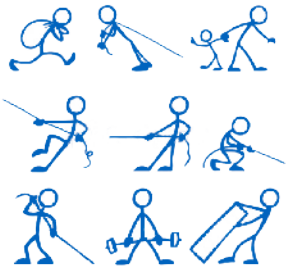

Activity-Based Costing in Project Management

By Travis K. Anderson

The purpose of this descriptive case study is to elaborate on the context of project management and the encompassing practice of earned value management (EVM) in relation to the fundamentals of activity-based costing (ABC). The opportunity is to develop an integrated management system using ABC concepts to plan, measure, and control costs that allow managers to focus on process performance and to make informed decisions along the product / service / project life cycle.

It is assumed that the reader is familiar with common project management terms; however, Figure 1 shows a web link to Wideman Comparative Glossary of Common Project Management Terms v3.1 for those readers unfamiliar with project management terminology.

Discussion and Analysis of Critical Issues

Organizations are faced with many challenges during this time of economic recession. The most common organizational reactions are to button down the hatches, secure the turf, and start chopping staff positions. Dysfunctional organizations tend to consistently look in the rearview mirror and employ managers that make snap decisions without sufficient data, which often result in organizational demise. Forward looking organizations that seek out opportunities during a time of economic recession tend to focus on process improvement initiatives, such as business-process analysis, ABC, EVM, and life-cycle compression metrics, among other things.

Wideman Comparative Glossary of Project Management Terms v3.1
http://www.maxwideman.com/pmglossary/index.htm

Figure 1. Wideman Comparative Glossary on the Internet (Wideman, 2002)

This case study assumes the forward-looking perspective. The next section introduces ABC, which is followed by a brief discussion of concepts and methods found during the research of several other independent case studies. Then, I provide an introduction and description of some basic project management processes, and finally I continue with a simplicity case and finally the conclusion.

Activity Based Costing (ABC)

Introduction

ABC was developed as a continuous improvement initiative of the accounting information system. Originally, ABC was used as a product costing methodology but is now being used as a cost management tool in many different functions of business (Awasthi, 1994, p 8). A couple of differences between ABC and traditional cost systems are

1. costs are traced to cost objects by identifying cost drivers
2. costs are traced on the basis of the structural or hierarchical level at which costs are incurred.

Therefore, ABC provides more accurate cost estimates of the product or service and the corresponding activities than traditional costing (Kee, 1995, p 49).

Discussion

It is important to note that, in traditional costing, the assumption is that products consume resources. ABC contrasts traditional costing by assuming that products consume activities and activities consume resources. Once the product or service activities are identified, costs are allocated to the product or service according to the amount incurred by those activities. This method of allocating costs provides a benefit for making decisions regarding different types of profitability and project accounting (Awasthi, 1994, pp 9–10).

There are two sets of costs related to the accuracy of ABC cost information

1. cost of measurement
2. cost of decision error

As the accuracy of measurement goes down the cost of decision error goes up. Detail is an important factor in the success of an ABC system, but the detail must be value add. It is important to control changes brought on by environmental factors (competition, volatility, profit margins, etc.…) while still allowing for diversity throughout the life cycle of the product or service (Awasthi, 1994, p 11). So how can one ensure accuracy in measurements for better decision making? The key is to identify and analyze the most optimal cost drivers that trace the costs of the activities back to the product or service.

Activity Identification and Analysis

Cost drivers are linked to business process mapping and activity analysis to obtain rigid data for measurement analysis. Figure 2 depicts a two-stage process that traces expenses through activities to cost objects.

The first stage traces expenses from the department or organizational level budget to activities that are assigned to resources (labor, space, materials, and suppliers). For example, a labor resource is allocated to an activity at 100% over duration of time equating to a unit of work converted to an activity cost. In the second stage, activity costs are traced through the activity cost drivers to the cost objects, i.e., products and / or services. This stage is concerned with explaining the causes of work and what things cost. Managers that focus on process drivers and cost drivers have a more detailed understanding of activity costs and associated activity dependencies. Therefore, managers can make better decisions on areas in need for process improvement instead of shooting from the hip (Brandt et al., 1999, pp 22–25).

ABC provides a hierarchical structure of detail. The challenge for managers is to ensure an optimal amount of detail that achieves balance and accuracy.

