Guide to Earned Value Management (EVM) Scalability for Non-Major Acquisition Implementations

Prepared by the Civilian Agencies and Industry Working Group (CAIWG)

March 2015
# CAIWG Guide to EVM Scalability

## Table of Contents

<table>
<thead>
<tr>
<th>Process</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Introduction</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>Process 1: Organizing for Project Management</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Primary Guidelines: 1, 2, 3, 5, 28</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Process 2: Establishing and Maintaining an Integrated Project Schedule</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Primary Guidelines: 6, 7, 23</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Process 3: Authorizing Project Work Scope, Schedule, and Resources</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Primary Guidelines: 7, 8, 9, 10, 11, 12, 14, 15, 32</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Process 4: Interfacing the EVMS with Accounting System</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Primary Guidelines: 16, 17, 18, 20</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Process 5: Managing using Project Performance Information</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Primary Guidelines: 22, 23, 25, 26, 27</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Process 6: Incorporating Approved Changes to the Project</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Primary Guidelines: 28, 29, 30, 31</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Process 7: Managing Project Material Items</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Primary Guidelines: 1, 6, 10, 21, 23, 26, 27, 28, 29</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Process 8: Managing Project Subcontracted Items</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Primary Guidelines: 1, 2, 6, 9, 16, 23, 26, 27, 28, 29</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Process 9: Managing Indirect Budgets/Costs</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Primary Guidelines: 4, 13, 19, 24</td>
<td></td>
</tr>
</tbody>
</table>
Introduction

1. Overview. Earned Value Management (EVM) is a proven project management tool that provides both the customer and the supplier visibility into work accomplishment by integrating the technical scope, schedule and cost parameters of that work. In use since the 1960s, the EVM philosophy and structure are embodied in the 32 Guidelines listed in Section 2 of the Earned Value Management System (EVMS) Standard, EIA-748. Guidance for establishing an EVMS using these guidelines is contained in Section 3.

Because EVMS has been used primarily as a contractual requirement on large development and production efforts, the project management literature contains a significant amount and, in some cases, detailed guidance expanding on how the information in Section 3 can be used effectively. However, little guidance exists on how to “scale” EVM for small to mid-size projects and/or contracts. The purpose of this document is to provide that guidance.

Although the concepts discussed in this guide often refer to contracts or contractors, per the Office of Management and Budget (OMB) Circular A-11, EVM is also required on government projects. Since EVM is more prevalently applied to contracts, this guide predominately uses contracts or contractors for illustration and definition purposes. However, this guide provides excellent guidance to government projects, and government users can use “project” in place of “contracts” or “suppliers” in place of “contractors” as applicable.

2. Creating the Guide. This guide was prepared by the Civilian Agencies and Industry Working Group (CAIWG). The CAIWG includes both government and industry membership and provides a forum for openly exchanging government and industry views on project management initiatives and performance-based management systems, including EVMS.

This guide provides information for small projects that could benefit from scalable EVM implementations, such as those typically found in universities, laboratories, small businesses, small contracts, and suppliers and vendors without validated EVM systems, and may be helpful to businesses or government agencies with small contracts. The definition of “small projects” and “non-major acquisitions” varies among government agencies and industrial organizations, and should be used when identifying projects for EVM application.

The concept of “scalable” EVM recognizes that implementation of the EVM Guidelines to reflect the smaller, less complex scope, schedule, and resource requirements of small projects does not require the level of detail and rigor needed for large, complex projects.

3. Structure of the Guide. The 32 Guidelines are by design interdependent upon each other and are an interwoven framework required for an integrated project management discipline. However, the design, operation, and implementation of EVM systems requires that suppliers/vendors must have the capability to apply their management and control systems in a way that is appropriate to the size, risk and complexity of their projects and that will provide useful and meaningful information for management decisions.

This guide takes a “process” approach to EVM Implementation rather than a guideline approach, consistent with the following nine typical processes employed in the preparation for and execution of a project:

1. Organizing for Project Management
2. Establishing and Maintaining an Integrated Project Schedule
3. Authorizing Project Work Scope, Schedule, and Resources
4. Interfacing the EVMS with the Accounting System
5. Managing using Project Performance Information
6. Incorporating Approved Changes to the Project
7. Managing Project Material Items
8. Managing Subcontracted Items
9. Managing Indirect Budgets and Costs

Key considerations for scaling EVM implementation on small projects include:

- The degree of scaling of many guidelines will be determined by, and be a function of, how the project is initially organized and scheduled.
- Performance information may be incorporated into the supplier’s management reporting data when suppliers/vendors/laboratories are treated like a part of the project organization that is executing the work.
- Compliance with contractual requirements and applicable industry and government regulations. The discussion of each process contains information on the implementation of its requirements.

4. Format. For each of the listed processes, the following information is provided:

- A description of the process and its underlying connection to project management.
- Discussion of the scalable approaches to implementation of the process on the project.
- The primary guideline and secondary guidelines affected by implementation.
- The benefits to be derived from effective implementation.
- Descriptions of typical products produced.
- Best Practice comments from the Government Accountability Office (GAO) cost and schedule guides, where applicable.

For questions or comments on this document contact Jerald Kerby, at 256-544-3243 or jerald.g.kerby@nasa.gov or Neil Albert at 703-740-2244 or nalbert@mcri.com.
PROCESS DESCRIPTIONS

Process 1: Organizing for Project Management

While not always recognized as a project management “process”, getting organized to perform work on any project usually follows a very logical sequence of steps. In this respect, it may be described as the process of “organizing.” One of the unique aspects of this process is that it touches, in some way, every other process that will be implemented. Since organizing is the process of gathering the correct resources to take the project to successful conclusion, it is the heart of the EVMS. Establish the wrong resource allocation and/or organizational assignments or incorrectly identify the authorized work scope, and it is doubtful that the project will achieve its established goals. In many cases, the project’s organization is partially formed during the proposal or preparation phase of a project. This involves accumulating the correct functional disciplines to ensure an adequate estimate is prepared for the work to be completed.

A. Establishing the Project Organization.

Following contract award, a contractor project team is identified. This team may be very small in number, but tends to be knowledgeable about the specifics of the recently awarded contract. Some members may have been part of the team that worked on the winning proposal. They are charged with the development of a contractor team that can carry out the specific requirements of the project as outlined in the Statement of Work (SOW) and can provide the product according to the negotiated contractual objectives.

**Scalability**

The number of levels of the project organizational breakdown structure (OBS) should be kept to a minimum and be determined by the management needs of the project. This requirement can be scaled by limiting the number of levels and overall size of the project organization. This can be as little as one level of an organizational structure or as many levels as necessary to ensure responsibility for all scope to be completed.

As the project progresses, the supplier, considering contractual requirements, should adjust the OBS to reflect the changing needs of management and reporting. Reducing the size of the project organization or the levels of management control are both scaling options that should be exercised as needed.

The implementation of subsequent steps in the EVM processes are directly affected by the work breakdown structure (WBS) and OBS decisions.

**Guidelines:**

| Primary: 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. |
| Secondary: | 3, 5, 6, 8, 9, 10, 12, 15, 16, 18, 21, 22, 23, 25, 26, 27, 28, 29 |

**Benefit to Project Management**

The OBS helps management focus on establishing the most efficient organization by taking into consideration the availability and capability of management and technical staff, including suppliers/vendors, to achieve the project objectives.

**Typical Products of Implementation**

- Project Organizational Structure

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Identify Who Will Do the Work: Once the WBS has been established, assign someone to do the work. To ensure that someone is accountable for every WBS element, it is useful to determine a level of accountability, or a control account (CA), at the point of intersection
between the OBS and the WBS. The CA becomes the management focus of an EVM system and the focal point for performance measurement.

### B. Defining the Authorized Work

Once the project has been authorized, it is necessary that all parties, both supplier and customer, understand the detailed scope of the project. A tool commonly used to do this is the WBS. The design and development of the WBS to levels beyond that contained in the Request for Proposal (RFP) and the contract is the supplier’s responsibility. To do this, the contractor considers a number of factors, such as, detail needed for job accomplishment, visibility of work-in-process, and requirements for cost and schedule reporting. There must be a relationship between the WBS and the contract SOW and the extension of the WBS should result in a logical grouping of SOW tasks. As part of this process, decisions are made regarding which efforts will be done in-house vs. by subcontractors/vendors.

#### Scalability

No unique characteristics for small projects would prevent them from implementing a WBS. Deviation from a “product-oriented” structure or scalability in size (number of levels) of the WBS would be based on the type of project and the complexity of the scope, not the type of project organization.

The number of levels of the WBS should be determined by the management needs of the project, with risk and project complexity serving as the primary driving factors. This requirement can be scaled by limiting the number of levels and elements in the overall size of the WBS. This can be as little as two levels of a product-oriented structure or as many levels as necessary to define all scope to be completed.

Each additional level of detail, at a minimum, doubles the number of the next lower-level WBS elements as well as the administrative cost of maintaining responsibility and performance measurement information; i.e. the number of CAs.

#### Guidelines:

| Primary: 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 |
| Secondary: | 3, 5, 6, 8, 15, 16, 17, 20, 21, 22, 23, 25, 27, 28 |

#### Benefits to Project Management

Identifying the authorized work using a WBS is an industry best practice and should be required for all projects. It identifies the basic building blocks of the project and is used for the planning of all authorized work.
The WBS is a product-oriented division of project tasks depicting the breakdown of work scope for work authorization, tracking, and reporting purposes that facilitates traceability and provides a control framework for management.

### Typical Products of Implementation
- WBS
- WBS Dictionary (may or may not be used, but a method is needed to reconcile the SOW to the WBS).

### GAO Best Practices

**GAO Schedule Assessment Guide, Best Practice #1** - The need to have a WBS is the cornerstone of every project, because it defines in detail the work necessary to accomplish a project’s objectives. For example, a typical WBS reflects the requirements to be accomplished to develop a project, and it provides a basis for identifying resources and activities necessary to produce deliverables. A WBS is also a valuable communication tool between systems engineering, project management and other functional organizations because it provides a picture of what has to be accomplished by decomposing the scope into finite deliverables.

### C. Assigning Organizational Responsibility for Work

The OBS reflects the way the project is functionally organized. To assign work responsibility to appropriate organizational elements, the authorized work, usually defined by the WBS, and the organizational structure must be interrelated with each other; that is, organizational responsibility must be established for identified units of work. The assignment of lower level work segments to responsible lower level managers provides a key control point, a CA, for management purposes and cost collection. A Responsibility Assignment Matrix (RAM), displaying the segment of work and the organizational entity assigned to complete it, is typically prepared to document the WBS/OBS intersections; i.e. CAs. It is at this level of management responsibility that the planning of authorized work, the measurement of the performance of that work, and the collection of the actual costs happens.

When effort is to be subcontracted, the applicable subcontractor is identified and related to the appropriate WBS element(s) and/or organization charged with acquiring the subcontracted item.

### Scalability

The size and detail of the RAM or similar matrix is strictly a function of the levels contained in the WBS and the OBS. The lower the levels in either or both structures are driven, the greater the number of CAs that will be created. For example, if the OBS has four level 2 elements and the WBS has four, then there are a maxi-
mum of 16 intersections possible. If, however, each structure is increased by only one level 2 element each, the maximum number of intersections increases to 25. Proper scaling of the WBS and the OBS in steps 1A and 1B above will result in the optimum relationship between the work and the workers.

**Guidelines:**

<table>
<thead>
<tr>
<th>Primary: 5</th>
<th>Provide for integration of the program work breakdown structure and the program organizational structure in a manner that permits cost and schedule performance measurement by elements of either or both structures as needed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary: 1, 2, 3, 8, 9, 16, 17, 18, 22, 23, 26, 28</td>
<td></td>
</tr>
</tbody>
</table>

**Benefits to Project Management**

Integration of the WBS and OBS establishes the CAs where the performance measurement necessary for project management is performed. This intersection results in designation of a focal point for management control, the control account manager (CAM). This integration activity provides assurance that all aspects of the work scope have been assigned to an organization responsible for its execution.

**Typical Products of Implementation**

- CAs
- RAM or similar matrix

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide,* Chapter 18 – Identify Who Will Do the Work: Once the WBS has been established, the next step is to assign someone to do the work. Typically, someone from the organization is assigned to perform a specific task identified in the WBS. To ensure that someone is accountable for every WBS element, it is useful to determine levels of accountability, or CAs, at the points of intersection between the OBS and the WBS. The CA becomes the management focus of an EVM system and the focal point for performance measurement.

**D. Integrating EVMS sub-processes**

The CA is the main action point for planning and control of effort. All aspects of the EVMS come together at this point including budgets, schedules, work assignments, cost collection, progress assessment, problem identification, and corrective actions. Most management actions taken occur as a result of significant problems identified at this level. The intent is to build a framework that interrelates the processes so they will support the effective project management by accurately integrating cost, schedule, and technical information from the execution of the contract.

