440	\$19,440	86%	\$27,900	early
4.1	concept 1 - creative design, user feature solutions	\$7,200	\$5,670	\$5,670	100%	\$7,200	early
4.2	concept 1 - engineering feasibility, manufacturing, cost assessment	\$7,200	\$3,240	\$3,240	100%	\$7,200	early
4.3	concept 2 - creative design, user feature solutions	\$7,200	\$7,830	\$7,830	75%	\$5,400	late
4.4	concept 2 - engineering feasibility, manufacturing, cost assessment	\$7,200	\$2,340	\$2,340	75%	\$5,400	early
4.5	documentation	\$3,600	\$360	\$360	75%	\$2,700	early
5	Phase 4 - Prototype & validation	\$23,400					OK
6	Phase 5 - Design engineering implementation	\$48,600					OK
7	Project management	\$17,712	\$9,630	\$1,260	27%	\$4,782	late
8	Total	\$194,832	\$97,830	\$20,700	54%	\$105,402	early

— · Figure 1 · —

The project status calculations in the earned value green column in Figure 1 show several tasks reporting “late” but their activities report early, the one red highlighted figure shows a discrepancy from earned value to actual cost of greater than 20%, an arbitrary automatic value flag the project manager assigned to tasks requiring attention. This is a fundamental benefit of EVA: **early problem identification**, problems as they occur, not after it’s too late.

This information can be critical: is there a problem with this task, scope creep or personnel; although the overall activity is performing well is it an anomaly that will correct itself? It is almost guaranteed with traditional project reporting Pert/Gantt linear charts this problem would be buried or obscured, perhaps known only to the task owner who almost certainly isn’t

going to inform the project manager in a timely manner and with full disclosure. EVA negates these situations, they simply can’t occur.

