

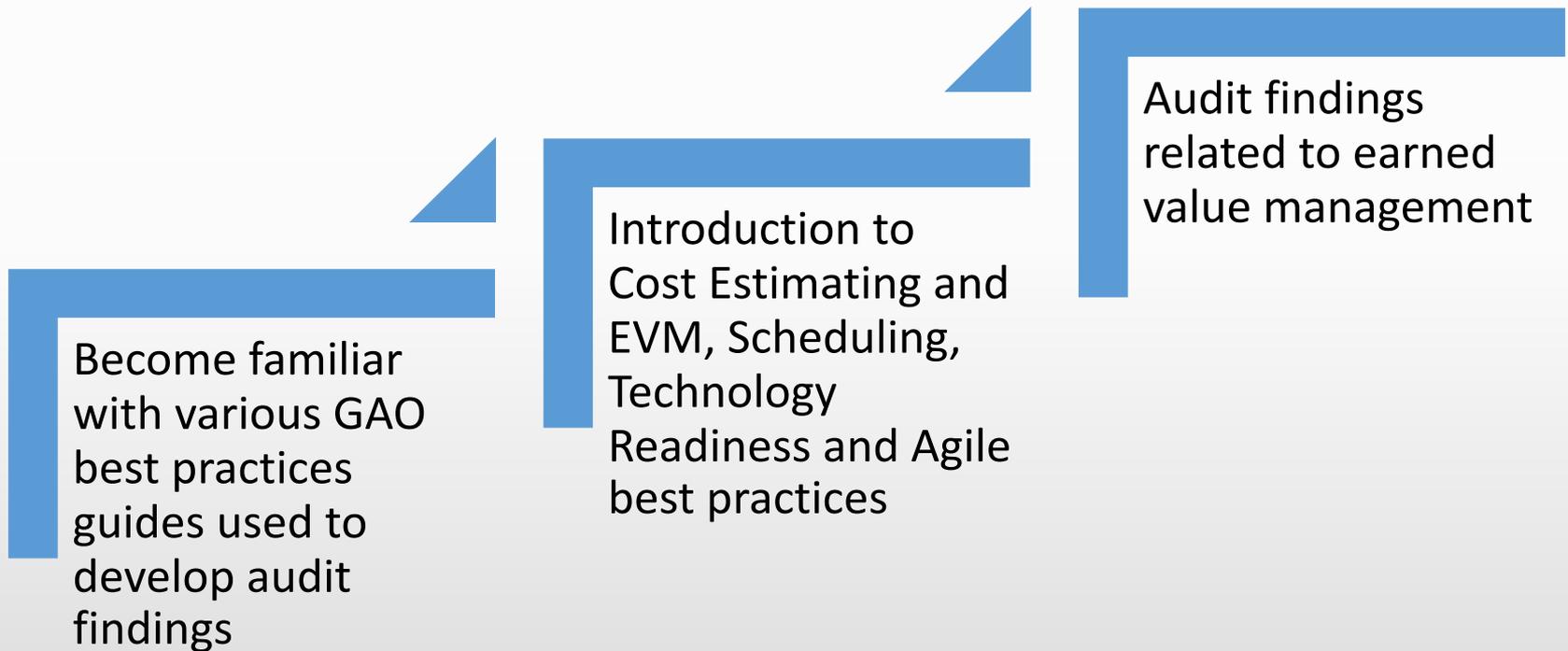


2017 EVM Practitioners' Forum

GAO Best Practices Guides

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Learning Objectives



Key Takeaways

- Best Practices for Cost Estimating, Scheduling, EVM, Technology Readiness, and Agile Methods
- Invitation to Participate in GAO Best Practices Expert Groups

The Role of GAO in Government

Known as the investigative arm of Congress, GAO exists to support Congress in meeting its constitutional responsibilities.

To that end, GAO works to

- Help improve the performance of federal government
- Ensure government agencies and programs are accountable to the American people
- Examine the use of public funds, and
- Evaluate federal programs by providing analyses and recommendations to help Congress make informed oversight and funding decisions

Why GAO Best Practice Guides are Important

- Legislators, government officials, and the public want to know
 - Whether government programs are achieving their goals
 - What these programs are expected to cost and when they will be finished
- Developing reliable program cost and schedule estimates are critical to
 - Effectively using public funds
 - Meeting OMB's capital programming process
 - Avoiding cost overruns, missed deadlines, and performance shortfalls