The establishment of a unique coding or ID structure (work order/job order/task code charge number structure) facilitates the linkage between the performance measurement processes. It also facilitates the correct assignment of work to both OBS and WBS elements.

**Scalability**

Small projects should determine a logical level of integration. The level of detail can be modified; however, a balance needs to be maintained in the granularity of estimating, planning, scheduling, work authorization, and cost accumulation processes. This functional integration allows future performance reporting by responsibility between the various supplier/vendors as well as contracting offices.
The organization and work scope relationship established in the previous step established the level of the CA. Establishing one ID number for each CA links the planning and execution of the work effort to the associated charge number in the accounting system. In some cases, there is a need to collect actual costs at a level below the CA level. Care should be taken to only do this when absolutely necessary as the proliferation of charge numbers leads not only to additional administrative costs but increases the possibility of data errors.

**Guidelines:**

| Primary: 3 | Provide for the integration of the 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. |
| Secondary: | 1, 2, 6, 8, 16, 17, 18, 22, 28, 29 |

**Benefits to Project Management**

The effective integration of planning, scheduling, budgeting, work authorization, and cost accumulation processes provides the capability for establishing the Performance Measurement Baseline (PMB), the plan against which progress will be measured. It also supports the identification of work progress and the collection of actual costs. The analysis of this information facilitates management decision-making and corrective actions. The integration of the sub-systems in relation to WBS and OBS allow summarization of cost data from the detail level through these structures to the appropriate project level needed for management insight and control.

**Typical Products of Implementation**

- Schedules linked to the budget and cost information in the EVMS
- Interrelationships between the various EVMS sub-systems identified and verified

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Managing Program Costs: Planning - Key Benefits of Implementing EVM (Table 29) - Key Benefit - Provides a single management system: The criteria for develop-
Implementing an EVM system promotes the integration of cost, schedule, and technical processes with risk management, improving the efficiency and effectiveness of project management; they require measuring progress, accumulating actual costs, analyzing variances, forecasting costs at completion, and incorporating changes in a timely manner. Implemented correctly, EVM provides a single management control system that prevents organizations from managing with one system and reporting from another. The concept that all work should be scheduled and traceable from the master plan to the details demonstrates that no specific scheduling software is required.

### E. Preparing for Project Changes

The process of organizing a project continues throughout the life of the project. As progress is made against the project work scope, it often becomes evident that changes in either the people working on the project (OBS) or to the work scope (WBS) become necessary.

#### Scalability

In establishing the initial program organization, care should be taken (as previously indicated) to create the smallest but most effective organization possible. There should also be a built-in capability to modify that organization as work scope evolves and additional or new types of resources are needed. This same philosophy applies to the WBS and the ability to add/modify/delete elements of the structure.

As the initial WBS is prepared, and depending on the early identification of work, placeholders should be incorporated into the WBS at the highest appropriate level; e.g., at level 2 based on expectations that the “products” of the project could/will expand. In the OBS, the early structure identifies the resources needed to complete the current “phase” of the project. If it is expected that, as the project progresses, there will be need for additional types of resources (for example, once the product is designed, there will be a need to manufacture it) then the initial structure would need to accommodate that expansion of the OBS.

#### Guidelines:

| Primary: 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. |
| Secondary: | 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 27 |

#### Benefits to Project Management

Building flexibility into the WBS and the OBS enhances management’s need to accommodate changes in the project, in terms of work and organizational responsibility, as they occur or are authorized by the customer.

#### Typical Products of Implementation

- Revised OBS
- Revised WBS

#### GAO Best Practices

**GAO Cost Estimating and Assessment Guide, Chapter 18 – Define the Scope with a WBS.** The hierarchical WBS ensures that the entire SOW accounts for the detailed technical tasks and, when completed, facilitates communication between the customer and supplier on cost, schedule, technical information, and the progress of the work. It is important that the WBS is comprehensive enough to represent the entire program to a level of detail sufficient to manage the size, complexity, and risk associated with the program.

**GAO Cost Estimating and Assessment Guide, Chapter 18 – Identify Who Will Do the Work.** Once the WBS has been established, the next step is to assign someone to do the work. Typically, someone from the organization is assigned to perform a specific task identified in the WBS. To ensure that someone is accountable for every WBS element, it is useful to determine levels of accountability, or CAs, at the points of intersection between the OBS and the WBS.
Process 2: Establishing and Maintaining an Integrated Project Schedule

Following the definition of the authorized work and identification of the organizational entities responsible for accomplishing that work, the next step is to create a fully integrated project schedule. Successful management requires the integration of the technical, schedule, and projected cost (budget) aspects of the program. When projects experience problems in technical performance, either schedule delays, cost problems, or both may follow. An adequate scheduling system will facilitate the depiction of the plan to accomplish the technical scope, the actual technical progress against that plan, and estimates of the time required to complete the remaining technical scope. The schedule baseline, progress, and estimated time to complete all should readily integrate with the financial depiction (budgets, earned value, and estimated cost to complete) of the technical scope.

A. Identifying Schedule Content and Requirements

The scheduling system should contain a project master schedule and related subordinate schedules which provide a logical sequence from the detail/working level to the master schedule level. Intermediate schedules should be established, if needed, to provide a logical sequence from the detail level schedules to the project master schedule. The scheduling system must also provide for the identification of interdependencies between organizations and/or WBS elements at the level appropriate for efficient project management. On many projects, this requirement can be met through the implementation of an Integrated Master Schedule (IMS). The IMS incorporates all levels of schedule information, from detail to master level, into one fully-integrated schedule.

Scalability

Scalability for this guideline should be based on the type of project and not the organization. As a core process for project management, schedules are required for small projects. All elements and the level of detail of the schedule should be agreed to by supplier and vendor. The limiting of the WBS and OBS levels and their intersections, as previously described, will also reduce the lines of detail required in the schedule.

The establishment of the schedule is ultimately tied to the level at which work accomplishment is to be executed. The CAs created in the Organizing process establish the basic framework of the schedules. The detail in the schedule will ultimately be reflected in the Control Account Plans (CAPs) created in subsequent steps. The schedule of small projects should contain, at a minimum, the expected sequence of work, significant interdependencies between segments of work, and time-phasing of authorized measurable work at a level of detail which reflects the risk of the effort being managed.

Guidelines:

| Primary: 6 | Schedule the authorized work in a manner which describes the sequence of work and identifies significant task interdependencies required to meet the requirements of the program. |
| Secondary: | 1, 2, 3, 7, 8, 10, 22, 23, 26, 28, 29, 32 |

Benefits to Project Management

Scheduling all work to be performed facilitates effective planning, statusing, and forecasting. This is critical to the success of all projects. Integrating and time phasing the technical and cost baselines result in the expected sequence of work, task interdependencies and insight into potential schedule slippages.

Typical Products of Implementation

- Integrated network schedules
- CAPs (may be separate plans or detailed schedules)

GAO Best Practices

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Schedule the Work to a Timeline: Developing a schedule provides a time sequence for the duration of the project’s activities and helps everyone understand both the dates for major milestones and the activities that drive the schedule. A project schedule also provides the vehicle for developing a time-phased budget baseline.
GAO Schedule Assessment Guide, Best Practice #2 - Sequencing All Activities: The schedule should be planned so that critical project dates can be met. To do this, activities need to be logically sequenced. Date constraints and lags should be minimized and justified. This helps ensure that the interdependence of activities that collectively lead to the completion of events or milestones can be established and used to guide work and measure progress.

B. Integrating Schedules with the WBS and OBS

The scheduling process covers all specified work from the lowest defined WBS elements to the project level milestones. At the CA level, responsibility for accomplishing the work is assigned to a specific organization. Detail schedules are used to correlate the activities of the working level organizations within a function, a WBS element and/or between lower level functions. These schedules may take any form as long as they support upper level schedules, ensure that performing organizations are planning their efforts to support intermediate (if appropriate) and/or project level milestones, and provide the basis for establishment of the PMB when resources are applied to them. Often, horizontal relationships are established at this level to ensure that organizational inputs and outputs correlate and that major project requirements are met. If there are intermediate schedules, either by WBS with functional breakouts or by function with WBS relationships, horizontal interdependencies may be established at this level.

Scalability

On small projects, the need for detail level integration may be satisfied at the CA level for those efforts that are deemed to have the highest risk of successful accomplishments. The need for visibility by the project manager (PM) into performance on critical activities determines the extent of detail level integration that is required. Care must be taken to minimize the amount of required schedule maintenance related to non-risk elements.

Guidelines:

Primary: 6

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

Secondary:

1, 2, 3, 7, 8, 10, 22, 23, 26, 28, 29, 32

Benefits to Project Management

Scheduling all work to be performed facilitates effective planning, statusing, and forecasting. This is critical to the success of all projects. Integrating and time phasing the technical and cost baselines result in the expected sequence of work, task interdependencies and insight into potential schedule slippages.
Typical Products of Implementation

- Integrated network schedules
- CAPs (may be separate plans or detailed schedules)
- Work authorization documents (WADs)

GAO Best Practices

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Schedule the Work to a Timeline: Developing a schedule provides a time sequence for the duration of the project’s activities and helps everyone understand both the dates for major milestones and the activities that drive the schedule. A project schedule also provides the vehicle for developing a time-phased budget baseline.

*GAO Schedule Assessment Guide*, Best Practice #2 - Sequencing All Activities: The schedule should be planned so that critical project dates can be met. To do this, activities need to be logically sequenced. Date constraints and lags should be minimized and justified. This helps ensure that the interdependence of activities that collectively lead to the completion of events or milestones can be established and used to guide work and measure progress.

C. Structuring Schedules for Progress Statusing and Forecasting

The scheduling system should cover all specified work and incorporate program milestones that are meaningful in terms of the technical requirements of the contract. It should provide schedules such that actual progress can be related to the plan and contain forecasts of expected future progress. Such schedules should identify key milestones and activities which recognize significant constraints and relationships. A key feature of the scheduling system is that it establishes and maintains the relationship between technical achievement and progress statusing. The graphic illustrates the use of various earned value techniques (EVTs) to determine physical progress.

Scalability

The two key drivers for this guideline are (a) the number/level of the CAs established during project set-up and (b) the number of work packages (WPs) created within those CAs. This requirement can be scaled by constructing the schedule to include the least number of milestones necessary to objectively measure progress. For the purpose of determining earned value (EV), small projects with low risk could be scaled by using longer and/or larger WPs and planning packages (PPs) with fewer milestones, and percent complete could be used as the primary EV measurement technique. Creating shorter WPs increases the number required to be maintained/statused but simplifies the process of determining work completion; i.e., the work is either finished or it is not. If percent complete milestones are used, taking interim EV between major milestones, thus allowing for objective measurement each month, is highly recommended. Otherwise, performance may be misstated, resulting in artificial variances that must be reported and explained. For effective project management, there should be a balance between these two concepts.

Guidelines:

**Primary:** 7
- Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.

**Secondary:** 6, 8, 10, 12, 22, 26, 28, 29, 32

Benefits to Project Management

Identifying milestones as objective indicators of work accomplished enables accurate comparisons to planned work. Performance metrics provide better management insight into the root cause(s) of perfor-
mance issues. This insight ensures that maximum consideration can be given to assessing the impact of performance issues, allowing appropriate and timely corrective action development and implementation.

**Typical Products of Implementation**

- Integrated schedules that identify contract products, deliverables, milestones and/or key events
- CAPs (may be separate plans or detail schedules)

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Performance measurement is key to EV because performance represents the value of work accomplished. Before any work is started, the CAMs or teams should determine which performance measures will be used to objectively determine when work is completed. These measures are used to report progress in achieving milestones and should be integrated with technical performance measures. Examples of objective measures are requirements traced, reviews successfully completed, software units coded satisfactorily, and number of units integrated.

**D. Adjusting Schedules for Project Changes**

Scheduling should interface with other elements of the EVMS to the extent necessary for measurement and evaluation of project status. The scheduling system should provide current status and forecasts of completion dates for all authorized work. The summary and detailed schedules should enable a comparison of planned and actual status of project accomplishment based on milestones or other indicators used for control purposes. The ability to modify future scheduled efforts based on current progress assessments and evaluations is critical to successful project management.

**Scalability**

Small projects, when establishing project schedules, should focus specific, detail planning on near-term efforts and maintain future work in larger, scheduled packages for management flexibility. This approach reduces the amount of schedule changes that would be necessary if the planning horizons for the detailed effort were farther out. The focus is on limiting the amount of detail information in the project schedule which is required for day-to-day management of the effort. However, there should be sufficient planning of future efforts to encompass all the authorized work within the project timeframe.

**Guidelines:**

| Primary: 23 | Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance, and provide the reasons for the variances in the detail needed by program management. |
| Secondary: 1, 2, 3, 5, 6, 7, 9, 22, 26, 30 |

**Benefits to Project Management**

The project schedule is a primary communication tool between the supplier and the customer. Maintaining a project schedule that consistently reflects the current status as well as projections of future conditions that will lead to project completion is essential for effective project management.

