

Special Report

Earned Value for the Masses
...a practical approach

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By Quentin W. Fleming and Joel M. Koppelman

The earned value concept has been around for over a century, or perhaps for only four decades, depending on how one counts the beginning. Over a hundred years ago the industrial engineers employed earned value to determine the true cost performance of production work. They established their planned standards, then measured the earned standards, and related the earned standards against the actual hours used to measure their true cost performance.

Later, in the early 1960s, the United States Air Force with the industrial engineers again taking the lead converted this same concept to the measurement of a one-time only developmental project called the Minuteman Missile. It worked. They were able to measure the true cost relationship of the work they were performing.

To repeat the process they began on the Minuteman project, the Air Force formed a committee to define their management oversight requirements on the acquisitions of major new systems. They formulated what was then called the Cost Schedule Planning and Control Specification, or the CSPCS. The resulting CSPCS document was nothing more than 35 criteria which Air Force management felt they needed to require from private companies in order to oversee performance on the major new systems they were procuring.

In the three plus decades since the CSPCS criteria were first issued their utility has met the test of time. While these same criteria later became the Cost/Schedule Control Systems Criteria (C/SCSC) in 1967, then the Earned Value Management System (EVMS) in 1996, and finally the American National Standards Institute-Electronic Industries Alliance (ANSI/EIA748) in 1998, they are essentially the same performance standards conceived by the Air Force in the mid 1960s. The original 35 (now 32) criteria are perfect for the mission for which they were created: to oversee the project performance of major systems acquisitions by United States Government Agencies.

The trouble is that some of us have felt that earned value should be more than simply a government reporting requirement. However, when we have tried to employ these same basic principles (the criteria) in the management of our smaller projects, we find that they smother them. The reason: most projects we work are not major systems. Most projects are but a fraction of the size and the complexity of major systems being developed for the government. How do we find the proper balance to implement earned value without inundating our projects with unnecessary requirements?

Perhaps the answer lies in the criteria themselves. What if we were to simply select perhaps only a few of the 32 EVMS criteria and then apply them to our next project...might that approach work? We think so. A low-end scalable earned value approach could be obtained, we believe, by simply employing a selected number of the EVMS criteria. All of the 32 criteria are nevertheless perfect for the oversight of major new systems, but not for most projects, in the opinion of these writers.

Let us focus on just a few of the 32 EVMS criteria and see what we come up with. Below we have taken just 10 EVMS criteria, verbatim, followed by our brief interpretation of the requirements. Why just 10, because it is an easy number to remember. But the main point: 10 criteria may just be sufficient to employ a simple form of earned value...earned value for the masses.

EVM Criterion # 1:

Define the authorized work elements for the program. A work breakdown structure (WBS), tailored for effective internal management control, is commonly used in this process.

In order to measure project performance one must determine what constitutes 100% of the project. There can be no substitute for this absolute requirement: the scope of the project must be defined in order to measure performance.

Does this mean that you will know with absolute certainty all aspects of your project...no. But you must make some intelligent assumptions about the makeup of the new project based on whatever information you can gather. You must define the project objectives, the deliverables, the key milestone points, etc. You make assumptions based on your past professional experiences.

A work breakdown structure (WBS) is typically recommended (perhaps required) for use in the scope definition process. The WBS is a hierarchical family tree which groups the major segments of the project and is used to specify its deliverables: hardware, software, services, intellectual points, and data. The WBS is perhaps the single most important requirement in the employment of earned value. It is the device which integrates scope with budget with schedule.

Each WBS level provides a progressively more detailed description of the work to be accomplished. Any work that is later requested of the project that cannot be identified within the WBS is potentially out of scope effort, and authorization is needed in order to perform such work.

The project WBS allows management to focus on a logical grouping of project work for actual performance measurement. At selected levels of specified WBS elements will be placed Control Account Plans, CAPs, which are the points at which management control and earned value performance will take place for the project. A CAP can best be thought of as a subproject, a point of management focus.

Thus, the summation of all CAPs will constitute the total project.

EVM Criterion # 2:

Identify the program organizational structure including the major subcontractors responsible for accomplishing the authorized work, and define the organizational elements in which work will be planned and controlled.

