Start With "Simple" Earned Value On All Your Projects

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When one hears the term Earned Value Management (EVM), there is a tendency to immediately think of the American National Standards Institute/Electronic Industries Alliance (ANSI/EIA)-748-1998 required by many government agencies and private contractors. We take exception to this formal definition of EVM. While the ANSI/EIA-748 Standard does require full compliance with 32 precise criteria, and will result in EVM, we suggest that a simple form of EVM can be gained by implementing just 10 of these formal criteria on all projects – even software projects.

In 1965, the U.S. Air Force acquisition managers defined 35 criteria which they felt would capture the essence of earned value management (EVM), and also satisfy their need to oversee the work that was being performed for them by private industry. Two years later, the Department of Defense (DoD) adopted these same criteria as their Cost/Schedule Control Systems Criteria (C/SCSC). These 35 standards were then consistently applied to all cost type and incentive type contracts for the next three decades.

Then in 1996, after a rewrite of the 35 C/SCSC criteria by private industry, the DoD accepted the rewriting/rewording of these criteria under a new title called the Earned Value Management System (EVMS). The total number of criteria was reduced to 32. Gone were the incomprehensible terms of Budgeted Cost for Work Schedule, Budgeted Cost for Work Performed, and Actual Cost of Work Performed, etc. In their place were titles like planned value, earned value, and actual costs. People (even busy executives) could understand the concept without the need for special training or a translator being present.

Private industry in the form of the National Defense Industrial Association (NDIA) took the defined criteria concept one step further. In June 1998, the NDIA obtained acceptance of the EVMS in the form of the American National Standards Institute, termed the ANSI/EIA-748 Standard. The good news in this story is that there has been a consistent application of the earned value criteria concept applied for more than 40 years. The earned value criteria have met the test of time.

The bad news is that these criteria were originally written for applications to complex major system acquisitions. Further bad news is that the original 35 criteria – and the reworded 32 criteria –

can be overly prescriptive to most of the projects in the world, in our opinion. They are great for major systems, but likely too much for most projects. Somehow a way must be found to capture the important fundamentals of earned value without overly prescribing requirements, which often discourages individuals wanting to adopt a technique to better manage their projects. And, as the ANSI/EIA-748 Standard becomes more commonplace, likely taking the form of a Federal Acquisition Requirements clause issued in routine procurements, a way must be found to scale back the full requirements to meet the needs of most projects – even small software projects.

Since 1996, the authors have been advocating a *simple* form of EVM for all projects, not just major complex systems [1]. Their intent is not to take issue with the full application of all 32 criteria whenever the project risks and complexities warrant full application. However, we think all projects could benefit from "*A methodology for … objectively measuring project performance and progress* [2][1]." EVM, the fundamental principles, should be applied to any project, of any size, in any industry.

We have studied the formal criteria concept and have summarized just 10 fundamental steps which are necessary to implement a *simple* (low-end) form of EVM on any project. Perhaps it might be called earned value light or earned value for the masses.

There are 10 minimum requirements necessary to employ *simple* earned value. This is a good place to start the process. It will set the foundation for employing EVM, which can be easily expanded to satisfy all 32 criteria, should that be desired sometime in the future.

Each of the following 10 fundamental steps will also make reference to a specific EVMS (ANSI/EIA-748 Standard) criterion.

Step 1: You must define the scope (objectives and deliverables) of the project.
Satisfying this first criterion is where we lose many projects, but it is critical to the earned value method. Certain types of projects, notably software, often give up at this point and refuse to go further. *Too difficult* is the cry. Management often relinquishes, and the project defaults to simply comparing their cost expenditures – planned costs versus actual costs. What a shame.

On any project, you must define the work to be done if for no better reason than to know where you are at all times and when you are done. To the extent that you can based on past experience, you must define 100 percent of the scope of the project. This is true for any project, but it is particularly critical on any project in which you intend to measure earned value performance.

With earned value, we constantly focus on the authorized work that has been completed plus management's official authorized budget for the completed work. We express the status as being 18 percent complete, 27 percent complete, 55 percent complete, and so forth. Point: If we have not defined what constitutes 100 percent of the project, how can we ever measure our point of percentage completion? We can not.