**Typical Products of Implementation**

- A Project Schedule with progress status and forecasts of future project activities.

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide*, Chapter 19. A good network schedule that is kept current is a critical tool for monitoring program performance. Carefully monitoring the contractor’s network schedule will allow for quickly determining when forecasted completion dates differ from the planned dates. Tasks may be re-sequenced or resources realigned to reduce the schedule condition. It is also important to determine whether schedule variances (SVs) are affecting downstream work. For example, a SV may compress remaining activities’ duration times or cause “stacking” of activities toward the end of the program, to the point at which it is no longer realistic to predict success.
Process 3: Authorizing Project Work Scope, Schedules, and Resources

The organizing and scheduling processes serve as the basis for defining budgets and authorizing all work at the appropriate levels within the framework of the WBS/OBS. Once the contractual effort is defined and scheduled to the maximum possible extent, resources for accomplishing the work are assigned, usually through the internal work authorization and budgeting process. Just as scheduling is an iterative process to sequence all work within prescribed project period of performance, budgeting is also an iterative process to provide for accomplishing the work within the authorized project value. On contracts with the government, the current and future funding profile can affect this time-phasing. The result of these processes is the establishment of a PMB.

The establishment of a PMB is essential to performing EVM. Small projects must be able to demonstrate that they can establish and maintain a PMB. The time-phased PMB represents the planned scope of all authorized work and schedule, and provides the PM with the capability to assess project performance. It is critical to establish a performance baseline in order to determine whether the project objectives can be met within known constraints (cost, schedule, scope, and resources).

A. Authorizing Scope and Resources to the Working Level

The work authorization process defines and identifies the work required to be accomplished by the responsible organizational elements. Budget values, representing the time-phased valuation of the resources authorized to complete the authorized work, are also assigned to the responsible organizations. Schedules and budgets should be established and approved for all authorized work at the level determined most appropriate by the supplier. At a minimum, the work authorization process should ensure that the elements shown in the graphic below are present irrespective of the chosen approach.
Scalability

At a minimum, small projects should have a work authorization process at the CA level in which budgets are planned by element(s) of cost, using varying degrees of formal documentation. If a WBS Dictionary is developed for a small project, it could serve as a work authorization document by including information such as charge numbers, period of performance, responsible manager, and associated budget.

Guidelines:

| Primary: 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. |
| Secondary: | 1, 2, 5, 8, 10, 12, 13, 16, 19, 21, 23, 27, 28, 29, 32 |

Benefits to Project Management

The authorization of work identifies who is authorized to charge the project, the technical work to be accomplished, and the approved resources (budget) and schedule to complete the authorized work. This is essential to control project cost and schedule and to identify when the work is complete.

Typical Products of Implementation

- CAPs by element of cost
- Work authorization documents
- PMB
- Bill of Materials (BOM)
- Dollarized RAM
- Schedules, if resource-loaded and supplier/vendor schedules

GAO Best Practices

*GAO Cost Estimating and Assessment Guide*, Chapter 3 - A life-cycle cost estimate (LCCE) provides a structured accounting of all resources and associated cost elements required to develop, produce, deploy, and sustain a particular project. This entails identifying all cost elements that pertain to the project from initial concept all the way through operations, support, and disposal. The LCCE usually becomes the project’s budget baseline. Using the LCCE to determine the budget helps to ensure that all costs are fully accounted for so that resources are adequate to support the project.

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Estimate Resources and Authorize Budgets. Budgets should be authorized as part of the EVM process, and they must authorize the resources needed to do the work. They should not be limited to labor and material costs. All required resources should be accounted for, such as the costs for special laboratories, facilities, equipment, and tools. It is imperative that staff with the right skills have access to the necessary equipment, facilities, and laboratories.

B. Scheduling Resources in the Control Account

Each CA contains the resources necessary to complete the assigned effort and performance measurement budgets reflecting the value of those resources. Budgets established at the CA level must be planned against the approved schedule by element of cost; i.e. labor, material/subcontracts, and other direct costs (ODCs). Effort contained within a CA is distributed into either WPs or PPs. “Work package” is the generic term used to identify discrete tasks which have definable results. WPs are single tasks containing adequate resources, time-phased in accordance with the approved schedule, and assigned to a performing organization for completion. WP descriptions must clearly distinguish one WP effort from another.

Work for a given CA which cannot be planned in detail at the outset should be divided into larger segments and placed in PPs within the CA. PPs are aggregates of future tasks and resources (budgets), time-phased per the agreed-to schedule, beyond the near-term detail plan. PPs will be divided into WPs at the earliest practical time. Time-phased budgets assigned to PPs must be supported by a specified scope of work and this relationship must be maintained when detail planning the effort.
### Scalability

On small projects, it may be impractical to identify the cost or budget for authorized work below the CA level; however, the vendor/supplier should be able to demonstrate that work can be subdivided within the context of its schedule.

Scaling could be accomplished by allocating CA budgets to WPs represented in the IMS by using either a weighted milestone or weighted percent complete EV method. For instance, a WP with a three month duration could have budget spread equally over three months with three equal milestones for each month for measuring EV. WPs should be resource loaded consistent with the scheduled work to avoid significant distortion in the resultant performance data.

### Guidelines:

<table>
<thead>
<tr>
<th>Primary: 10</th>
<th>To the extent it is practicable to identify the authorized work in discrete work packages, establish budgets for this work in terms of dollars, hours, or other measurable units. Where the entire control account is not subdivided into work packages, identify the far-term effort in larger planning packages for budget and scheduling purposes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary:</td>
<td>2, 6, 7, 8, 9, 11, 13, 22, 27, 28, 29, 32</td>
</tr>
</tbody>
</table>

### Benefits to Project Management

The establishment of a near-term, detailed plan provides project management and the project team with an integrated measurement tool for assessing both physical progress (scheduled work accomplishment) and costs of work accomplishment (cost accumulation) for purposes of making and implementing management actions for the future health of the project.

### Typical Products of Implementation

- CAPs divided into WPs and PPs
- CA schedules and CA time-phased budgets

### GAO Best Practices

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Identify Who will do the Work: WPs contain detailed tasks typically four to six weeks long and require specific effort to meet near-term CA objectives and are defined by who authorizes the effort and how the work will be measured and tracked. Planning Packages are far-term work usually planned at higher levels. As time passes, PPs are broken down into detailed WPs. This conversion of work from a PP to a WP, commonly known as “rolling wave” planning, occurs for the entire life of the project until all work has been planned in detail.

### C. Providing Schedules and Resources for Future Effort

When all of the work for a given project cannot be planned in detail at the outset, it can be initially divided into larger segments so that the entire project requirement may be viewed as a sum of all identified parts. On some projects, due to work scope and funding uncertainties, it may be impractical to identify future work beyond a significant phase or event (milestone), e.g., design approval, test results, etc. These milestones should be those events of primary interest to the PMs from the standpoint of assessing the adequacy of the design approach, the achievement of major technical milestones, or any other point where a technical evaluation of the program is warranted. The customer and contractor PMs should concurrently identify these key technical review points. In such cases, detail planning would be required for CAs, PPs and WPs, only to the first review point. All planning beyond this point would be done in larger increments at a summary level, but in enough detail to permit resource analysis for downstream work.

### Scalability

Small projects should create a near-term “planning window” based on project milestone definitions, within which detailed WPs are created. Any effort beyond that window should be placed, along with appropriate resources, in summary level planning packages (SLPP) until sufficient visibility into the detailed work content is available.
**Guidelines:**

| Primary: 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 un-definitized work. Budget for far-term efforts may be held in higher level accounts until an appropriate time for allocation at the control account level. If an over-target baseline is used for performance measurement reporting purposes, prior notification must be provided to the customer. |
| Secondary: | 1, 2, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 28, 29, 31, 32 |

**Benefits to Project Management**

The flexibility to hold future efforts in PPs and SLPPs facilitates accurate near-term work planning and helps avoid the replanning for future effort when project situations change. Small projects should take maximum advantage of these “tools” when creating the PMB for their projects.

**Typical Products of Implementation**

- Summary level accounts (work/resources) to be divided into CAs
- Summary level account schedules
- Summary level account time-phased budgets

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide, Chapter 18.* The PMB includes all budgets for resources associated with completing the program, including direct and indirect labor costs, material costs, and ODCs associated with the authorized work. It represents the formal baseline plan for accomplishing all work in a certain time and at a specific cost.

**D. Confirming Accurate Budget Distribution**

In order to ensure that the budgets assigned to individual segments of work within the CA, i.e., WPs and PPs, accurately reflect the value of the resources assigned to the CA for execution of the work scope, the sum of those budgets, once planned, must add up to the total value authorized on the work authorization document.

**Scalability**

This guideline is directly affected by the establishment of the CAs and, if appropriate, SLPPs in the Organizing process. Each CA, once created, must summarize properly to the authorized amount or the total value of the project will not reconcile with the value authorized by the customer.

| Primary: 11 | Provide that the sum of all work package budgets plus planning package budgets within a control account equals the control account budget. |
| Secondary: | 8, 10, 12, 13, 15, 28, 29, |

**Benefits to Project Management**

The integrity of the PMB is essential to the effective management of the project. This requires that the budget for the CA must equal the sum of its WP and PP budgets.

**Products of Implementation**

- CAP total budget
- WP budget
- PP budget

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide, Chapter 8* - In constructing a WBS, the 100 percent rule always applies. That is, the sum of a parent’s children must always equal the parent. In this way, the WBS makes sure that each element is defined and related to only one work effort, so that all activities are included and accounted for. It also helps identify the specialists who are needed to complete the work and who will be responsible so that effort is not duplicated.
E. Establishing Objective Measures of Work Progress

When CA WPs are detail planned, meaningful indicators must be identified for use in measuring the status of their completion. For measurable WPs, the CAM must specify the start, interim, and completion milestones or the units of work that will be used to measure accomplishment of the task. WP milestones must portray the beginning or end of discretely measurable pieces of work. Whenever possible, discrete WPs are measured using a milestone method; i.e., 0/100, 50/50, etc. The EVT chosen for each WP should provide the most objective and accurate assessment of work accomplishment, i.e., budgeted cost of work performed (BCWP).

Scalability

Small projects could be scaled in the following ways:

- If the EV measurement technique within the WP or CA is the same (50/50, 0/100, etc.), then elements of cost could be co-mingled.
- Small projects could use longer duration and/or larger dollar value WPs or CAs for projects that are low risk.
- For travel and/or material:
  - A single CA could be used, with future out-year budget contained in a single PP.
  - A high-level WBS element or charge code could be used for all travel and/or material.
  - Annual budgets by organization could be developed for each fiscal year, and EV performance could be taken as travel occurs or material is purchased.
  - Level of effort (LOE) could be used as the EV measurement technique; however, it is not the preferred approach.

Guidelines:

| Primary: 7 | Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress. |
| Secondary: | 6, 8, 10, 12, 22, 26, 28, 29, 32 |

Benefits to Project Management

Valid indicators of progress at the WP level lead to accurate EV data upon which project management decisions can be made. Subsequently, the summarization of this information provides visibility into progress towards completing project milestones represented in the intermediate and master levels of the schedule.

Typical Products of Implementation

- CAPs/WP Plans
- Progress indicators at the WP level

GAO Best Practices

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Determine an Objective Measure for Earned Value. Performance measurement is key to EV because performance represents the value of work accomplished. Before any work is started, the CAMs or teams should determine which performance measures will be used to objectively determine when work is completed. These measures are used to report progress in achieving milestones and should be integrated with technical performance measures.

F. Resource Plans for Non-measureable Effort

On every project, there will be work efforts that either cannot be measured in terms of physical progress or for which the measurement of effort provides little or no value in terms of project progress, i.e., LOE tasks. Because LOE represents tasks or activities for which there is no definable end product and cannot be measured, the budgets for these tasks represent a “resource plan” and, by definition, cannot have a SV; i.e., if you cannot measure it, how can it be ahead of or behind schedule.

Scalability

For small projects, each task must be assessed to determine the best method to budget and measure its progress toward completion. The number of LOE tasks (low dollar, non-critical) in a small project should
be held to a minimum, with most tasks being identified as discrete or apportioned effort. Scalability could be achieved by placing all LOE scope within one or a few WPs or CAs.

**Guidelines:**

| Primary: 12 | Identify and control level of effort activity by time-phased budgets established for this purpose. Only that effort which is not measurable or for which measurement is impracticable may be classified as level of effort. |
| Secondary: 8, 11, 13, 15, 23, 28, 29, 32 |

**Benefits to Project Management**

LOE WPs should be used when tasks of a general or supportive nature are created and do not produce definite end products. Although meaningful product-oriented or management-oriented events are critical for performance measurement, not all activities lend themselves to objective measurement.