This criterion is related to # 1, and merely extends the scope definition process. While criterion # 1 defined and decomposed the project work, criterion # 2 requires a determination of who will actually perform the work.

All tasks contained in the project's WBS must be assigned to a specific company organization for performance. If, however, there is no capability within the company to perform such work, or if such capability is not available to the project for whatever reason, then such work must be procured from an outside source. Make or buy determinations are a part of the scope definition process.

EVM Criterion # 3:

Provide for the integration of the company's planning, scheduling, budgeting, work authorization and cost accumulation processes with each other, and as appropriate, the program work breakdown structure and the program organizational structure.

The purpose of this criterion is to require the integration the project management processes with both the way the work was defined (by WBS), and with the functional organizations who will be performing the effort. This requirement specifies that projects employ a single management control system using a common information database which transcends the company's functional organizations. The project's control account plans, CAPs, which will have all tasks allocated to specific functions for performance, provides the basis for such integration.

Companies, particularly those with large and well established functional organizations, often have difficulty satisfying this criterion. Each of the various functional organizations will have their own set performance agendas, and each would like to manage their affairs in their own particular manner. Sometimes functional performance goals can be at odds with project goals.

The control account plan, the CAP, is the fundamental building brick of earned value management, and makes it possible for the various functional elements to work from a common project database. With use of CAPs, performance results can be monitored by either the WBS, to satisfy external customer demands, or from the company's organizational perspective, to satisfy their internal functional customers.

EVM Criterion # 6:

Schedule the authorized work in a manner which describes the sequence of work and identifies the significant task interdependencies required to meet the requirements of the program.

Earned value requires a scheduling system. A schedule is simply the defined project scope locked into a time-frame for performance. A good scheduling system will tell the project manager which tasks are holding up other tasks, and how long the project will take to finish based on the length of its longest or critical path.

This criterion requires that companies use a formal scheduling system to support all projects. Projects must issue a master schedule which sets forth all critical milestones and key tasks. The project's "planned value" will be determined by compliance with this criterion.

On the larger and more complex projects, and in organizations where there are numerous projects being performed concurrently, the project's master schedule will be reinforced by subordinate schedules, often taking the form of detailed functional schedules. However, all schedules within the organization must be in concert with the requirements contained in each project's master schedule.

EVM Criterion # 7:

Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.

This criterion is related to # 6 above, and requires that all projects have the ability to measure their physical performance, as defined within the tasks displayed in project schedules. It requires defined metrics to convert the "planned values" into "earned values."

Projects must specify what physical products, deliverables, outputs, metrics, milestones, and technical performance indicators will be used to measure work actually accomplished against their planned schedule. There are numerous methods with which to measure physical work accomplishment, and the projects must specify which of these methods they plan to employ.

EVM Criterion # 8:

Establish and maintain a time-phased budget baseline, at the control account level, against which program performance can be measured. Initial budgets established for performance measurement will be based on either internal management goals or the external customer negotiated target cost including estimates for authorized but undefinitized work. Budget for far-term efforts may be held in higher level accounts until an appropriate time for allocation at the control account level. On government contracts, if an over target baseline is used for performance measurement reporting purposes, prior notification must be provided to the customer.

This criterion requires a time-phased project baseline to measure performance. Such baselines are made up from the summation of the project's control account plans (CAPs). Management reserves (MR) are typically considered to be outside of the performance baseline, until specifically authorized for work within the baseline. The project baseline must include all authorized work. Any authorized project work which is not yet negotiated must be included in the project baseline at some estimated value until negotiated.

On those projects which run for a long-duration, it may not be possible to budget the far-term effort down to the specific work package level. In such cases far term budgets may be kept at the higher level WBS elements, called "planning packages." However, it is critical to the integrity of earned value measurement that far-term budgets also be tightly controlled to prevent the co-mingling of such effort with near-term fully defined work packages.

This criterion requires that all project costs, including indirect costs, be allocated into the baseline. But indirect costs do not necessarily need to be allotted to specific CAPs. If indirect costs are left outside of individual CAP budgets, such costs must be allocated so that the full value of the baseline includes all costs, direct and indirect. Some projects accomplish this requirement by creating a separate CAPs covering indirect costs.