GAO Best Practice Guides Develop Audit Findings

- Purpose of the Guides are to
 - Address best practices for ensuring credible program cost and schedule estimates for both government and industry
 - Provide a detailed link between cost estimating, scheduling, and EVM
 - OMB has endorsed EVM for measuring cost, schedule, and technical performance
 - Guide demonstrates how realistic cost and schedule estimates are necessary for setting achievable program baselines and managing risk
- We developed the GAO Cost and Schedule Guides to
 - Establish consistent best practices that can be used across the federal government
 - Provide auditors with a standardized approach for analyzing program costs, earned value management (EVM) data, and schedules

Development of GAO Best Practice Guides

- GAO seeks input from a wide range of experts, starting with planning and design through report development.
- Guides are developed through an iterative, consultative process which involves a committee of experts in the related domain(s).
 - Members are from government agencies, private companies, independent consultant groups, trade industry groups, and academia.
- Expert meetings are open to anyone with the requisite experience and interest in the topic.
 - Meeting minutes are extensively documented and archived after review by the GAO team and all participants.

GAO's Published Best Practices Guides

- 2009 Cost Assessment Guide
 - Update on-going
- 2016 Schedule Assessment Guide
- 2016 Technology Readiness Assessment Guide
 - In exposure draft period till June 30th 2017
- Software Agile Guide – under development

Cost Guide Update

- GAO Cost Guide is now 8 years old (published in 2009) and is in the process of being updated
 - March 2016 : Formal announcement to experts that the update is underway
 - June – July 2016: Collect comments on current guide
 - August 2016: Start Incorporating comments and updating draft guide
 - March 2018: Publish updated cost guide

Cost Guide Update

- Improve definitions of criteria and leading practices based on
 - Lessons learned over 8 years of application
 - Latest industry and government practices
- Update references to existing laws and federal guidance
- Update integration with Schedule Guide, Tech Readiness Guide, Software Agile Guide, Standards for Internal Control
- Modernize graphics

The 2009 Cost Assessment Guide's Layout

- The Guide consists of 20 chapters with supporting appendices
 - Chapters 1-17 address the importance of developing credible cost estimates
 - They discuss in detail a 12 step cost estimating process for developing high quality cost estimates
 - Chapters 18-20 address managing program costs once a contract has been awarded and discuss
 - EVM
 - Risk management
 - Other program management best practices
- The Guide also provides case studies of prior GAO audits to showcase typical pitfalls that can occur in the cost estimating process

The Updated Cost Assessment Guide's Layout

- The updated Guide will consist of 22 chapters with supporting appendices
- It will be broken into sections
 - Section 1: Introduction
 - Section 2: Overview
 - Section 3: 12 Steps for Creating a Cost Estimate
 - Section 4: Best Practice Criteria for Evaluating a Cost Estimate
 - Section 5: EVM
- The Guide will also reflect new case studies of prior GAO audits to showcase typical pitfalls that can occur in the cost estimating process

The Updated Cost Assessment Guide's Layout

- Chapters 1-3 provide an overview of cost estimating and explains how the 12 steps relate to the best practice criteria.
- Chapters 4-15 describe in detail the 12 step cost estimating process for developing high quality cost estimates.
- Chapters 16-19 address the importance of developing credible cost estimates and discuss the 4 best practice criteria.
- Chapters 20-22 address managing program costs once a contract has been awarded and discuss EVM

Characteristics of Reliable Cost Estimates

Are all costs included?



Comprehensive

- Develop the estimating plan
- Determine the estimating approach

Can the estimate be recreated?



Well Documented

- Define the program
- Identify ground rules and assumptions
- Obtain data
- Document the estimate
- Present estimate to management

Is the estimate unbiased?



Accurate

- Develop the point estimate using appropriate estimating techniques
- Rely on historical data
- Estimate most likely costs
- Update the estimate with actual costs

What is the uncertainty?



Credible

- Conduct sensitivity analysis
- Conduct risk and uncertainty analysis
- Perform cross checks on cost drivers
- Create an independent cost estimate