**Products of Implementation**

- CAPs which identify LOE WPs and budgets

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide, Chapter 18 – Planning: Determine an Objective Measure for EV.* No one method for measuring EV status is perfect for every project. What is important is that the method be the most objective approach for measuring true progress. Therefore, LOE should be used sparingly; projects that report using a high LOE for measuring EV are not providing objective data and the EVM system will not perform as expected.

**G. Creating Holding Accounts for Work and Budgets**

In many projects, particularly developmental activities, there is considerable uncertainty; i.e., risk, regarding the timing or magnitude of future difficulties. The establishment of a Management Reserve (MR) budget provides the PM with the capability to adjust for these uncertainties by providing performance measurement budget to track their execution. The Undistributed Budget (UB) account is used to hold budget, and its corresponding scope, at the project level until sufficient work definition and organizational responsibility are identified to allow time-phasing at the summary or working level.

**Scalability**

A small project’s MR and UB should be commensurate with the level of risks and opportunities identified by the project. MR might not apply for short duration projects where risk is minimal; UB might not apply to small projects if the work scope is easily identified to all the CAs or when the contract is firm fixed price.

**Guidelines:**

| Primary: 14 | Identify management reserve and undistributed budget. |
| Secondary: 8, 15, 28, 29, 32 |

**Benefits to Project Management**

Incorporation of UB and project risk is essential for executing updates to the baseline. The PMB planning process provides an opportunity to identify risk and should quantify those risks by identifying an appropriate level of MR for unplanned activities within the project scope. Unexpected work scope growth within the contract SOW, changes in rates, or schedule slips are examples of situations that may make the amount of the PMB assigned to an individual CAM inadequate.

**Typical Products of Implementation**

- Project control logs showing MR, UB and changes to the PMB and contract budget base (CBB)
- Monthly performance reports to verify that starting and ending values are consistent with various logs

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide, Chapter 18 – Develop the PMB.* The PMB includes all budgets for resources associated with completing the program, including direct and indirect labor costs, material costs, and ODCs associated with the authorized work. It represents the formal baseline plan for accomplishing all work in a certain time and at a specific cost. It includes any UB, used as a short-term holding account for new work until it has been planned in detail and distributed to a particular CA.
To help ensure timely performance measurement, it is important that UB be distributed to specific CAs as soon as practicable.

The PMB does not equal the program contract value because it does not include MR or fee. The budget for MR is accounted for outside the PMB, since it cannot be associated with any particular effort until it is distributed to a particular CA when a risk occurs and leads to a recovery action.

H. Maintaining Control of the Performance Measurement Baseline

The sum of the CA budgets, budgets for higher-level WBS elements (SLPPs), and UB is the PMB. The PMB contains the entire budget assigned to identify components of work. This includes budget values for indirect costs that are expected to be allocated to the program based on the overhead pool allocation procedures described in the cost accounting standards (CAS) disclosure statement. The sum of the PMB and MR is known as the project and/or CBB and is always reconcilable to the authorized project value.

As changes occur to the CBB or PMB, whether due to internal replanning or project changes directed by the customer, the documentation supporting the current value and time-phasing of the PMB must be maintained accurately.

**Scalability**

Regardless of project size, all changes to the project baseline must be documented in accordance with the project’s change management process.

A small project’s change management process may incorporate less formal documentation, such as financial spreadsheets, the grouping of change documents in a single form, or other electronic media.

**Guidelines:**

<table>
<thead>
<tr>
<th>Primary: 32</th>
<th>Document changes to the performance measurement baseline.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary:</td>
<td>6, 7, 8, 9, 10, 12, 13, 14, 15, 26, 29</td>
</tr>
<tr>
<td>Primary: 15</td>
<td>Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserve.</td>
</tr>
<tr>
<td>Secondary:</td>
<td>1, 2, 8, 11, 14, 28, 31, 32</td>
</tr>
</tbody>
</table>
Benefits to Project Management

A disciplined change control process is required to ensure that the CBB, the PMB, and performance measurement data are accurate and reliable and all changes are captured.

Typical Products of Implementation

- Change control logs
- CA / WP / PP plans
- Master, intermediate, and detail level schedules
- SOW, WBS, WBS dictionary
- Work authorization documents
- Management performance reports

GAO Best Practices

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Update the PMB as Changes Occur. Because changes are normal, the EVM guidelines allow for incorporating changes—unless it is a retroactive change to the performance data (with the exception of error correction). However, it is imperative that changes be incorporated into the EVM system as soon as possible to maintain the validity of the PMB. When they occur, both budgets and schedules are reviewed and updated so that the EVM data stay current. Furthermore, the EVM system should outline procedures for maintaining a log of all changes and for incorporating them into the PMB, and the log should be maintained so that changes can be tracked.
Process 4: Interfacing the EVMS with the Accounting System

The ability of the accounting system to accurately accumulate actual costs is critical to the accurate establishment of performance measurement information for program management. The guidelines applicable to this section are focused on the creation of an effective relationship between the accounting system and the EVMS. Nothing in these guidelines requires the contractor to modify their accounting system or processes. The accounting system must be formally structured and maintained and must have books of account that comply with generally acceptable accounting principles. By meeting both of these requirements, the accounting system, based on the coding structure created for each program, will accumulate actual costs, by element of cost, for transfer to the EVMS. Within the EVMS, the use of the coding structure enables the matching of actuals from the accounting system with the budgets established within the CAs.

A. Ensuring Actual Costs are Comparable to Project Budgets

The accounting system must be capable of accounting for all resource expenditures on a project. The coding structure established during the Organizing Process, when linked to the accounting system and the CAs in the EVMS, creates this capability. In the application of this guideline, the supplier/vendor should have a disclosure statement from the Defense Contract Audit Agency (DCAA) that identifies the treatment of direct actual costs (direct labor, material, miscellaneous ODCs, and supplier/vendor costs), indirect costs, depreciation, capitalization, etc. The accumulation of direct costs should be accomplished through the supplier/vendor formal accounting system. The accumulation of direct costs should be consistent with the way the work is planned and budgeted in the EVMS. The actual costs reflected in the monthly EVM reports should reconcile with the project management reports which pull costs directly from the formal accounting system; in some cases these reports will be the same.

Scalability

At a minimum, a small project should collect and report actual direct costs at the CA level by WBS. If internal management or the customer requires information by OBS element, then the cost collection structure must also support this requirement.

If the accounting system used by a small project’s supplier/vendor does not accommodate cost collection at the CA level, estimated actuals could be used for analyzing and reporting current performance, followed
by subsequent reconciliation with actual costs on a regular basis. In the absence of a formal accounting system, a financial spreadsheet could be used to accumulate hours, work in progress, invoices, travel and material costs, and other expenses. Rates could then be applied to determine actual costs on a monthly basis, followed by year-end reconciliation to recognize adjustments in applied rates.

**Guidelines:**

<table>
<thead>
<tr>
<th>Primary: 16</th>
<th>Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary: 1, 2, 3, 8, 10, 23, 28, 29, 32</td>
<td></td>
</tr>
</tbody>
</table>

**Benefits to Project Management**

The establishment of a valid comparison of planned costs for completed work with the actual costs for that same work provides the basis for realistic evaluation of cost deviations and ultimately facilitates Estimate at Completion (EAC) projections.

**Typical Products of Implementation**

- Reconciliation of project costs with the accounting system
- Actual costs reported at the CA level (at a minimum)
- Reconciliation of subcontract reported actual costs to subcontract payments
- Internal and external performance reports for suppliers/vendors
- Supplier/vendor CAPs, when used

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Execute the Work Plan and Record all Costs: For this step, project personnel execute their tasks according to the PMB and the underlying detailed work plans. Actual costs are recorded by the accounting system and are reconciled with the value of the work performed so that effective performance measurement can occur. A project cost-charging structure must be set up before the work begins to ensure that actual costs can be compared with the associated budgets for each active CA.

**B. Establishing a Cost Collection Structure to Support Management Requirements.**

By either integrating the accounting charge numbers into or associating them with the coding structure established in the Organizing Process, the performance information generated by the EVMS, using actual costs collected within the accounting system, supports both internal and external management in the execution of the project. The costs from the accounting system should adequately integrate into the EVM performance system for management reporting at the CA for both WBS and OBS elements.

---

![Charge Number Structure](image-url)

---
Scalability

Regardless of project size, the direct costs in a CA must summarize into only one higher-level WBS and/or OBS element. However, if the accounting system is not capable of capturing costs by WBS/OBS element at the CA level, then a separate mapping of cost collection accounts to these structures should be developed to ensure data integrity of the summarized information.

Guidelines:

| Primary: 17 | When a work breakdown structure is used, summarize direct costs from control accounts into the work breakdown structure without allocation of a single control account to two or more work breakdown structure elements. |
| Secondary: | 1, 3, 5, 16, 21, 22, 25, 27, 28, 29, 30 |

| Primary: 18 | Summarize direct costs from the control accounts into the organizational elements without allocation of a single control account to two or more organizational elements. |
| Secondary: | 2, 3, 5, 11, 16, 21, 22, 25, 27, 28, 29, 30 |

Benefits to Project Management

Ensuring the accurate summarization of accounting system information provides project management with timely and auditable information upon which to make effective management decisions.

Typical Products of Implementation

- Cost collection account structure
- WBS/OBS cost collection mapping
- WBS/OBS (roll-up scheme)
- Management performance reports

GAO Best Practices

Not specifically addressed in the GAO best practices guides.

C. Collecting Actual Unit/Lot Cost for Deliverable Items

On small projects for which there are multiple units required to be delivered to the customer, there may be a need to determine the individual cost of each unit or for a group of units (Lot). This information is primarily of use when there is a potential for future procurements of the same item or when there are multiple customers being delivered the units. If this information is required, either by the customer or internal management, the contractor’s accounting system must support the collection of this information.

Scalability

For a small project in a non-manufacturing environment, unit costs, equivalent unit costs or lot costs typically will not be applicable. However, if applicable, a small project should have the capability through its charge-number structure to isolate unit costs or equivalent unit costs. Isolation of these costs could be accomplished by using a financial spreadsheet that is separate from the accounting system, and should be able to differentiate between completed units and work-in-process. A logical average-cost methodology could also be employed after a number of units are in progress or have been completed.

Guidelines:

| Primary: 20 | Identify unit costs, equivalent unit costs, or lot costs when needed. |
| Secondary: | 1, 2, 3, 16, 17, 18, 19, 27, 28 |

Benefits to Project Management

This guideline allows the project to identify unit and lot costs for the flexibility to plan, measure performance, and forecast.

Products of Implementation

- Project cost collection structure
- Enterprise Requirements Planning system supports the identification of unit costs, equivalent unit costs, or lot costs when needed, including differentiation of work in process.

GAO Best Practices

Not specifically addressed in the GAO best practices guides.
Process 5: Managing Using Project Performance Information

As the work scope on the project is completed and resources consumed in achieving progress, the output of the EVMS reflects that progress and whether the project is meeting schedule and cost parameters. As the project deviates from the established plan, as represented by the PMB, both internal and external management must evaluate these deviations, both positive and negative, and determine their impact on future project execution including an evaluation and update of the project EAC. If necessary and possible, actions must be taken to bring the project back to within acceptable parameters.

A. Providing Performance and Cost Variances for Project Analysis

At the end of each reporting cycle, the responsible managers, at the CA level, assess the status of in-progress work and determine the appropriate value to be “earned” by using the EVT established when planning the effort. This information is then valued by the EVMS and compared to the value that was originally budgeted for that work, i.e., budgeted cost of work scheduled (BCWS) and the actual cost for work performed (ACWP). This comparison results in a dollarized SV that represents the value of work completed on, behind, or ahead of the schedule date for that work. In addition, a dollarized cost variance (CV) is calculated that represents the costs equal to, above, or below the expected costs for that work as represented by the original budget value. These two formulas are: (1) SV = BCWP – BCWS and (2) CV = BCWP – ACWP.

Scalability

Small projects are responsible for ensuring that schedule and cost analyses are performed at the end of each reporting cycle and variances are identified that have tripped internal and external thresholds (SV, CV). Scaling can be accomplished by revising thresholds for a small project and by establishing external and internal variance analysis requirements that are at different WBS levels based on top cost and schedule drivers. Additionally, focusing on cumulative variances only (not current period) and focusing on only the most important variances will also reduce the administrative impact on the project.

Guidelines:

Primary: 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.

Secondary: 1, 2, 3, 5, 7, 9, 16, 23, 30

Benefits to Project Management

The monthly analysis of deviations from the plan for both schedule and cost provides management at all levels the ability to rapidly and effectively implement corrective actions to accomplish the project objectives with an understanding of the project risk and the causes of the risk.