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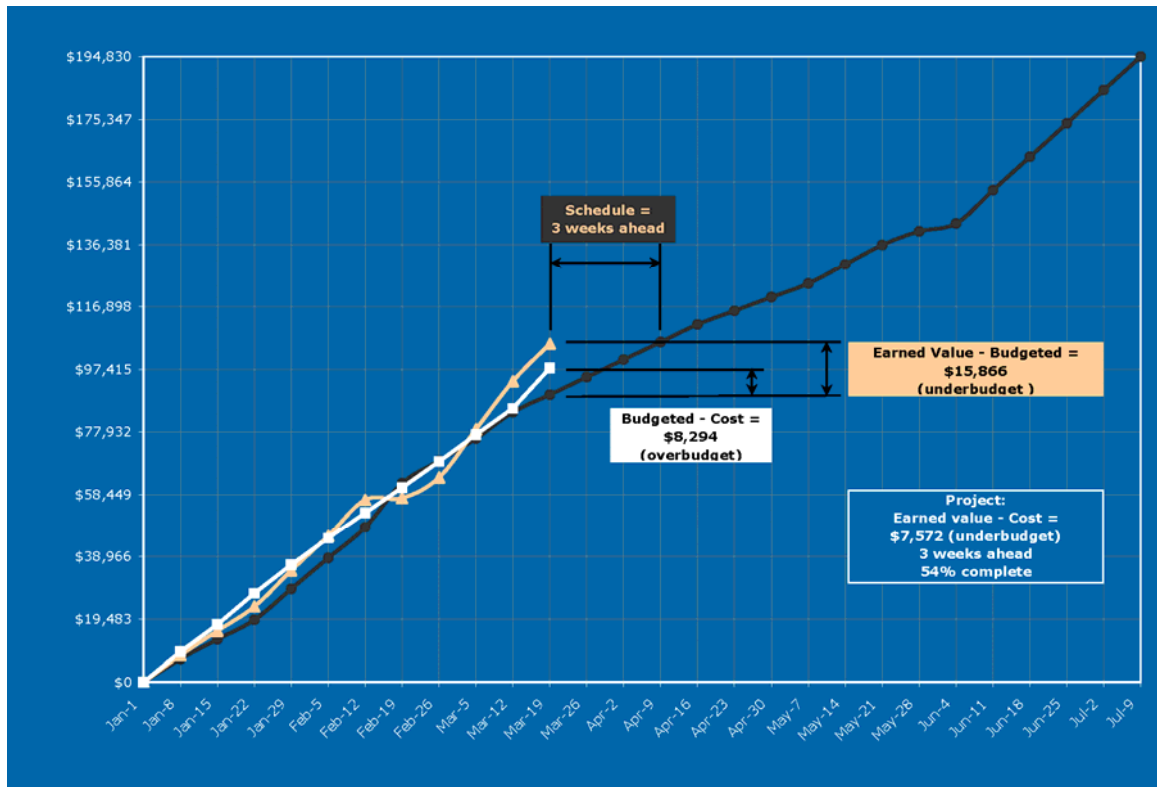
Work Breakdown Structure		% complete			
		26-Feb	5-Mar	12-Mar	19-Mar
1	Phase 1 - Requirements				
1.1	meetings, site visits and interviews				
1.2	market and cost analysis				
1.3	patent search				
1.4	competitor analysis				
1.5	documentation				
2	Phase 2 - Design concepts				
2.1	concept 1 - instrument				
2.2	concept 2 - instrument				
2.3	concept 3 - instrument and accessories				
2.4	concept 4 - instrument and accessories				
2.5	concept 5 - instrument derivatives				
3	Phase 3 - Assessment and review	35%	100%		
3.1	prepare presentation packages	100%			
3.2	arrange meetings	100%			
3.3	focus group, needs analysis		100%		
3.4	marketing, engineering risk analysis		100%		
3.5	documentation		100%		
4	Phase 4 - Concept refinement and definition		7%	51%	86%
4.1	concept 1 - creative design, user feature solutions		20%	75%	100%
4.2	concept 1 - engineering feasibility, manufacturing, cost assessment		5%	100%	
4.3	concept 2 - creative design, user feature solutions		5%	50%	75%
4.4	concept 2 - engineering feasibility, manufacturing, cost assessment				75%
4.5	documentation			10%	75%
5	Phase 4 - Prototype & validation				
6	Phase 5 - Design engineering implementation				
7	Project management	21%	22%	25%	27%
8	Total labour	\$ 6,478	\$ 14,937	\$ 14,931	\$ 11,694
		\$ 63,840	\$ 78,777	\$ 93,708	\$ 105,402
		33%	40%	48%	54%

— · Figure 2 · —

The 3-line graph in Figure 3 illustrates an EVA fundamental concept: earned value overbudget status should equate to early finish whereas actual costs compared to earned value gives true budget performance. It's a confusing concept, but correct and only EVA paradigm tracking *dollars in time* can assess in real time true project schedule and cost performance.

The concept of WBS activity precedents, antecedents and dependents is irrelevant. EVA is valid whether an activity is being or waiting to be performed; it's schedule performance, not deliverable status that is being reported.

Fundamental is the project managers release from tracking the traditional project deliverables precedent-milestone-antecedent hierarchical model. EVA using the *dollars in time* paradigm allows the project manager to only study and manage cost in time, leaving the performance metric of precedent-milestone-antecedent of technical deliverables to the technical discipline leads. This burden release emphasizes the benefit of *20% effort for 80% results*, and with practice establishes with project managers that EVA is the only tool required for project management.



– · Figure 3 · –

Figures 1 and 3 provide incredible data density control with readily understandable visual display of quantitative information for the entire project to date. Properly set up, the only work required is % complete estimate updates shown in Figure 2. All performance metrics and graphical visualization is automatic.

Why is EVA the only tool you need?

EVA is a lightweight, flexible, easy to learn tool adaptable to projects of any size, able to control them all, requires minimal effort to track and report in real time from task to activity levels up to entire project progress.