The term "over target baseline" as used in the criterion is simply a kind and gentle and ambiguous term for an "overrun." All projects require a well defined and formally controlled baselines in order to measure earned value performance for the life of the project.

EVM Criterion # 16:

Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.

This criterion requires the use of generally accepted methods of accounting for all direct project costs. Any method of accounting may be used, but the preferred technique is the "applied direct cost" method, which simply means direct resources are accounted for as they are consumed. It is fairly easy to allocate direct labor costs and their corresponding burdens, and other direct costs to a specific project. However, direct costs covering materials, because they are often purchased for inventory, or consumed in a later time period, or may be transferred out of inventory to another project, often provide a major challenge to measure on any given project.

Some companies, because they have been functionally oriented for so long a time, experience difficulty isolating the direct costs against their specific projects.

EVM Criterion # 22:

At least on a monthly basis, generate the following information at the control account and other levels as necessary for management control using actual cost data from, or reconcilable with, the accounting system:

- (1) Comparison of the amount of planned budget and the amount of budget earned for work accomplished. This comparison provides the schedule variance.***
- (2) Comparison of the amount of the budget earned and the actual (applied where appropriate) direct costs for the same work. This comparison provides the cost variance.***

This criterion is one of the most important, and differentiates earned value management from other traditional approaches of measuring cost performance as planned costs versus actual costs. This requirement is for a monthly (at a minimum) comparison of performance results at the control account level with a focus on:

1. A comparison of earned value versus planned value to determine the "schedule variance",
2. A comparison of earned value versus actual costs, to determine the "cost variance."

While this criterion only requires a monthly analysis, recent experiences in industry suggests a trend toward the weekly measurement of direct labor hours. The comparisons should be sufficiently detailed to allow for performance measurement by category of direct costs, by subcontractor performance, and by organization

EVM Criterion # 27:

Develop revised estimates of cost at completion based on performance to date, commitment values for material, and estimates of future conditions. Compare this information with the performance measurement baseline to identify variances at completion important to company management and any applicable customer reporting requirements including statements of funding requirements.

A key issue facing all projects is how much it will cost to complete the job, typically called the estimate at completion or EAC. Likely, this will be one of the primary reasons why projects elect to employ earned value: to get an accurate forecast of the total funds needed to complete the project. If it is going to cost more than management has authorized to complete a job, management deserves to know it as early as possible. Management may elect to use the remaining funds elsewhere.

Some project managers have been known to put a positive spin on actual performance results, and perhaps even mislead management into unrealistic expectations. Other times it may be senior management who will insist on ignoring actual performance results and direct the project manager to make overruns "go-away." Call it optimistic, or unrealistic, some managers have established a reputation for themselves of consistently making poor forecasts of the total cost requirements. This is often the case when working under "cost reimbursable" type arrangements. An essential component of any management control system must be the ability to make accurate and timely forecasts of the total costs on projects.

This criterion requires that EACs be routinely performed based on actual performance and a reasonable determination of the work ahead. Such forecasts must relate to the authorized statement of work, and are best supported by bottom-up estimates for all remaining tasks.

Even though indirect costs will be beyond the control of any given project manager, because of their impact on total costs, indirect costs are an essential part of any accurate EAC. Historical performance of indirect pools should be considered while forecasting the EAC.

EVM Criterion # 28:

Incorporate authorized changes in a timely manner, recording the effects of such changes in budgets and schedules. In the directed effort prior to negotiation of a change, base such revisions on the amount estimated and budgeted to the program organizations

Criterion # 1 required that the full scope of the project be defined. This last criterion requires that all changes be addressed, either approved or rejected, and all approved changes be incorporated into the project baseline in a timely manner.

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By selecting just 10 of the formal 32 EVMS criteria, we believe one can employ a simple but effective form of earned value for use on any project. We suggest that you experiment, innovate, and implement a simple form of earned value on your next project. Use these 10 basic criteria to get started.

You may not get it right the first time. But shortly you will find that earned value management provides you with a status of your project which is not available with any other project management technique.