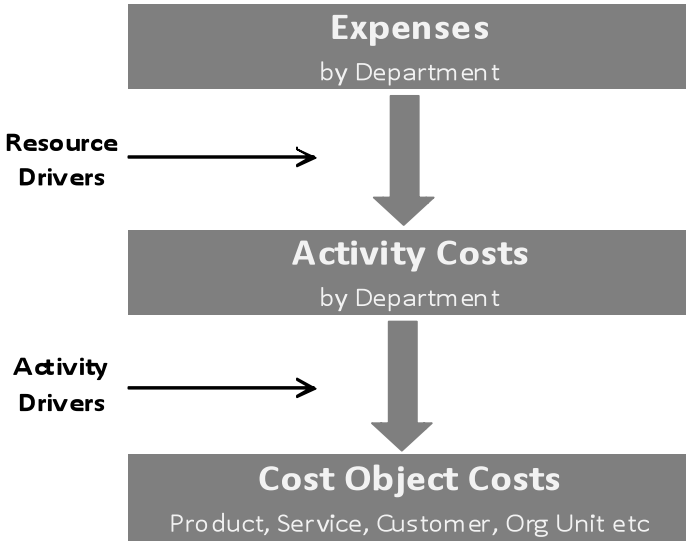

Figure 2. Basic ABC Flow

Cost Driver Optimization

Managers chose cost drivers for planning and control purposes. Choosing too many cost drivers and the system is bogged down creating extra costs and inefficiency problems. Managers must strive to strike a balance between accuracy benefits and costs of data management. In their article “Cost Driver Optimization in Activity-Based Costing”, Babad and Balachandran indicate that an optimal number of cost drivers generally discriminates and captures most of the incurred costs and identify a priority order that specifies which low-priority and relatively insignificant activities will be combined to save costs without sacrificing much accuracy (Babad and Balachandran, 1993, p 565).

At this point, I have introduced and discussed the concepts of ABC as a process object for organizations to use. The next section expands on the context of project management and the encompassing practice of EVM in relation to the fundamentals of ABC.

Project Management EVM — Introduction and Background

A project is characterized as a progressively elaborated temporary endeavor undertaken to create a unique product, service, or result (PMBOK, 2004, p 5). Projects generally exist as a sub-set of the organization. A project charter provides the project manager with the authority and accountability over the

scope, schedule, and budget (triple constraints) at the project level (PMBOK, 2004, p 81).

EVM is defined in the PMBOK glossary as a management methodology for integrating scope, schedule, and resources, and for objectively measuring project performance and progress. Performance is measured by determining the budgeted cost of work performed (i.e., earned value) and comparing it to the actual cost of work performed (i.e., actual cost). Progress is measured by comparing the earned value to the planned value (PMBOK, 2004, p 353).

EVM is implemented through an EVM System (EVMS), which provides quantitative metrics that lead to a higher confidence in decision making related to forecasting by identifying early warning signs. This process is analogous to using the rearview mirror to see what is behind the vehicle before making the decision to switch lanes. A properly designed EVMS encompasses sound project management practices.

Project Management EVM and ABC

Project Life Cycle

Project managers or organizations parcel projects into phases for better management control. Phases are typical identified within a life cycle. The phases of the project life cycle are depicted in Figure 3. The project life cycle is not intended to represent the project management process. The project life cycle typically defines 1) what technical work to do in each phase, 2) when the deliverables are to be generated in each phase, 3) who is involved in each phase and 4) how to control and approve each phase (PMBOK, 2004, p 20).

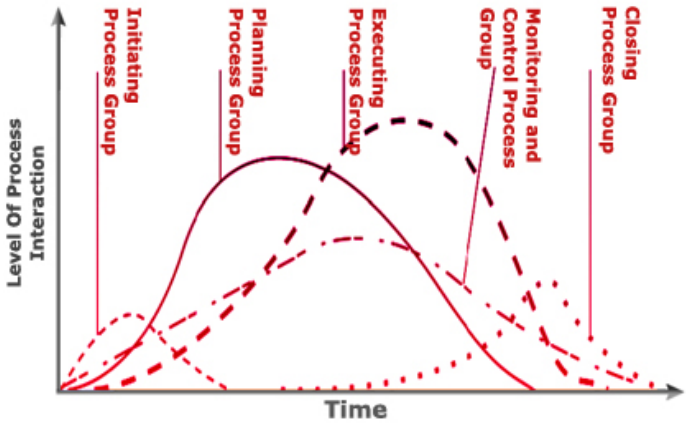

Figure 3. Project Life Cycle (PMBOK, 2004, p 68)