EVA's objective *dollars in time* paradigm is valid whether activities are being or yet to be performed,

immediately and graphically shows budget status, late or early completion all as it begins to happen. Unlinking status tracking of project deliverables from cost and time to perform them increases objectivity and greatly reduces confusing workload. Data density control is absolute and visual display of the projects' quantitative information is easy to understand, almost self explanatory.

Fundamental benefits of EVA:

Early problem identification

Unlinking project performance from tracking technical deliverables

Incredible data density control with readily understandable visual display of quantitative information

Common problems with EVA

Not believing it when the data looks bad.

Because EVA is a real time performance metric tool, schedule or cost slippage will be presented graphically for all to see and the common response is to explain it away as a local anomaly, known and expected.

Not updating the EVA tool with regular cost and % complete work assessments.

Typically followed by playing catch-up later on and entering data all at once. Hides early problem identification, sometimes used as explanation for #1 problem.

Incomplete WBS activities and budget and improper mid-project updates.

Moving dollar amounts around immediately affects all earned value calculations. This is ok if an error was made, or scope creep is agreed to. See Maintenance section for tips on EVA updates.

% complete work assessments not discussed with team members leading to increased subjectivity.

If only the project manager assesses work performance % completes then the EVA becomes his/her subjective, often slanted, report. The one doing the work has the best assessment of its status. EVA is very objective and robust when many owners contribute to its data.

EVA used with other project tracking tools and trying to link or equate them.

EVA is a stand alone tool for complex, large multi discipline projects. Allowing the PM to track the project performance in time and the technical discipline leads to track deliverables performance in time. The dollars in time paradigm and unlinking of technical deliverable tracking is a key how EVA is a light weight tool with incredible data density control. Attempts to link back these two separated activities are a waste of time and never work well.

Maintenance

Day to day use of an EVA tool is beyond the scope of this article, however general maintenance best practices are known, including three persistent issues:

Errors and omissions: If actual E&O is acknowledged, then add dollars to affected WBS line items or reschedule its projected costs, but don't reapportion % completes as, over time, the dollar/schedule modification and ongoing % completes of the project will level off the activity performance. Take a long view; don't submit to short term appearance.

Scope creep: Add new line items to the costed WBS and projected costs calculation. Again, take a long view, as immediately your curve comparison will change, but over time you will see them perform properly. Generally, it is inadvisable to add dollars to an existing line item as your previous estimations of % complete suddenly and unrealistically increase in value.

Equipment, tooling purchases: Usually these are lump sum payments and can be entered as 100% complete at purchase or invoice. If they are staged purchases then enter the % purchase at the proper time and move these amounts respectively in the projected costs calculation. This sort of manipulation is acceptable due to the nature of the acquisition and its accounting.

Other Common EVA notes

Much EVA is utilized as cost or schedule performance indexes (respectively CPI, SPI) where whole project analysis is rolled up to an over/under 1. For the project manager this is not useful for regular control of the project as the

granularity is too high. A performance index is a good, succinct executive reporting metric, with additional information to support the over/under.

50/50 EVA models, also 25/50/75, have been used but are a cheat. Essentially, these models state at project start, you're 50% complete and you stay there until completion when you're 100% complete. Absolutely useless, unless your project covers 1 or 2 accounting periods only, even then of dubious reporting quality.

"Believe it when the data looks bad"

Having audited many EVA reviews, early problem identification by poor earned value data was explained as an anomaly, anticipated, will be dealt with in succeeding weeks, etc. Yet, a majority of those projects never recovered, lost money and were delivered late. When the project manager reported that the project was in trouble and needed help as the EVA indicated, and appropriate remedies were done, these projects returned profitable performance usually on adjusted time and budget. When the EVA tool is properly set up and maintained, and it flags a potential problem, the analogy of the squeaky wheel is obvious: why ignore it.

Weighing the options:

Traditional project reporting tools' Pert/Gantt linear charts bury or obscure schedule and cost problems.

EVA negates these situations, they simply can't occur.