How does one define a new job when specific details are often lacking? There are no absolute answers. But one of the most useful of all tools available to any project manager is the Work Breakdown Structure (WBS). The WBS is to the project manager what the organization chart is to the executive. A WBS allows the project manager to define a new endeavor by laying out all the assumed work within the framework of the WBS and then decomposing each element into measurable work packages.

Additionally, once the WBS is assumed to constitute a reasonable portrayal of the new project, the WBS can then be used to

take the next critical steps in the project planning process, including make-or-buy analysis, risk assessment, scheduling, estimating, and ultimately the authorization of budgets to proceed.

(Reference: EVM Criterion No. 1 [2]: Define the authorized work elements for the program. A WBS tailored for effective internal management control is commonly used in this process.)

Step 2: You must determine who will perform the defined work, including the identification of all critical procurements. It is important to a project to decide who will perform the defined work. Experienced workers generally work better and faster than inexperienced people, but they also cost more. Often, using an experienced work force is a good investment. However, sometimes the project's own organization may have no experience in developing a critical new technology, and the project must procure the effort from another company. These choices are called *make* or *buy* decisions, and selecting those items that must be purchased for the project is an essential extension of the scope definition process.

Why is it important to identify the work which must be procured outside? Because project procurements (versus in-house work) create *non-forgiving* legal arrangements. Formal contracts must be executed. If you commit to buy something that is not what you need, or the requirements must be changed, such changes will be accommodated, but at a price. Sellers love to have changes in scope. Each change gives them an opportunity to *get well* from a competitive bid. The earlier the procured work is identified and responsibilities assigned, the better such packages can be managed by the project.

By contrast, internal budgets can be executed in a more informal way, and the fact that everyone is on the same payroll allows for some margin of slack. But there is no slack with the procured work. Procurements must be done properly at the start or the project will pay a price.

Lastly, whether the project work is done by the project's own organization or procured from outside the company, the measurement and reporting of progress must take place. Inside or outside, the project must be able to continuously measure the earned value versus the actual cost of the work being performed.

(Reference: EVM Criterion No. 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.)

Step 3: You must plan and schedule the defined work. The earned value technique could be thought of as representing nothing more than a good scheduling system, but with authorized resources (the budgets) embedded into the schedule. The schedule reflects the authorized scope and timeframe, and the budget is earned for work as it is accomplished.

A formal scheduling system is thus necessary to the employment of earned value because it is the vehicle that describes the project scope, the planned value, and then measures the resulting earned value. The project schedule is vital to earned value because it reflects the project manager's baseline *planned value* for everyone to follow.

On more complex projects, there should be some method used to isolate the constraints between one task and other tasks. What work is holding up other work? Typically to satisfy this requirement, some

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form of critical path methodology will need to be employed. The critical path (and near critical paths) on a project must be aggressively managed in conjunction with negative earned value schedule variances.

A behind-schedule variance indicates that the project is falling behind its baseline plan. If any late tasks are also on the critical path, or they represent high risk tasks, they must be aggressively managed to successful completion.

(Reference: EVM Criterion No. 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.)

Step 4: You must estimate the required resources and formally authorize budgets. Once the project scope has been fully

defined and subsequently planned and scheduled, the next requirement is to estimate the resource requirements (budgets) for all defined tasks. Some projects follow the start-up sequence of scope, schedule, and budget while others follow scope, budget, and schedule. Software projects, because they are often driven by the availability of limited resources will schedule the project based on available people. Either way can be correct as long as scope definition comes first.

Each defined WBS element must have a resource value estimated to complete all of the specified work, including changes. Management will then assess the requested resources and approve a value in the form of an authorized budget. Individual WBS budgets should never contain contingencies or management reserves. Reserves or contingencies, if they exist, must be isolated and owned by the project manager.

Remember the rule that *planned value* represents two things: the scheduled work, plus the authorized budget. *Earned value* also represents two things: the completed authorized work, and the same authorized budget. Thus, in order to plan and then measure earned value, one needs to schedule all defined tasks along with the authorized budget necessary to complete the tasks.

All authorized budgets must be achievable in order to have a viable project baseline.

(Reference: EVM Criterion No. 9: Establish budgets for authorized work with identification of significant cost elements [labor, material, etc.] as needed for internal management and for control of subcontractors.)