Work Breakdown Structure (WBS)

In this process, project deliverables and objectives are subdivided into smaller more manageable components. A WBS is a deliverable-oriented hierarchical decomposition of the work. WBS models vary among projects from service / functional to hybrid. This idea is the activity analysis concept mentioned previously in "Activity Identification and Analysis" under Activity Based Costing (ABC).

Work is planned to the lowest-level WBS component called a work package. Estimating schedule work package cost involves developing an approximation of the costs of the resources needed to complete each work package. Resources are applied via applications such as Microsoft Project or Primavera in a resource loaded network (RLN), i.e., a resource loaded schedule. Work packages are executable and are classified as either discrete or level of effort.

- Discrete effort: Tasks which can be directly measured and are related to the completion of specific end products
  - Performance Measurement Techniques (PMT) are used for objectively measuring the work performance and taking credit for work complete.
- Level of Effort (LOE): Activities are those that typically have no associated technical end product
  - Characteristics of tasks referred to as Level of Effort (LOE) are:
    - Primarily general or supportive activities
    - Budget is scheduled over the period of performance
    - Earned value is based on the passage of time
    - Performance is equal to the planned value

Activity costs are traced to the highest level typically known as the control account. The deliverables are generally at the next level below the control account, whereas the resources and activity drivers are at the lowest-level of the WBS. Estimating schedule work package resources involves determining what resources and what quantities of each resources will be used and when each resource will be available to perform project activities. EVM PMTs are applied to the work packages and roll-up (sum-up) at the control account level. Some common examples

of discrete EVM PMTs are percent complete, 0/100, 50/50, interim milestones, and percent complete. Whereas LOE is by definition, earned value equals planned accomplishment.

Figure 4 is a generic representation of a WBS. Notice the phases and deliverables located throughout the WBS. Also notice the work packages at lowest-levels of the WBS.

Figure 5 is a software development representation of a WBS using a traditional waterfall development software lifecycle.