Typical Products of Implementation

- Variance analyses (budget-based SVs and CVs)
- Management action plans
- Updated schedule task completion and cost-at-completion forecasts
- Project schedules and schedule analysis outputs

GAO Best Practices

GAO Cost Estimating and Assessment Guide, Chapter 18 - Analyze EVM performance data and record variances from the PMB Plan. Because all programs carry some degree of risk and uncertainty, CVs and SVs are normal. Variances provide management with essential information upon which to assess program performance and to estimate cost and schedule outcomes. EVM guidelines provide for examining cost and
schedule variances at the CA level at least monthly and for focusing management attention on variances with the most risk to the program. This means that for EVM data to be of any use, they must be regularly reviewed. In addition, management must identify solutions for problems early if there is any hope of averting degradation of program performance.

B. Analyzing Significant Variances

Establish reasonable selection criteria to ensure proper analysis of all significant problems which do not cause an excessive burden on the CAM and mid-level managers. Use of meeting notes, minutes, or other material generated as a normal function of the management process supports this analysis. The selection criteria should ensure all significant variances are analyzed and any external reporting requirements are supported. Some example approaches to establishing what a “significant” variance is are shown in this table.

**Example Threshold**

<table>
<thead>
<tr>
<th><strong>Variance</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on criticality</td>
<td></td>
</tr>
<tr>
<td>Based on program</td>
<td></td>
</tr>
<tr>
<td>Based on size ($) and/or</td>
<td></td>
</tr>
<tr>
<td>Customer reporting requirements</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Data Analysis Formulae</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SV%/CV%</td>
<td></td>
</tr>
<tr>
<td>SPI/CPI</td>
<td></td>
</tr>
<tr>
<td>% Complete vs. % Spent</td>
<td></td>
</tr>
<tr>
<td>Trend</td>
<td></td>
</tr>
</tbody>
</table>

Once a significant variance has been identified, it should be analyzed to show the causal effects of the variance along with an accurate assessment of projected future cost impacts. In analyzing the SV, for example, the value generated by the EVMS should be compared to the actual schedule, i.e., the IMS to determine if they correlate and if there is impact to the critical path. The analysis of the CV should include an analysis of the various “components” of the variance; i.e., labor variance analysis, material variance analysis (see Process 7, step f) and analysis of indirect costs (Process 9, Step d). The formulas for the calculation of the labor component of the CV are:

**Labor Cost Variance Analysis:**

Rate Variance = Earned rate minus the actual rate times the actual hours.
Volume Variance = Earned hours minus the actual hours times the budgeted rate.

An example application of these formulas is shown in the following table:
Rate variances are rarely recoverable and management actions could be to use less expensive labor categories or attempt to reduce the number of hours required of the more expensive labor categories. Volume variances may not represent recurring instances of the level of performance and should be evaluated in this light. The ability to reduce volume variances will also contribute to reducing the impact of rate variances. The results of these analyses should be applied to the EAC update.

**Scalability**

Scaling could be accomplished by revising thresholds for a small project, also by establishing external and internal variances that are at different WBS levels and that are based on top cost and schedule drivers, as well as by generating and reporting on variances that are cumulative only (not current period), and finally by analyzing only the most important variances that are driven by thresholds.

**Guidelines:**

- **Primary**: Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance, and provide the reasons for the variances in the detail needed by program management.
- **Secondary**: 1, 2, 3, 5, 6, 7, 9, 22, 26, 30

**Benefits to Project Management**

The monthly analysis of deviations from plan for both schedule and cost provides management at all levels the ability to rapidly and effectively implement corrective actions to accomplish the project objectives with an understanding of the project risk and the causes of the risk.

**Typical Products of Implementation**

- Variance analysis (cost and schedule variances)
- Management action plans
- Schedule and cost-at-completion forecasts
- Project schedules and schedule analysis outputs

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Analyze EVM performance data and record variances from the PMB. Because all projects carry some degree of risk and uncertainty, cost and schedule variances are normal. Variances provide management with essential information on which to assess project performance and estimate cost and schedule outcomes.
C. Preparing Summarized Information for Management Evaluations

During the periodic reporting cycle, performance measurement information is developed at the WP/CA level and summarized in a series of reports, charts, and graphs for different levels of the WBS and OBS. This integration of system data and its subsequent roll up and reporting in a useful form are significant elements of the information feedback essential to effective management and control. For the PM and intermediate levels of management, this summarized information facilitates focusing on variances that may require broader corrective actions at a higher level than at the lower CA level.

<table>
<thead>
<tr>
<th>Scalability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small projects, based on the WBS and OBS previously established during project set-up, will be able to focus on summarized information at the project level for analysis and corrective action implementation. As the project size increases, the level of management attention will fall at levels lower than the project level and require intermediate managers to evaluate the impact of variances on portions of the program and coordinate corrective actions across the project.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Guidelines:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary: 25</td>
</tr>
<tr>
<td>Summarize the data elements and associated variances through the program organization and/or work breakdown structure to support management needs and any customer reporting specified in the project.</td>
</tr>
<tr>
<td>Secondary:</td>
</tr>
<tr>
<td>1, 2, 3, 15, 17, 26, 27, 28, 29, 30</td>
</tr>
</tbody>
</table>

### Benefits to Project Management

Variance analyses provide an understanding of current status of project performance, allowing the PM to properly allocate available resources to mitigate project risk and take appropriate corrective actions. Variances also identify significant problem areas generated from all levels of the organization and WBS, and provide valuable management information for decision making.

<table>
<thead>
<tr>
<th>Typical Products of Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variance analyses</td>
</tr>
<tr>
<td>Schedule and cost performance reports</td>
</tr>
<tr>
<td>Management action plans</td>
</tr>
<tr>
<td>Updated schedule and cost forecasts</td>
</tr>
<tr>
<td>Risk and opportunity management plans</td>
</tr>
</tbody>
</table>

**GAO Best Practices**

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Analyze EVM Performance Data and Record Variances from the PMB. Because all programs carry some degree of risk and uncertainty, CVs and SVs are normal. Variances provide management with essential information on which to assess program performance and estimate cost and schedule outcomes. EVM guidelines provide for examining CVs and SVs at the CA level at least monthly and for focusing management attention on variances with the most risk to the program. This means that for EVM data to be of any use, they must be regularly reviewed. In addition, management must identify solutions for problems early if there is any hope of averting degradation of program performance.

### D. Determining and Implementing Appropriate Corrective Actions

The results of variance analysis, i.e., the understanding of how and why variances from the plan occurred, should lead to the implementation of actions that will correct or mitigate the effect of those variances on the future plan for the project. These actions, once approved and implemented, should be monitored for progress and completion.
### Scalability

By identifying corrective actions at the previously established CA or intermediate levels, the overall impact on project resources of implementing and tracking these actions to conclusion is reduced.

### Guidelines:

**Primary:**
- Implement managerial action taken as the result of earned value information.

**Secondary:**
- 2, 5, 23, 25, 27, 29, 32

### Benefits to Project Management

Early identification of problems permits management to react in a timely fashion and assign additional resources to effect the solution. The more timely and more accurate the data and its analysis are, the better the management decision-making will be.

### Typical Products of Implementation

- Independent completion estimates
- Risk and opportunity management data and similar metrics
- Management action plans and review briefings

### GAO Best Practices

**GAO Cost Estimating and Assessment Guide,** Chapter 18 - Analyze EVM Performance Data and Record Variances from the PMB Plan. EVM guidelines provide for examining CVs and SVs at the CA level at least monthly and for focusing management attention on variances with the most risk to the program. This means that for EVM data to be of any use, they must be regularly reviewed. In addition, management must identify solutions for problems early if there is any hope of averting degradation of program performance.

### E. Evaluating and Updating Projected Project Costs

Periodically, every project should develop a comprehensive estimate of total project costs; i.e., an EAC. This is normally accomplished at the CA level by (1) evaluating the efficiency achieved by performing organizations for completed work and comparing it to the complexity of the remaining efforts; (2) establishing a schedule forecast that reflects the expected time-frame for completing the remaining work; (3) considering all remaining risk areas on the project versus cost avoidance possibilities; (4) ensuring the most current rate structure is used to value the projected resources; and (5) summarizing the results to derive the most accurate estimate.

### Scalability

Regardless of size, small projects should generate performance-to-date data at the CA level, and therefore should perform EACs on a regular basis for the remaining work at or below the CA level, taking into account future cost, schedule, risk and resource requirements. These estimates should be summarized up through the WBS and the OBS to the project level for management visibility and control. All performance-to-date data should be consistent with the reporting requirements that were established at the outset of the project and/or contract.
Scaling, as with previous requirements, is first achieved through limiting the depth and breadth of the WBS, thereby reducing the number of CAs that requires EAC updates. Further scaling can be achieved by reducing the frequency of developing EACs, for example quarterly at the CA level. The total project EAC, i.e., “bottoms-up” updates should be completed semi-annually or annually. Finally, limiting the amount of required supporting documentation reduces the administrative burden of this activity. Reporting the results of EAC updates should be as required by both internal procedures and external contractual requirements.

### Guidelines:

| Primary: 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 (project) management and any applicable customer reporting requirements including statements of funding requirements. |
| Secondary: | 5, 8, 9, 10, 14, 16, 19, 21, 23, 24, 26, 28, 29, 30 |

### Benefits to Project Management

To effectively manage the project, the ability to make accurate and timely forecasts of the final cost is required. Accurate and timely forecasts will ensure continuing visibility into resource needs and lead to project success for both the customer and the supplier/vendor. Accurate and timely estimates support the customer’s ability to provide sufficient funding to the project and enhance internal management’s visibility into critical resource requirements.

### Typical Products of Implementation

- Basis of estimate
- Risk and opportunity management plans
- Operational metrics
- EV metrics
- Updated schedule and cost-at-completion forecasts

### GAO Best Practices

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Forecast Estimates at Completion Using EVM. Managers should rely on EVM data to generate EACs at least monthly. EACs are derived from the cost of work completed along with an estimate of what it will cost to complete all unaccomplished work. A best practice is to continually reassess the EAC, obviating the need for periodic bottoms-up estimating. It should be noted, however, that the Department of Defense (DOD) requires an annual comprehensive EAC.
Process 6: Incorporating Approved Changes to the Project

Once a project has been planned and execution of the effort started, it is inevitable that there will be changes to the original plan to compensate for the realities of both external and internal impacts on the project. These changes can occur based on customer decisions relative to content, schedule or the ability to provide funds for the estimated costs to complete the project. There can also be internal changes resulting from management decisions concerning the path forward as well as the need to mitigate risks or take advantage of opportunities as either occurs during the life of the project. In either case, necessary changes must be made in a timely manner in order to maintain the validity of the baseline plan for future efforts.

A. Making Changes to Project Plans and Budgets

Customer-directed changes to the project can impact virtually all aspects of the internal planning and control system, such as organization structures, work authorizations, budgets, schedules, and EACs. External changes can be of two types:

- Fully negotiated changes where scope, schedule and price (cost plus profits/fees) have been mutually agreed to by both customer and supplier. In this case, the negotiated value is added to the baseline total and the work scope is planned using normal, internal processes.
- Authorized but unpriced efforts where negotiations continue while the execution of authorized scope begins. The initial value added to the plan represents the project’s initial estimate of expected costs and only the near-term effort is planned at the CA level. The remaining effort is held in UB until such time as negotiations are completed.

In either of the above cases, the incorporation of authorized changes should be made as quickly as possible and should be strictly controlled. This will ensure the PMB can be accurately maintained. Changes made as a result of internal replanning decisions; i.e. CA replanning, PP draw-down, issuance of MR for unforeseen scope or technical requirements, etc., must also be made expeditiously and the plan updated to reflect these changes.

Scalability

Regardless of size, projects should incorporate all approved internal and contractual changes to the PMB in a documented, disciplined and timely fashion. For scaling purposes, a small project’s use of informal documentation to capture changes to scope, schedule and budget is acceptable, such as a financial spreadsheet or other electronic media. Reducing or streamlining the number and level of approvals required on baseline change documentation can facilitate timely approval and change incorporation into the PMB.

Guidelines:

| Primary: 28 | Incorporate authorized changes in a timely manner, recording the effects of such changes in the 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. |
| Secondary: | 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 27 |
| Primary: 29 | Reconcile current budgets to prior budgets in terms of changes to the authorized work and internal replanning in the detail needed by management for effective control. |
| Secondary: | 1, 2, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 17, 18, 21, 25, 27, 28 |

Benefits to Project Management

A properly maintained PMB is crucial to effective program management. The timely and accurate incorporation of contractual changes ensures that the information generated from the execution of the baseline plan provides an accurate picture of progress and facilitates correct management actions and decisions.

Typical Products of Implementation

- Contractual/internal change documents
- Change control logs
• New/Revised CA/WP/PP plans
• Revised master, intermediate, and detail level schedules
• Updated SOW, WBS, and WBS Dictionary
• New/revised work authorization documents

GAO Best Practices

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Update the PMB as Changes Occur. Because changes are normal, the EVM guidelines allow for incorporating changes—unless it is a retroactive change to the performance data (with the exception of error correction). However, it is imperative that changes be incorporated into the EVM system as soon as possible to maintain the validity of the PMB. When they occur, both budgets and schedules are reviewed and updated so that the EVM data stay current. Furthermore, the EVM system should outline procedures for maintaining a log of all changes and for incorporating them into the PMB, and the log should be maintained so that changes can be tracked.