Step 5: You must determine the metrics to convert planned value into earned value. How does one measure the accomplishment of planned value into earned value? One sets up measurable (verifiable) metrics within the baseline schedules to quantify the authorized work, and then measures the completion of the authorized work. Specific milestones or tasks with weighted values are measured as they are physically performed. Remember, earned value project management is nothing more than managing a project with a resource-loaded schedule.

Since earned value was first introduced, various methods have been devised to measure project performance. However, the most respected methods use some type of discrete measurement. Specific milestones representing points in time are assigned values, which when fully completed, the assigned budgeted values are then earned. Also, tasks are assigned values, which can be measured as they are partially completed, at which time some value is

assigned to the completed work through the reporting period.

(Reference: EVM Criterion No. 7: Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.)

Step 6: You must form a performance measurement baseline and determine the points of management control referred to as Control Account Plans (CAPs). Earned value requires use of an integrated project baseline. An integrated baseline means that the defined work must include both the baseline schedule and the authorized budget. Integration takes place within each of the specified WBS elements.

Project management must next specify their points of management focus, referred to in earned value as CAPs [2]. CAPS are placed at selected WBS elements and can best be thought of as sub-projects, project teams, or subdivisions of the total project. The sum of the CAPS will constitute the total project baseline. The actual earned value performance measurement will take place within each of the specified CAPs. Total project performance is simply the summation of all the detailed CAPs, which can be placed at any level of the WBS.

On some commercial type contracts, the total project baseline may sometimes include such things as indirect costs and even profits or fees to match the total authorized project commitment. The project baseline must include whatever executive management has authorized the project manager to accomplish.

Most likely, internal company projects typically do not contain indirect costs or profits. Many (perhaps most) internal project baselines will simply represent the sum of the defined CAPs, which are often made up from direct labor hours only. The authorized project baseline constitutes whatever management has decided it should be.

Note: The referenced EVM criterion No. 8 contains a lot of words, most of which are beyond the requirement for simple earned value applications.

(Reference: EVM Criterion No. 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 upon either internal management goals or the external customer-negotiated target cost including estimates for authorized but undefined 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.)

Step 7: You must record all direct costs by project consistently with the authorized baseline budgets, in accordance with the organization's general books of accounts. This criterion simply requires that project managers be informed as to how much money they have spent on their projects – a simple requirement that some organizations find extremely challenging. The reason is many organizations have been functionally oriented for so long that they have lost their ability to focus on individual project performance. It is absolutely essential that direct costs be identified by project as work progresses.

In order to employ earned value on any project, the actual costs must be aligned to the authorized project budgets. Remember the rule that planned value represents the authorized work plus budget, which is then converted into completed work and the same budget to represent the earned value. Earned value must then be relatable to the

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actual costs in order to determine the cost efficiency factor, called the Cost Performance Index (CPI). The CPI is likely the single most important metric for any project employing earned value.

There is a trend in projects employing earned value to measure performance on a weekly basis. We need to understand what this means, and what it does not mean. Weekly EVM means the measurement of internal direct labor hours. On a weekly basis, the company labor tapes will produce a planned value, earned value, and actual hours for internal direct labor hours only. Direct labor dollars, indirect costs, purchased articles, travel, etc., are generally not available on a weekly basis. Weekly performance measurement takes place on the internal direct labor hours only.

(Reference: EVM Criterion No. 16: Record direct costs in a manner consistent with the budgets

in a formal system controlled by the general books of account.)

Step 8: You must continuously monitor the earned value performance to determine cost and schedule departures from the baseline plan: both schedule variances (earned value less the planned value) and cost variances (earned value less the actual costs). Projects employing earned value must monitor their cost and schedule results against the authorized baseline for the duration of the project. Management will focus their primary attention on exceptions to the baseline plan, particularly those that are greater than previously defined acceptable tolerances. Earned value is thus a *management by exception* concept.

A negative earned value schedule variance simply means that the value of the work performed does not match the value of the work scheduled, that is, the project is falling behind in its scheduled work plan. Each behind-schedule task should be assessed as to its criticality. If the late tasks are on the critical path, or if the tasks carry a high risk to the project, then efforts must be taken to get the late tasks back on schedule. However, additional project resources should not typically be spent on low-risk tasks or tasks that have positive critical path float.