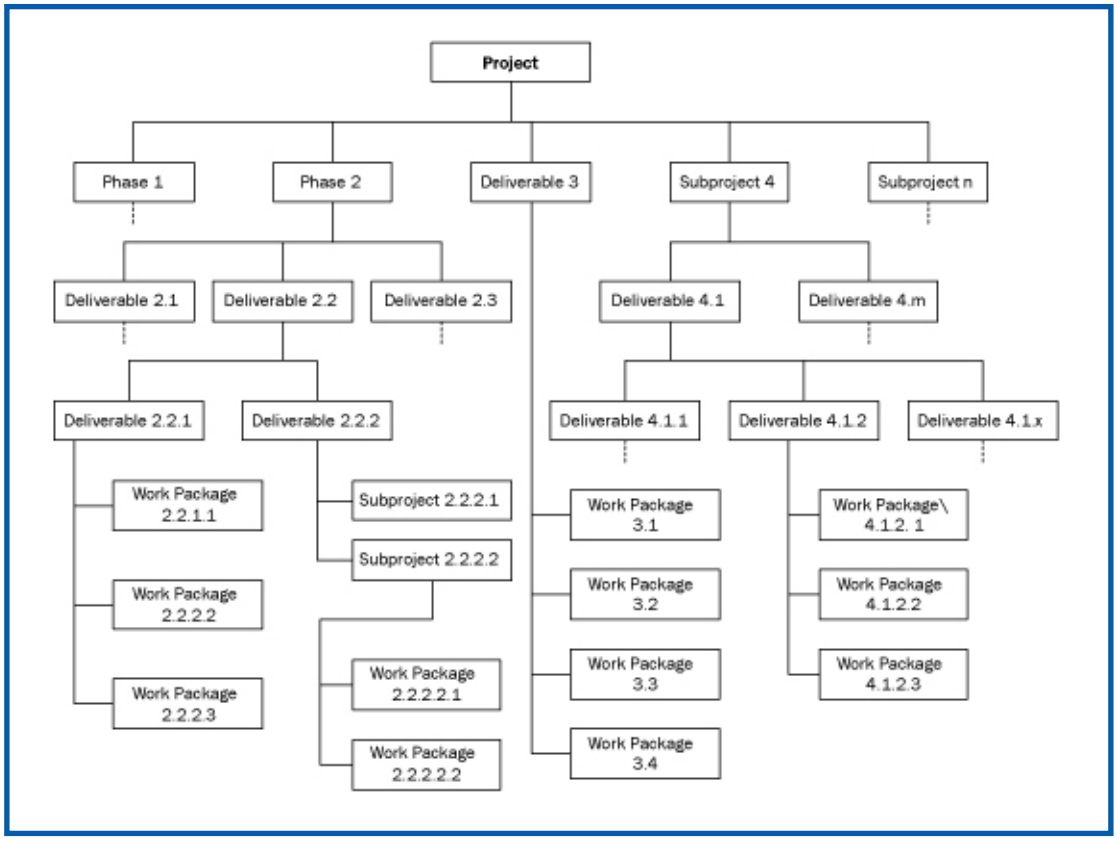

Figure 4. WBS Example 1 (PMBOK, 2004, p 114)

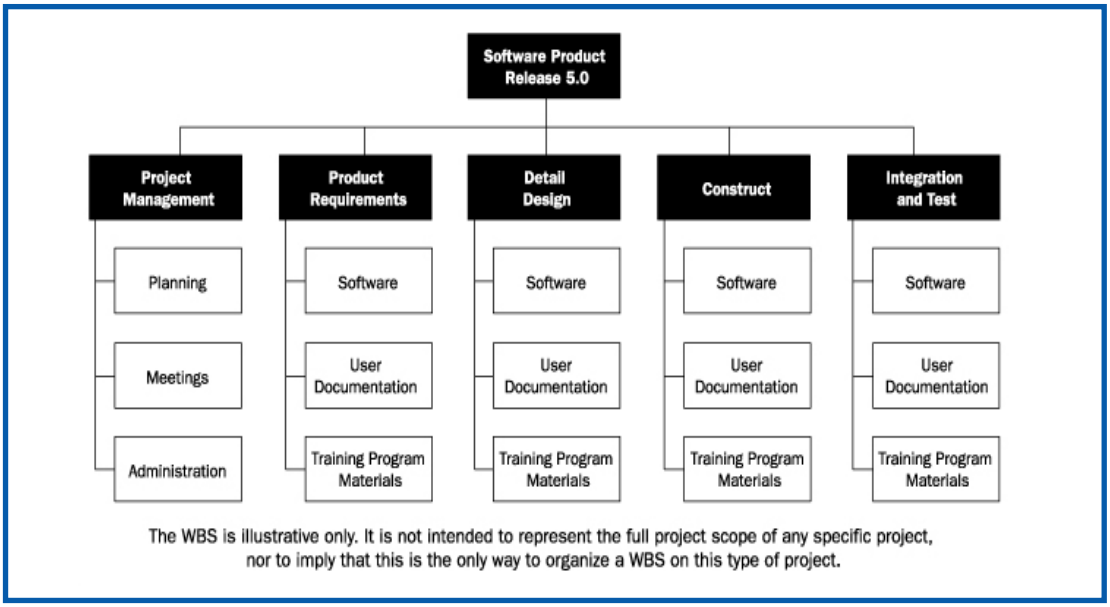

Figure 5. WBS Example 2 (PMBOK, 2004, p 116)

Responsibility Assignment Matrix (RAM)

To define the cost objects, a program manager (PM) will use a RAM. Max Wideman defines the RAM as an important tool that correlates the work required by a contract work breakdown structure (CWBS) element to the functional organization responsible for accomplishing the assigned tasks. The responsibility assignment matrix is created by intersecting the CWBS with the program organizational breakdown structure (OBS). This intersection identifies the cost account (Wideman, 2002).

Figure 6 and 7 are great examples of how cost objects are realized as control accounts. All the activity estimates, risks, and incurred costs related to the cost account are summarized at these management control points. This summary gives the PM tremendous insight to the health of his / her project.