B. Maintaining Correlation for Approved Project Values

One of the key elements of an EVMS implementation is the relationship between the value established for the project baseline plan and the customer authorizing document; i.e., contract, task order, internal company authorization, etc. Internal adjustments to plans for future actions are a normal management process as project execution proceeds and situations change. It is important to ensure that overall project scope, cost, and schedule baselines and retroactive changes are properly controlled to maintain the integrity of project performance data. As long as both parties to the project recognize the same “target” value for the project, then the information provided by the EVMS (performance measurement data) will continue to support management actions based on its analysis.

Scalability

All changes to authorized work/schedule/resources must be traceable to the original baseline, regardless of project size. In small projects, change control documentation can be simplified, for instance, by using a single document, such as a financial spreadsheet or other informal electronic media, which includes, at a minimum, sections for MR, UB, the PMB, CBB, and EAC.

Guidelines:

| Primary: 30 | Control retroactive changes to records pertaining to work performed that would change previously reported amounts for actual costs, earned value, or budgets. Adjustments should be made only for correction of errors, routine accounting adjustments, effects of customer or management directed changes, or to improve the baseline integrity and accuracy of performance measurement data. |
| Secondary: 16, 17, 18, 19, 21, 22, 23, 24, 25, 27 |

Benefits to Project Management

Controlling retroactive changes is imperative because they could arbitrarily eliminate or create CVs and SVs and thus degrade the usefulness of the EV data.

Typical Products of Implementation

• Change control logs
• Retroactive change control process, including approval

GAO Best Practices

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - Update the PMB as Changes Occur. Because changes are normal, the EVM guidelines allow for incorporating a change—unless it is a retroactive change to the performance data (with the exception of error correction). However, it is imperative that changes be incorporated into the EVM system as soon as possible to maintain the validity of the PMB. When they occur, both budgets and schedules are reviewed and updated so that the EVM data stay current. Furthermore, the EVM system should outline procedures for maintaining a log of all changes and for incorporating the changes into the PMB, and the log should be maintained so that changes can be tracked.
## C. Establishing Procedures for Baseline Values in Excess of Project Costs

As a project progresses, the amount of performance measurement budget assigned to the remaining work scope may be insufficient to provide valid management information to both internal and external managers. At this point, a decision to establish a new baseline plan in an amount that is more reflective of future expectations is appropriate. The plan should be based on a comprehensive estimate of the resources required to finish the project scope, valued at future expected rates and factors, and time-phased in accordance with the forecasted project schedule. When completed, this over-target baseline (OTB) becomes the new vehicle for determining both cost and schedule progress and forecasting future completion dates and costs.

### Scalability

If the decision is made to proceed with an OTB, small projects could limit the impact of the process on the project by evaluating resource needs at a high WBS level, based on lower-level inputs for establishing the new plan.

### Guidelines:

<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>8, 15</td>
</tr>
</tbody>
</table>

**Benefits to Project Management**

To maintain a valid PMB, avoid changes made outside the authorized baseline control processes which would compromise the integrity of performance trend data and delay visibility into overall project variance from plan, thus reducing the alternatives available to managers for project redirection or revisions. The use of a mutually recognized OTB, while affecting past performance information, ensures future data will provide visibility in project progress and support effective management decisions.
<table>
<thead>
<tr>
<th>Typical Products of Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Contractual/internal change documents and change control logs</td>
</tr>
<tr>
<td>• New/Revised CA/WP/PP plans</td>
</tr>
<tr>
<td>• Revised master, intermediate, and detail level schedules</td>
</tr>
<tr>
<td>• Updated SOW, WBS, and WBS Dictionary</td>
</tr>
<tr>
<td>• New/revised work authorization documents</td>
</tr>
<tr>
<td>• Revised Management Reports</td>
</tr>
</tbody>
</table>

**GAO Best Practices**

The GAO Estimating and Cost Assessment Guide does not address this subject.
Process 7: Managing Project Material Items

The term "material" includes any property that may be incorporated into or attached to an end item to be delivered under a contract. Material also consists of any property that may be consumed in performance of a contract. Material includes raw and processed items, manufactured parts and equipment that are purchased according to specification, small common items held in inventory, and purchased services. Material can be associated with engineering effort such as design and testing or with the production of deliverable hardware.

Material is normally purchased from outside vendors but it may also be supplied by other divisions of the contractor's company. For interdivisional transfers of material, a contractor's material control system should have formal procedures covering areas such as dollar value thresholds for material transfers and provisions pertaining to profit for material transfers by performing organizations.

Small projects will normally not involve the delivery of multiple units of the same product; i.e., manufacturing/production, so many of the concepts that apply to this type of procurement will not be covered here.

NOTE: The GAO Cost Estimating and Assessment Guide does not specifically address EVM for material.

<table>
<thead>
<tr>
<th>A. Identifying all Material Items Required to Execute the SOW</th>
</tr>
</thead>
</table>

The CA budget for material items should be based on defined/expected quantities of material items necessary to meet the requirements of the project. Material budget planning begins with the development of a projected materials list or BOM during the proposal phase. In the case of a development effort, this may be the offeror's “best guess” of material requirements based on like procurements or customer information provided in the proposal request. On projects where an approved design exists, the BOM will be based on the parts list associated with that design factored by the number of units to be built. The BOM should be structured in such a way as to identify specific material items to the WBS scope where they will be consumed.

**Scalability**

Scalability of this activity is fully dependent on the WBS that was prepared in Process 1, Step b. A review of the scope of each of the lowest level WBS elements should reveal the types and quantities of material items that are needed to complete that effort. This process should be supportive of creating the BOM for the project.

**Guidelines:**

| Primary: 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. |
| Secondary: 3, 5, 6, 8, 15, 16, 17, 20, 21, 22, 23, 25, 27, 28 |

**Benefits to Project Management**

The early and accurate identification of project material requirements will lead to greater stability in the resource budgeting process and allow realistic “lead-times” to be established for critical and long-lead material items.

**Typical Products of Implementation**

- Project BOM
- Material requirements by WBS

<table>
<thead>
<tr>
<th>B. Scheduling Material Requirements</th>
</tr>
</thead>
</table>

Material schedules should be planned according to the engineering development or production schedule. Detail scheduling is done in terms of a "set back" schedule where "need-by" dates are established, and the time needed for delivery and ordering are set back from the time the material is required by the user to complete their work requirements. This set-back time must also take into account the "lead time" for the material item to be procured. This is the time between purchase order issuance and material delivery and may vary from several days to several years depending on the type of material involved.
Scalability

One option to reduce the amount of time and effort expended on managing material items is to acquire all needed material items early in the project and maintain them in a dedicated storage area. This approach, however, should only be taken if material requirements are firmly established and confirmed.

Guidelines:

Primary: 6
Schedule the authorized work in a manner which describes the sequence of work and identifies significant task interdependencies required to meet the requirements of the program.

Secondary: 1, 2, 3, 7, 8, 10, 22, 23, 26, 28, 29, 32

Benefits to Project Management

As with the identification of required types and quantities of labor resources, the need to accurately identify material requirements and ensure they are available when needed supports project objectives and accurate analysis of project status.

Typical Products of Implementation

- Integrated Network Schedule
- CAPs containing material requirements

C. Establishing Budget Values for Material Items

The establishment of material WPs for developmental material and production material can differ significantly. In a developmental effort, most material is consumed by the engineering organizations in the design and testing of potential hardware items. The budgets for these PPs should be substantiated and segregated in some manner in order to ensure that budget designated for material procurement is not inadvertently used for other requirements. In the event the small project has a requirement to produce multiple copies of the product, an “assembly-line” environment will exist and will make use of the normal factory planning process. Material requirements scheduling must support the “factory” schedule for producing the items.

Scalability

These WPs may be established within the same CA as the labor that will consume the material. Planning packages should be established for developmental type material items when design work has not progressed sufficiently to permit adequate definition of parts required.

Guidelines:

Primary: 10
To the extent it is practicable to identify the authorized work in discrete work packages, establish budgets for this work in terms of dollars, hours, or other measurable units. Where the entire control account is not subdivided into work packages, identify the far term effort in larger planning packages for budget and scheduling purposes.

Secondary: 2, 6, 7, 8, 9, 11, 13, 22, 27, 28, 29, 32

Benefits to Project Management

Identification of material items in separate WPs enhances visibility into their status and ensures they are time-phased in support of user requirements.
Typical Products of Implementation

- CAPs divided into WPs and PPs
- CA schedules
- CA time-phased budgets

D. Ensuring Accounting System Interface Supports Project Management Needs

Acceptable costing techniques should be used to fully account for all material purchased for the project. The accounting system should ensure accurate cost accumulation which assigns material costs to appropriate CAs in a manner consistent with the budget. Actual costs for material items should be reported in the same accounting period that EV is taken for the material to facilitate management analysis.

Where actual costs are not available in a timely manner, assign estimated costs to the material item and make adjustments when actuals are recorded later in the accounting system.

Scalability

For small projects, assignment of these costs to CAs could be accomplished using a financial spreadsheet that is separate from the accounting system, with costs recorded at point of receipt (acceptance), or point of stock (inventory), or point of issue to work-in-process (consumption), and taking into consideration residual or scrap inventory.

Small projects should define a material planning and control approach that will differentiate high value/critical material from low value/non-critical material. The high value/critical material should be planned and tracked with greater rigor than low value/non-critical material. Scaling could also be accomplished by planning and tracking low value/non-critical material in a single CA.

Guidelines:

| Primary: 21 | For EVMS, the material accounting system will provide for:
| 1) Accurate cost accumulation and assignment of costs to control accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques.
| 2) Cost recorded for accomplishing work performed in the same period that earned value is measured and at the point in time most suitable for the category of material involved, but no earlier than the time of actual receipt of material.
| 3) Full accountability of all material purchased for the program including the residual inventory. |

Secondary: 1, 2, 3, 5, 9, 10, 12, 16, 17, 18, 20, 22, 23, 27, 30

Benefits to Project Management

Having the actual cost for material items available in the same accounting period as the EV information establishes a valid comparison of expected costs versus actual costs and supports estimates of future cost for like activities.

Typical Products of Implementation

- Material system reports
- Material cost reconciliation to accounting records

E. Providing Performance and Cost Variances for Project Analysis

Budgets should be scheduled in accordance with a project event and earned when the event occurs. To avoid distortion, actuals should be recorded/reported when the budget is earned. Analysis of variances for material accounts should focus on significant concerns; i.e., high value and/or critical material items. This may include usage incurred above or below the normal or exact quantities plus normal attrition amounts, as well as variances in the expected price of the material.

The formulas for calculating the price and usage variance components are:

- Price Variance (the price earned for a part minus the actual cost of that part):
  \[ PV = (BCWP \text{ cost} - \text{actual [ACWP] cost}) \times \text{the budgeted quantity}. \]
- **Usage Variance**: (the quantity earned minus the quantity consumed): 
  \[ UV = (BCWP \text{ quantity} - \text{actual [ACWP] quantity}) \times \text{the budgeted cost}. \]

<table>
<thead>
<tr>
<th>Material CV Components</th>
<th>Category</th>
<th>Amount</th>
<th>Price Variance</th>
<th>Quantity Variance</th>
<th>Total CV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Planned Quantity</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Planned Price</td>
<td>$212.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BCWS</td>
<td>$21,250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EV %</td>
<td>40%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Earned Quantity</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BCWP Price</td>
<td>$212.50</td>
<td>$212.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BCWP</td>
<td>$8,500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Act Quantity</td>
<td>42</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Act Price</td>
<td>$210.50</td>
<td>$210.50</td>
<td>$210.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACWP</td>
<td>$8,841</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SV</td>
<td>$12,750</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CV</td>
<td>-$341</td>
<td>$80</td>
<td>-$421</td>
<td>-$341</td>
</tr>
</tbody>
</table>

Price variances are rarely recoverable and management actions could be to find other sources for subsequent procurements for the material items. Volume variances may not represent recurring instances of the level of performance and should be evaluated in this light. The ability to reduce volume variances will also contribute to reducing the impact of price variances. The results of these analyses should be applied to the EAC update.

**Scalability**

Scaling could be accomplished by revising thresholds for a small project, also by establishing external and internal variances that are at different WBS levels and that are based on top cost and schedule drivers, as well as by generating and reporting on variances that are cumulative only (not current period), and finally by analyzing only the most important variances that are not driven by thresholds.

**Guidelines:**

- **Primary**: Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance, and provide the reasons for the variances in the detail needed by program management.