The single most important aspect of employing earned value is the cost efficiency readings it provides. The difference between the value of work earned, versus the costs incurred to accomplish the work provides the cost efficiency factor. If the project spends more money than it receives in value, this reflects an overrun condition. Overruns are typically non-recoverable. Overruns expressed as a percentage value have been found to deteriorate unless the project takes aggressive actions to mitigate the condition.

Perhaps of greatest benefit, the earned value cost efficiency rate has been found to stabilize from the 20 percent point of a project completion. The cost efficiency factor, CPI, is thus an important metric for any project manager or portfolio executive to monitor.

(Reference: EVM Criterion No. 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.)

Step 9: Using earned value data, you must forecast the final required costs based on actual performance and keep management apprised so they can take corrective actions if necessary. One of the more beneficial aspects of earned value is that it provides the capability to quickly and independently forecast the total funds required to complete a project, commonly referred to as the estimate at completion. Based on actual cost and schedule performance against the baseline plan, a project is able to accurately estimate the total funds it will require to finish the job within a finite range of values.

Often, management or customers will have a preconceived notion of what final costs should be or what they would like them to be. If the earned value statistical forecast of estimated final costs are greater than the *official* project manager's estimate to complete the project, someone needs to reconcile these professional differences of opinion.

Actual performance results on any project, good or bad, are in effect *sunk costs*. Such costs represent what the project has actually achieved in performance. Thus any improvements in performance must come from the future work – tasks that lie ahead of the project's status date. Earned value allows the project manager to accurately quantify the cost and schedule performance achieved to date. And if the results achieved to date are less than that desired by management, the project can exert a more aggressive posture to influence the future work.

Earned value allows the project to accurately quantify the value of its work it has achieved. It also allows the project to quantify the value of the future work in order to stay within the objectives set for the project by management. Likely, the single most respected method to forecast the final cost results is to assume that the project will continue at its established cost efficiency rate, CPI; it will get better or worse within a narrow, finite range.

(Reference: EVM Criterion No. 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.)

Step 10: You must manage the authorized scope by approving or rejecting all changes, and incorporating approved changes into the project baseline in a timely manner. The project performance measurement baseline, initially put into place at the project start, is only as good as the management of all proposed new changes to the baseline for the duration of the project. Performance baselines quickly become invalid simply by failing to incorporate changes into the approved baseline with the addition or deletion of added work scope.

All new change requests of the project must be quickly addressed, either by approving such changes or by rejecting them. All project managers should have sufficient authority to say *no*.

In order for the initial baseline to remain valid, every change must be controlled. Maintaining an approved baseline can be as challenging as the initial definition of the project scope at the start of the project.

(Reference: EVM Criterion No. 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.)

Summary

Earned value project management is not a difficult concept to understand or employ. It is certainly not as complicated a process as some have made it to be throughout the years. We have concluded that effective earned value can be achieved by simply applying these 10 steps and can be applied to any project, of any size, in any industry. Earned value is for the masses.

Again, we are not taking issue with the EVMS or ANSI-EIA-748 Standard. What we are suggesting is starting with the implementation of earned value in a limited way, on all projects, by simply taking the 10 simple steps as outlined here.

As you read over these 10 steps, we hope you come to the conclusion that employing earned value project management consists of nothing more than simply following fundamental best project management processes. As was stated nicely by a gentleman from the United Kingdom:

> Whilst you can practice good project management without EVM, you cannot practice EVM effectively without good project management. [3]

We could not have stated it better.◆

Note

1. The numbers as shown relate to the sequence of the listed criteria in both the EVMS and ANSI-EIA-748 Standard.

References

1. Fleming, Quentin W. and Joel M. Koppelman. <u>Earned Value Project Management</u>. 3rd ed. Newtown Square, PA: Project Management Institute, 2005.
2. Project Management Institute. <u>A Guide to the Project Management Body of Knowledge</u>. 3rd ed. Newtown Square, PA: Project Management Institute, 2004.
3. Crowther, Steve. "Best of British: Earned Value Management." <u>British Association for Project Management</u> June 1999:13.

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