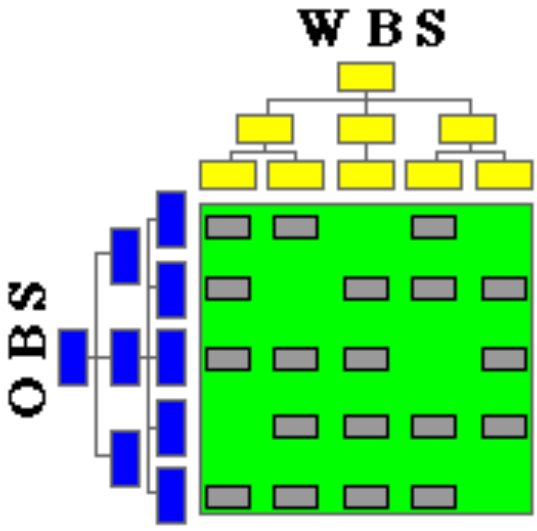

Figure 6. RAM Example 01 (Valuation Opinions, Inc., 2008).

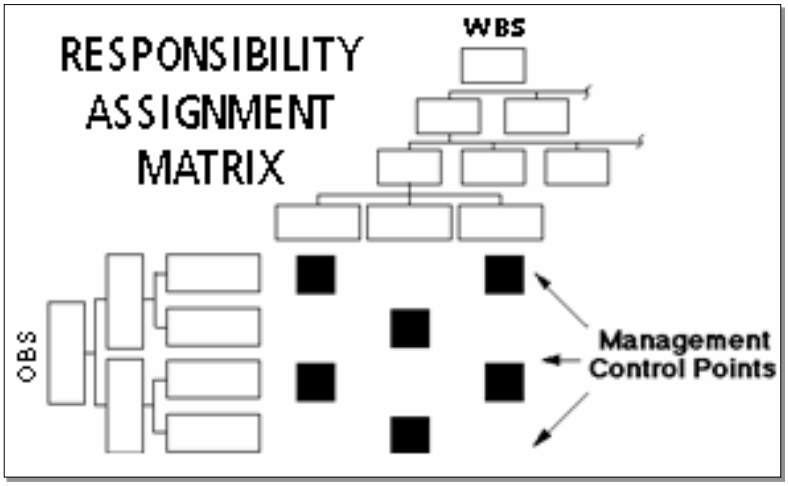

Figure 7 RAM Example 02 (Performance Management Associates, Inc., 2008)

Resource Loaded Network (RLN)

A RLN is an integration of schedule and cost and is represented as a network of time phased resource loaded activities sequentially ordered across the phases of the project life cycle. A resource loaded activity is also called a work package. The longest path through the sequential network of activities is known as the critical path. The PM uses what is known as the critical path method to focus on those activities along this path to ensure the project delivers on time and within budget.

A PM can exercise a critical path analyses, what-if drills, and PERT analyses to monitor time and cost impacts. There are many programs that do not identify the critical path. The implication of not identifying and monitoring the critical path extremely diminishes the PM's ability to keep the program on track to completing successfully. Figure 8 represents a network of activities with the critical path indicated in bold red.

Descriptive Case

Project managers utilize ABC concepts throughout the project life cycle and may not even know it. One of the first jobs for the PM and team to conduct is a delineation of the deliverables and objectives defined in the statement of work (SOW) using ABC concepts. A simple example is when a project sponsor initiates the transfer of scope (deliverables and objectives) to be performed within a stated timeline and within a specific budget to the PM via the project charter. Before establishing the activity costs, the scope must be decomposed into a work breakdown structure (WBS).

The PM develops an initial RAM to align the WBS with the OBS to determine control accounts and assign control account managers (CAM). CAMs develop the scope description in the WBS

dictionary, which is comprised of inputs, outputs, assumptions, constraints, risks, deliverable milestones dates, among other things. It is the basis of estimate (BOE) artifact that explains the rationale behind the costs related to the time-phasing of activities and substantiates the activity cost estimates. The appropriate technical, schedule, and cost artifacts are captured into one project management plan (PMP).