- **Secondary**: 1, 2, 3, 5, 6, 7, 9, 22, 26, 30

**Benefits to Project Management**

The monthly analysis of deviations from plan for both material schedule and material cost provides management at all levels the ability to rapidly and effectively implement corrective actions to accomplish the project objectives with an understanding of the project risk and the causes of the risk.

**Typical Products of Implementation**

- Variance analyses (CVs and SVs)
- Management action plans
- Schedule and cost-at-completion forecasts
- Project schedules and schedule analysis outputs
## F. Determining and Implementing Appropriate Corrective Actions

Based on the results of variance analysis for material items, corrective actions are relatively simple. If material items are late and are impacting deliveries, then efforts to expedite subsequent material deliveries must be taken. If material items are costing more than planned, then actions may involve finding a second, less expensive source.

### Scalability

Regardless of project size, effective project management requires executing corrective action plans (whether formal or informal) and mitigating issues as soon as they are identified, and tracking their resolutions to closure.

### Guidelines:

| Primary: 26 | Implement managerial action taken as the result of earned value information. |
| Secondary: | 2, 5, 23, 25, 27, 29, 32 |

### Benefits to Project Management

When the project management team has been provided the EVM variances, corrective action plans can be executed to mitigate significant variances and any negative trends which are impacting project performance.

### Typical Products of Implementation

- Management action plans and review briefings
- Variance Analyses

## G. Evaluating and Updating Estimates of Project Costs for Material

Information relative to price and usage variances should be used to support an update to the EAC. This provides timely notification to management of expected/incurred price changes which may affect future costs on the current project as well as future procurements. On production contracts, the evaluation of excess usage can lead to identification of increased material requirements necessary to maintain the production line at optimum capacity and to meet the contractual requirements.

### Scalability

Small projects should perform EACs on a regular basis for the remaining work, taking into account future cost, schedule, risk, and resource (material) requirements. These estimates should be summarized up through the WBS/OBS to the project level for management visibility and control.

Scaling, as with previous requirements, is first achieved through limiting the depth and breadth of the WBS, thereby reducing the number of CAs that requires EAC updates. Further scaling can be achieved by reducing the frequency of developing EACs, for example quarterly at the CA level. The total project EAC, i.e., “bottoms-up” updates should be completed semi-annually or annually. Finally, limiting the amount of required supporting documentation reduces the administrative burden of this activity. Reporting the results of EAC updates should be as required by both internal procedures and external contractual requirements.

### Guidelines:

| Primary: 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 (project) management and any applicable customer reporting requirements including statements of funding requirements. |
| Secondary: | 5, 8, 9, 10, 14, 16, 19, 21, 23, 24, 26, 28, 29, 30 |

### Benefits to Project Management

To effectively manage the project, the ability to make accurate and timely forecasts of the final cost is required. Updated forecasts will not only ensure continuing visibility into resource needs and lead to project success for both the customer and the supplier/vendor but will also support the customer’s ability to provide sufficient funding to the project and enhance internal management’s visibility into critical resource requirements.
Typical Products of Implementation

- Basis of estimate
- Risk and opportunity management plans
- Operational metrics
- EV metrics
- Updated schedule and cost-at-completion forecasts
- Material performance data

H. Adjusting for Changes in Material Requirements

There are a number of factors that can drive changes in the material items/quantities needed to successfully complete a project. As the project progresses, design improvements, advances in material technologies, price changes, etc. can cause the original BOM to be updated. As with the original planning of material budgets, updates to the BOM must be incorporated into the project plan (PMB) in a timely and efficient manner.

Scalability

For scaling purposes, a small project could use informal documentation to capture changes to scope, schedule and budget, such as a financial spreadsheet or other electronic media. Reducing or streamlining the number and level of approvals required on baseline change documentation can facilitate timely approval and change incorporation into the PMB.

Guidelines:

| Primary: 28 | Incorporate authorized changes in a timely manner, recording the effects of such changes in the 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. |
| Secondary: | 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 27 |
| Primary: 29 | Reconcile current budgets to prior budgets in terms of changes to the authorized work and internal replanning in the detail needed by management for effective control. |
| Secondary: | 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 25, 26, 27, 32 |

Benefits to Project Management

The timely incorporation of both externally and internally driven changes to the project plan ensures that performance measurement information provided to management and the customer will continue to be accurate and reflective of actual project progress and supportive of management decision making.

Typical Products of Implementation

- Contractual change documents
- Change control logs
- CA / WP / PP plans
- Master, intermediate, and detail level schedules
- SOW, WBS, and WBS Dictionary
- Work authorization documents
Process 8: Managing Subcontracted Items

Often, a significant portion of the project and/or prime contractor effort is performed by subcontractors. Subcontract arrangements are generally with other companies but may also include other organizational entities within the prime's corporation. For the purposes of this process, the term "subcontractor" also refers to inter-divisional work; i.e., effort performed by another profit center within the prime contractor's parent organization. While purchased material items are “off-the-shelf” hardware, subcontracts generally involve one or more of the following elements:

- design and development
- manufacturing effort
- requirement to meet a performance specification
- SOW
- substantial cost/schedule/technical risk

A procurement placed on a subcontract basis requires more comprehensive management techniques for schedule and/or technical control than do BOM items. Because of this, the application of EVM to a subcontracted effort can cause unique process implementation.

From an EVM perspective, a distinction must be made between those subcontractors what are considered “major”, i.e., delivering critical, high-risk, and/or high-dollar items to the project, or “minor”, those that do not meet the definition of major. Major subcontractors are normally expected to provide reports to the project that contain all elements of EV information (BCWS, BCWP, ACWP, associated schedule and CVs, budget at completion, EAC, variances at completion, and analysis of all variances designated as significant) in support of customer reporting requirements. For minor subcontractors, the project is expected to generate this information gathered by the assigned subcontract manager or CAM.

NOTE: *The GAO Cost Estimating and Assessment Guide* does not specifically cover EVM for subcontracts.

### A. Identifying all Subcontract Items Required to Execute the SOW

All subcontracted effort must be identified to a WBS element and described in a WBS dictionary or similar document. All subcontracted efforts should be identified in separate CAs and the appropriate CA documentation developed.

**Scalability**

Once the decision has been made to subcontract for a project requirement, and the distinction between major/critical subcontractors made, the extent of EV information required of the subcontractor can be limited in the same way as the projects by limiting the size/extension of the subcontractor’s WBS against which reporting will be required.

**Guidelines:**

| Primary: 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 |
| Secondary: | 3, 5, 6, 8, 15, 16, 17, 20, 21, 22, 23, 25, 27, 28 |

**Benefits to Project Management**

The WBS is required for all projects and is used as the basic building block for the planning of all authorized work. Identifying and including subcontracted effort in the WBS facilitates tracking and reporting of these externally managed activities and provides a control framework for project management.

**Typical Products of Implementation**

- WBS
- WBS Dictionary or similar document containing subcontract work definition.
### B. Establish Subcontract Management Organizations

When designating the internal organization responsible for managing a subcontracted effort, the project must assign a manager with sufficient authority and responsibility to be able to ensure the subcontractor will perform to the terms and conditions of the subcontract. Whatever arrangement the prime contractor makes, the person(s) assigned should have all of the same responsibilities as other CAMs within the program organization.

**Scalability**

A small project could scale this requirement by establishing a single individual/team to manage all subcontracted efforts within the project. The person/team must have the requisite technical skills to effectively interface with the subcontractors and understand the support for physical progress represented by the subcontractor’s BCWP information.

**Guidelines:**

<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3, 5, 6, 8, 9, 10, 12, 15, 16, 18, 21, 22, 23, 25, 26, 27, 28, 29</td>
</tr>
</tbody>
</table>

**Benefits to Project Management**

The OBS helps management focus on establishing the most efficient organization by taking into consideration the availability and capability of management and technical staff, including suppliers/vendors, to achieve the project objectives and allowing them to report to those organizations.

**Typical Products of Implementation**

- OBS

### C. Scheduling Subcontractor Requirements

One aspect of schedule integration that provides unique problems is the integration of subcontractor schedule information into the prime contract schedule. This integration should be accomplished in a manner that provides an accurate depiction of the impact of subcontractor performance on the project schedules.

**Scalability**

As a core process for project management, schedules are required for small projects. All elements and the level of detail of the schedule should be agreed by supplier and vendor. The limiting of the WBS and OBS levels and their intersections, as previously described, will also reduce the lines of detail required in the schedule.

The detail in the schedule for subcontracted items will ultimately be a function of the in-house CAPs created for subcontracted effort in subsequent steps. The project schedule should contain for subcontracted items, at a minimum, the expected sequence of work, significant interdependencies between segments of work, and time-phasing of authorized measurable work at a level of detail which reflects the risk of the effort being managed.

**Guidelines:**

<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1, 2, 3, 7, 8, 10, 22, 23, 26, 28, 29, 32</td>
</tr>
</tbody>
</table>

**Benefits to Project Management**

Scheduling all work to be performed facilitates effective planning, statusing, and forecasting. This is critical to the success of all projects. Integrating and time phasing the technical and cost baselines result in the expected sequence of work, task interdependencies and insight into potential schedule slippages.
Typical Products of Implementation

- Integrated Network Schedules (including subcontractor schedule information)
- CAPs for subcontracted items

D. Establishing Subcontract Budget Values

The identification of budgets for subcontracted items is a result of establishing the requirement for the item to be procured as a subcontract rather than purchased as a material item. This involves identification of the subcontractor, the establishment of an estimated value for the subcontract, and, ultimately, negotiating the subcontract scope, schedule, and value. The project budget for the subcontract, then, is based on the value (cost plus profit) of the subcontract, as subcontractor profit is a cost to the prime.

Scalability

There is little in the way of scalability here. Whatever the subcontract value is negotiated to be is the budget that must be established for that subcontract. Tracking the subcontractor profits/fees in separate WPs would facilitate the analysis of subcontractor performance by allowing the managers to focus on cost performance.

Guidelines:

| Primary: 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. |
| Secondary: | 1, 2, 5, 8, 10, 12, 13, 19, 21, 23, 27, 28, 29, 32 |

Benefits to Project Management

Knowing the value of the subcontractor effort allows project management to assess both physical progress (scheduled work accomplishment) and the costs of work accomplishment (cost accumulation) for purposes of making and implementing management decisions.

Typical Products of Implementation

- CAPs dividing subcontractor effort into WPs / PPs
- CA schedules
- Time-phased subcontract budgets at the CA level

E. Ensuring Accounting System Interface Supports Project Management Needs

The relationship between subcontractor actual costs and what is reported in the prime contractor’s accounting system is a function of the timeliness of subcontractor invoicing and prime contractor processing. It is not unusual for subcontractor actuals in the prime’s accounting system to be significantly lower than what is being reported in the subcontractor’s EV report for ACWP. It is the prime’s responsibility to integrate the information reported to the customer by verifying the ACWP in the subcontractor’s report current for the cost to accomplish the work represented by BCWP. If there is some concern that the value may be under/overstated, then the prime should create estimated actuals for its report to the customer and reconcile these to invoiced actuals from the subcontractor.

Scalability

At a minimum, a small project should collect and report actual direct costs at the CA level by WBS. If internal management or the customer requires information by OBS element, then the cost collection structure must also support this requirement.

If the accounting system used by a small project’s supplier/vendor does not accommodate cost collection at the CA level, estimated actuals could be used for analyzing and reporting current performance, followed by subsequent reconciliation with actual costs on a regular basis.

In the absence of a formal accounting system, a financial spreadsheet could be used to accumulate hours, work in progress, invoices, travel and material or subcontractor costs, and other expenses. Rates could then be applied to determine actual costs on a monthly basis, followed by year-end reconciliation to recognize adjustments in applied rates.
### Guidelines:

<table>
<thead>
<tr>
<th>Primary</th>
<th>16</th>
<th>Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary</td>
<td>1, 2, 3, 5, 17, 18, 21, 22, 27, 30</td>
<td></td>
</tr>
</tbody>
</table>

### Benefits to Project Management

The establishment of a valid comparison of planned costs for completed subcontractor work with the actual costs for that same work provides the basis for realistic evaluation of cost deviations and ultimately facilitates EAC projections for comparison to the subcontractor’s EAC.

### Typical Products of Implementation

- Reconciliation of subcontract reported actual costs to subcontractor payments
- Internal and external performance reports for subcontractor performance

### F. Providing Performance and Cost Variances for Project Analysis

Procedures established by the prime contractor for measuring the performance of the subcontractor must consider:

- The requirement to review the subcontractor’s performance report for accuracy and adequacy. This includes an independent analysis of the performance measurement information contained in the data formats of the report, an evaluation of the variance analysis information contained in the report.
- Where a performance report is not submitted, the prime must determine the subcontractor’s progress against the internally established baseline, calculate ACWP based on accounting system actuals and/or estimate the actuals, as appropriate.
- The requirement to ensure that variances for subcontract effort generated internally accurately reflect the subcontractor’s performance and evaluation of those variances.
- The capability to incorporate the subcontractor’s management information, including analysis of significant variances, into the information submitted to the customer.

During the time period between subcontract authority to proceed (ATP) and definitization, the prime contractor must make provisions to perform the above actions based on best available information.

### Scalability

Scaling could be accomplished by revising thresholds for small project subcontracts, also by establishing external and internal variances that are at different WBS levels and that are based on top cost and schedule drivers, as well as by generating and reporting on variances that are cumulative only (not current period), and finally by analyzing only the most important variances that are not driven by thresholds.

### Guidelines:

<table>
<thead>
<tr>
<th>Primary</th>
<th>23</th>
<th>Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance, and provide the reasons for the variances in the detail needed by program management.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary</td>
<td>1, 2, 3, 5, 6, 7, 9, 22, 26, 30</td>
<td></td>
</tr>
</tbody>
</table>

### Benefits to Project Management

The monthly analysis of deviations from plan for both major and minor subcontracts provides management at all levels the ability to rapidly and effectively evaluate subcontractor corrective actions and to provide needed assistance, if necessary, in order to accomplish the project objectives with an understanding of the project risk and the causes of the risk.
G. Determining and Implementing Appropriate Corrective Actions

Based on the analysis of the subcontractor’s data, the project subcontract management team/CAM can determine what types of actions are appropriate to assist the subcontractor in completing work requirements on cost and schedule. This could include providing technical assistance, expediting material to be delivered to the subcontractor, or other actions appropriate to the prime/subcontractor relationship.

Scalability

The identification of corrective action plans at the subcontract or intermediate level helps to limit the overall impact on project resources.

Guidelines:

<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>2, 5, 23, 25, 27, 29, 32</td>
</tr>
</tbody>
</table>

Benefits to Project Management

Early identification of subcontractor problems permits project management to react in a timely fashion and assign additional resources to effect the solution. The more timely and more accurate the data and its analysis are, the better the management decision-making will be.

Typical Products of Implementation

- Management action plans and review briefings
- Risk and opportunity management data and similar metrics
- Independent completion estimates

H. Evaluating and Updating Estimates of Project Costs for Subcontracts

The primary responsibility for generating subcontract estimates at completion lies with the subcontractor. Whatever the prime’s responsibility is for calculating and updating the project EAC, the subcontractor EACs must be completed in support of this requirement. Once completed, the project subcontract management team/control account manager’s must evaluate the accuracy and supportability of the estimate before it is incorporated into the project EAC and is submitted to both internal and external management.

Scalability

The subcontractor must create the subcontract EAC in accordance with their internal procedures. The project level analysis of the submitted EAC can be conducted at the subcontract level using technical knowledge of the subcontract progress and performance measurement metrics.

Guidelines:

<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>5, 8, 9, 10, 14, 16, 19, 21, 23, 24, 26, 28, 29, 30</td>
</tr>
</tbody>
</table>

Benefits to Project Management

To effectively manage the project, the ability to make accurate and timely forecasts of the final cost is required. Accurate and timely forecasts not only of in-house efforts but subcontracted work will ensure continuing visibility into resource needs and lead to project success for both the customer and the supplier/vendor. Accurate and timely estimates support the customer’s ability to provide sufficient funding to the project and enhance internal management’s visibility into critical resource requirements.
Typical Products of Implementation

- Basis of estimate
- Risk and opportunity management plans
- Operational metrics
- EV metrics
- Updated schedule and cost-at-completion forecasts

I. Adjusting for Changes in Subcontracted Requirements

There are a number of factors that can drive changes in the subcontractor scope of work needed to successfully complete a project. As the project progresses, design improvements, advances in technology, price changes, etc. can cause the original subcontract scope to require updating. As with the original planning of subcontractor budgets, updates must be incorporated into the project plan (PMB) in a timely and efficient manner.

Scalability

There is little in the way of scalability here. Whenever the subcontract value is changed through negotiations, it is the budget that must be established for that subcontract. Tracking the subcontractor profits/fees in separate WPs would facilitate the analysis of subcontractor performance by allowing the managers to focus on cost performance.

Guidelines:

| Primary: 28 | Incorporate authorized changes in a timely manner, recording the effects of such changes in the 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. |
| Secondary: | 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 27 |
| Primary: 29 | Reconcile current budgets to prior budgets in terms of changes to the authorized work and internal replanning in the detail needed by management for effective control. |
| Secondary: | 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 25, 26, 27, 32 |

Benefits to Project Management

The timely incorporation of both externally and internally driven changes to the project plan ensures that performance measurement information provided to management and the customer will continue to be accurate and reflective of actual project progress and supportive of management decision-making.

Typical Products of Implementation

- Subcontract change documentation
- Change control logs
- CA / WP / PP plans
- Master, intermediate, and detail level schedules
- SOW, WBS, and WBS Dictionary
Process 9: Managing Indirect Budgets and Costs

This process applies to establishing, implementing, controlling and evaluating indirect budgets and indirect costs that are incurred and allocated to the individual projects. Since indirect costs are not usually project specific, there should be some method for assigning the appropriate values for indirect budgets and indirect actuals to all affected projects.

Indirect budgets and indirect costs must be managed and controlled. The contractor must assign responsibility for all aspects of the indirect system by designating the organizations and/or individuals with responsibility for: (1) indirect budget development and assignment of resources, (2) indirect performance and control, (3) analysis of indirect variances (to-date and at-completion), (4) indirect budget revisions and, (5) development of indirect rate forecasts.

A. Identifying Functional Responsibility for Indirect Management

The contractor must establish an indirect budgeting process which includes the formal assignment of duties and limits of responsibility, a description of the indirect system, and policies and procedures applicable to the establishment and control of indirect costs. Assignment and control of the indirect resources must be clearly defined and should be commensurate with the authority to approve or to avoid the expenditure of resources.

Scalability

Regardless of project size, the manager(s) assigned responsibility and authority for controlling indirect costs should be clearly identified. The process for managing indirect costs, including responsibility, is typically documented in the organization’s accounting procedures.

For small projects, responsibility for controlling overhead costs can be assigned to a single person, in many cases within the office of the Chief Financial Officer.

Guidelines:

| Primary: 4 | Identify the organization or function responsible for controlling overhead (indirect costs). |
| Secondary: | 13, 19, 24 |

Benefits to Project Management

Visibility into direct and indirect costs is essential for successful management of a project. Therefore, it is important to have a documented process and an organization established specifically to manage and control indirect costs.

Typical Products of Implementation

- CAS disclosure statement (if applicable)
- Organizational chart
- Cost accounting activities in accordance with applicable regulatory requirements
- DCAA audits, if applicable

GAO Best Practices

*GAO Schedule Assessment Guide*, Best Practice #3: Activities must be resource-loaded with labor, material, and overhead. Also Guideline #13: Establish overhead budgets for each significant organizational component of the company for expenses which will become indirect costs. Reflect in the project budgets, at the appropriate level, the amounts in overhead pools that are planned to be allocated to the project as indirect costs.
**B. Ensuring Proper Allocation of Indirect Budgets to the Direct PMB**

The PMB should include indirect budgets. Realistic time-phased budgets and forecasts for indirect costs must be established by organization. The contractor should apply the most appropriate indirect rates to project direct budgets so that a valid PMB containing both direct and indirect budgets can be established. Indirect budgets should be reviewed at least annually or when major changes are identified in factors affecting indirect costs.

### Scalability

A small project’s indirect budget should be established in accordance with the project’s direct budget, using an allocation method consistent with the manner in which actual indirect costs will subsequently be applied to the project.

### Guidelines:

<table>
<thead>
<tr>
<th>Primary: 13</th>
<th>Establish overhead budgets for each significant organizational component for expenses which will become indirect costs. Reflect in the program budgets, at the appropriate level, the amounts in overhead pools that are planned to be allocated to the program as indirect costs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary:</td>
<td>4, 8, 9, 10, 12, 14, 19, 24, 28, 29, 32</td>
</tr>
</tbody>
</table>

### Benefits to Project Management

The overall value of establishing indirect budgets lies in the ability of the supplier management to manage cost elements that cannot be directly assigned to individual cost objects (projects). By comparing actual indirect expenses to established indirect budgets, the supplier can determine if the absorption of indirect expense based on existing documented allocation schemes is on track or if allocation rates will need to be adjusted. The accurate assignment of indirect expenses, therefore, ensures that each project will only receive its fair share of indirect costs.

Indirect budgets play an important role in budgetary control and management of any project. Indirect costs can account for a major portion of the cost of any project. Indirect budgets must be applied, in some circumstances, to be compliant with CAS.

### Typical Products of Implementation

- Documented process for managing indirect costs (e.g., Disclosure Statement)
- Indirect cost policies and procedures
- Chart of account
- Indirect budget and performance reports

### GAO Best Practices

*GAO Cost Estimating and Assessment Guide*, Chapter 18 - The PMB includes all budgets for resources associated with completing the program, including direct and indirect labor costs, material costs, and ODCs associated with the authorized work. All WBS cost estimates should be checked to verify that calculations are accurate and account for all costs, including indirect costs.

**C. Providing Appropriate Allocation of Indirect Costs to Projects**

Overhead costs represent expenses which benefit more than a single contract. The accounting process should record all allocable indirect costs consistent with the provisions of the contractor's CAS Disclosure Statement or documented accounting procedures. The contractor's procedures and/or EVMS description should specify the level at which indirect cost information will be allocated to individual contracts.

### Scalability

If the cost collection system of a small project does not segregate direct and indirect costs, the customer and the supplier/vendors may agree in advance to fixed indirect rates for the duration of the project.

In the absence of a formal accounting system, a financial spreadsheet could be used to budget, then collect or generate all indirect costs on a monthly basis, followed by year-end reconciliation to recognize adjustments in applied overheads.
### Guidelines:

| Primary: 19 | Record all indirect costs which will be allocated to the program consistent with the overhead budgets. |
| Secondary: 2, 4, 13, 24, 26, 27, 30 |

### Benefits to Project Management

**Visibility into direct and indirect costs is essential for successful management of a project.** Therefore, it is important to have a documented process and organizations specifically assigned to manage and control indirect costs. Indirect costs are for common activities that cannot be identified specifically with a particular project or activity and should typically be budgeted and controlled separately at the function or organization manager level.

### Typical Products of Implementation

- Cost collection account structure
- WBS/cost collection mapping
- WBS (roll-up scheme)
- CAS disclosure statement, if applicable

### GAO Best Practices

*GAO Cost Estimating and Assessment Guide, Chapter 2* - In response to the 2002 President’s Management Agenda, the OMB Capital Programming Guide requires agencies to develop a baseline assessment for each major project it plans to acquire. As part of this baseline, a full accounting of LCCEs, including all direct and indirect costs for planning, procurement, operations and maintenance, and disposal, is expected.

*GAO Cost Estimating and Assessment Guide, Chapter 15* - Validating that a cost estimate is accurate requires thoroughly understanding and investigating how the cost model was constructed. For example, all WBS cost estimates should be checked to verify that calculations are accurate and account for all costs, including indirect costs.

### D. Supplying Analysis of Indirect Performance to Projects

Indirect cost performance against budget must be analyzed at the organizational level responsible for indirect cost control. Significant indirect CVs resulting from differences between planned and actual rates should be identified, documented and reported to the appropriate level of management. The causes of these variances must be identified and possible corrective actions considered. Corrective actions should be implemented promptly, which increases the likelihood that budgetary objectives will be met. The results of this analysis are supplied to the affected projects for their use in (a) reporting to their customer and (b) updating the EAC for projected indirect cost performance.

### Scalability

When the cost collection system of a small project segregates direct and indirect costs, indirect cost analyses should be conducted and reported in a consistent manner. In the absence of a formal accounting system, a financial spreadsheet could be used to budget, then collect or generate all indirect costs on a monthly basis, thus allowing for generation of variance analyses.

When direct and indirect costs are not segregated on small projects, analyses should be performed in accordance with cost allocation methodologies established at the outset of the project.

| Guidelines: |
| Primary: 24 | Identify budgeted and applied (or actual) indirect costs at the level and frequency needed by management for effective control, along with the reasons for any significant variances. |
| Secondary: 4, 13, 19, 27, 30 |

### Benefits to Project Management

The Supplier’s cost accumulation system should segregate direct and indirect cost, thus allowing for ongoing indirect cost analysis, which would provide visibility into potential indirect cost overruns. Additionally,
this analysis would provide the opportunity to develop and implement management corrective action plans in order to meet project cost and schedule objectives.

<table>
<thead>
<tr>
<th>Typical Products of Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Indirect CV analyses</td>
</tr>
<tr>
<td>• Indirect cost management action plans</td>
</tr>
<tr>
<td>• Indirect cost updated schedule and cost forecasts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GAO Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not specifically called out in the GAO assessment guides.</td>
</tr>
</tbody>
</table>