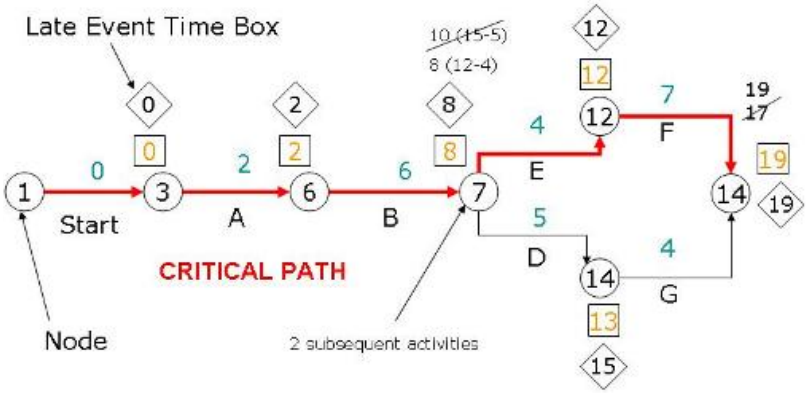

Figure 8. Critical Path (Construction-planning-and-control.com, 2008)

Using an application like Primavera, the resources are assigned to work package activities and EVM PMTs are applied across the time phased resource loaded network (RLN) or more commonly known as the schedule. The RLN is then integrated with another application like Deltek Cobra, which becomes the EVM interface tool for generating quantitative metrics and reports related to program performance. The technical baseline, schedule baseline, and the cost baseline are integrated into a performance measurement baseline (PMB), which establishes the foundation for performance tracking and estimate to complete forecasting.

Conclusions and Recommendations

ABC is absolutely applicable in the context of project management and the encompassing methodology of EVM. Organizational managers and PMs alike need a method to manage vast amounts of activities. Tracing cost to the product / service / project element gives managers an advantage to make informed decision for process improvement. ABC is one method of many and project management is the discipline of tactical processes to implement business strategy. Organizations that focus on opportunities and process improvement initiatives may just come out on top as winners in this most uncertain time of economic uncertainty.

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Continued from p. 4

award, but this approach would likely increase costs and would certainly lose points during the source selection process, thereby degrading the competitive position assumed when establishing the teaming arrangement. However, there is also the issue of how to implement such a system. Remembering that today's team members will probably be tomorrow's competitors, how would proprietary data such as rates be addressed within the system? This subject will be addressed in more detail later in this article.

A second approach is using the EVMS of one of the team members as the EVMS to be used by the holding company and also by all of the team members. Hopefully, at least one of the team members already has a validated EVMS, which would allow the holding company to state in its proposal that it will use a validated EVMS to manage the contract. This process would be easier to implement than the previous approach, but it still must be validated as a system (or at least demonstrated that the other team members are properly using the validated system), and there is still the proprietary data issue.

A third approach would be to have each team member use its own EVMS with the holding company consolidating the data provided by the team members into a single report to be sent to the customer. Part of that report would be a single integrated master schedule (IMS) that would be statused by each team member. The Contract Performance Report (CPR), or its equivalent, would be in total dollars only (hours could be provided, but rates would not be revealed), thus avoiding the proprietary data issue. Format 2 of the CPR would identify each team member as an organization. This approach, while appearing to be the most desirable, will not satisfy most customers. First, the requirement that the prime contractor (the holding company) must have a validated EVMS has not been satisfied. Second, the customer will want more detail such as hours, direct non-labor dollars, and rates (both direct and indirect). The second issue could be satisfied by each team member sending a separate proprietary report directly to the customer, but the issue of a validated EVMS still remains. Validating the holding company's EVMS, such as it would be, would not suffice because all that accomplishes is consolidating data from the team members. This approach is the equivalent of a prime (or integrating) contractor with multiple subcontractors, but the prime does not add any value of its own.

Because none of the described approaches satisfies the basic requirement that the entity awarded the contract for the major acquisition either has, or can get, a validated EVMS, it would be reasonable for the potential customer to reject a proposal as non-responsive. Therefore, before implementing any such approach, the customer must be consulted as to what it would and would not accept. Of course, the customer would have to get the approval of its agency's EVMS focal point of any agreement that does not strictly comply with federal government and agency requirements.

Designating a "Lead" Team Member

In this scenario, one of the team members is designated as the company that will submit the proposal, receive the award, and be responsible for all contractual requirements, including any EVMS requirements. Ideally, the lead team member will already have a validated system. If not, the lead team member must initiate action to receive a CFA validation. This approach is much like the second previously mentioned approach, but it avoids the issue of the entity with the contract not having, and not able to get, a validation. However, it still has the issue of all team members using the same EVMS and how to handle proprietary data.

To get a CFA to even consider accepting a teaming arrangement using one team member as lead, most of the following, if not all, conditions should exist:

- All team members use a single IMS for schedule baseline establishment and reporting schedule status.
- All team members have their labor hours scheduled in the IMS and in the team leader's EVMS cost processor.
- The team leader's EVMS cost processor uses wrap rates (all-inclusive rates) associated with each team member's organization up to, but not including, profit.
- All team members report their hours directly into the team leader's EVMS, as well as reporting back to their home offices.

- All material, equipment, and other non-labor direct costs are contained in the team leader's EVMS.
- Variance analysis at the control account level is based on hours and non-labor direct costs only.
- Rate variance is accomplished at the wrap-rate level by each team for its wrap rates.
- All team members are co-located at or near the team leader's facility.

As in the holding company scenario, this approach must be discussed with the customer as early as possible to address any concerns before they become insurmountable. One way to accomplish this approval would be to insert a provision in the EVMS description that covers the possibility of being a team leader of what otherwise would be a subcontract EVMS flowdown situation. Of course, the insertion must be submitted to the CFA for review and approval. If approved, it will be much easier to justify in a response to an RFP because the letter approving the change is government concurrence that the teaming arrangement described therein was validated by competent authority as being compliant with the EVMS guidelines and government regulations.

Recommendation

In our opinion, the scenario of designating a lead team member offers the best chance of acceptance by a CFA because the contract will be awarded to an entity that either has a validated EVMS or has the ability to achieve an EVMS validation; however, there are still obstacles to overcome.

Assuming that team members will be working side by side on the same tasks, how will this issue be addressed in the earned value structure of IPTs, control accounts, and work packages? If a task is a work package, that would mean that there could be two or more performing organizations within a work package. This situation, unfortunately, does not satisfy one of the Guidelines' Work Package Characteristics "Single performing organization."

The issue of proprietary data must be addressed. Wrap rates are one way to resolve the proprietary issue, but it introduces other issues. The customer will want specific rate variance analyses. How will that be done? A control account manager (CAM) is required to discuss labor efficiency as well as labor rate variances in the control account's variance analysis report, but the CAM is not privy to the rate variance specifics of other team members that are charging to the control account. The CAM can calculate a rate variance for the entire control account, but cannot discuss the source of that variance. One way to isolate the variance is to have the control account budget limited to direct costs, with indirect costs being controlled at the project level. That process limits a rate variance to a labor direct rate variance that is usually caused by using a different level of expertise, such as a senior engineer instead of a junior engineer. This type of change would be evident to the CAM, but the CAM might not be able to be specific as to impact for each team member.

Limiting the control account budget to direct cost only might not be acceptable to the customer, so that solution must be addressed with the customer. Even if the customer accepts that solution, the issue of addressing indirect cost variances is still there. One way to take care of that issue is to have each team member submit a separate report directly to the customer, addressing rate variances within its organization. Again, customer concurrence is required.

Teaming arrangements are relatively new to the earned value environment, and policies need to be developed to address these issues, which can only be accomplished by working with the EVMS Focal Points for the CFA.

About the Authors

Doug Fisher has more than 35 years of project management experience implementing and using earned value. He served in the Air Force in weapons system acquisition and, on retirement, worked in project management and earned value positions at a major defense contractor and Department of Energy scientific laboratories. He received the Program Manager of the Year Award at Aeronautical Systems Division and is a past Vice President of PMI–CPM.

Jim Gasbarro also has more than 35 years of earned value experience. In the Air Force, he was an EVMS Review Team Director. After retirement, he worked at a major defense contractor where he was the EVMS Focal Point. In that position, he attained the first international EVMS acceptance and established the first Joint/International EVMS Surveillance Program. He is a past chair of NDIA's Program Management Systems Committee.