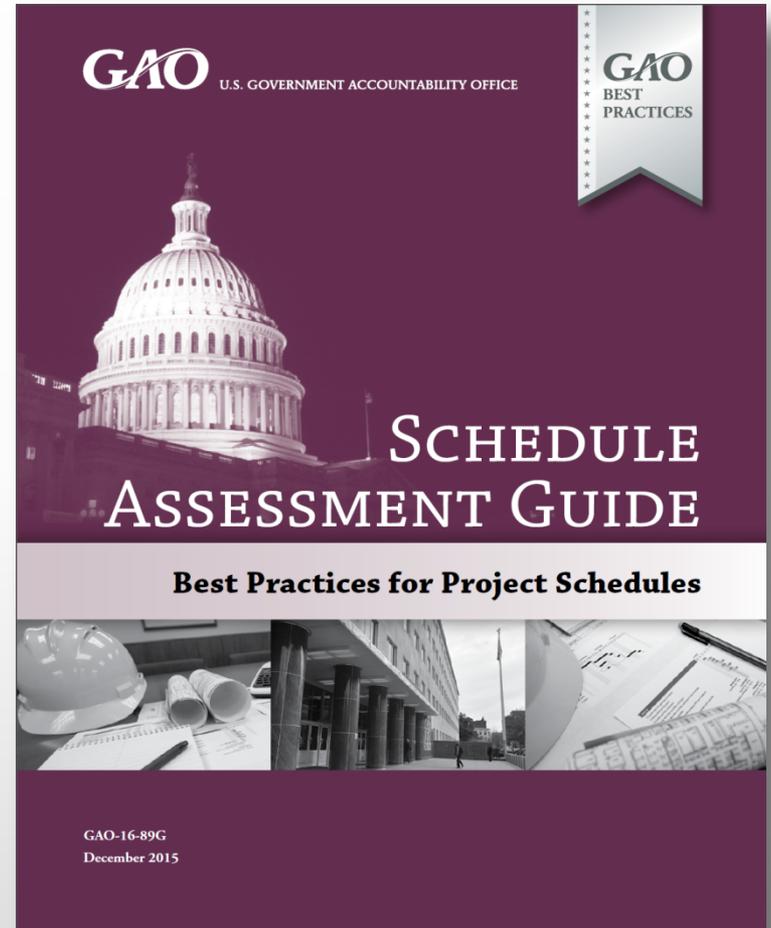
GAO's Schedule Assessment Guide

The GAO *Schedule Assessment Guide* develops the scheduling concepts introduced in the GAO *Cost Estimating and Assessment Guide*.

- Best practices for developing and maintaining high-quality schedules
- Contains explanatory text, illustrations, and detailed case studies
- Includes appendixes that list key questions, documentation, and technical guidance

Public exposure draft released 2012-2013 and over 1,000 comments received

The Final version of the GAO Schedule Guide can be downloaded for free at www.gao.gov/products/GAO-16-89G



Schedule Guide

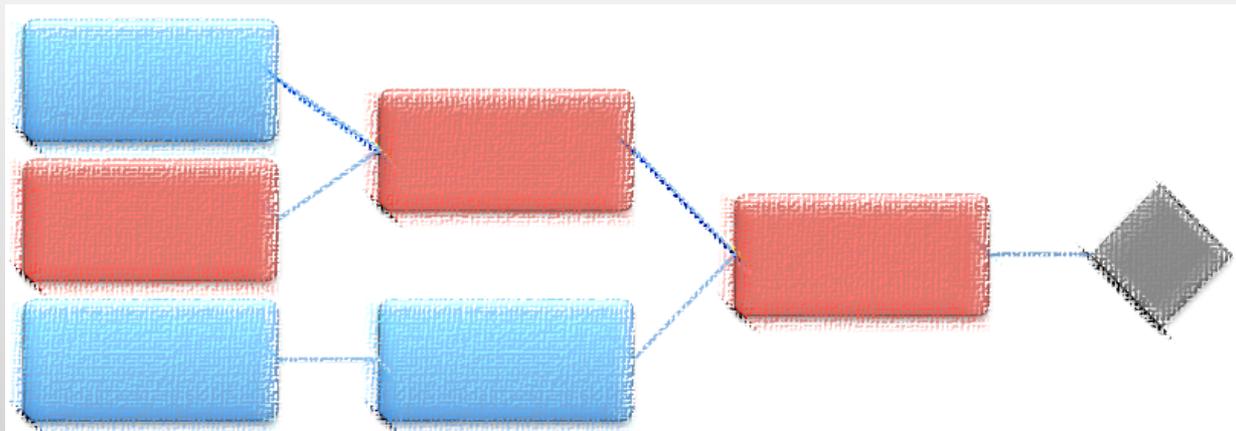
- Origin
 - Expands on the scheduling concepts introduced in the Cost Guide
 - Initially intended to be an appendix to a Cost Guide version 2, but became its own publication
- Purpose
 - Allow GAO auditors to assess the reliability of program plans and reported dates through an assessment of project schedules
 - Useful for agencies creating and maintaining project schedules

The Importance of Scheduling

The success of a program depends in part on having an integrated and reliable master schedule

A schedule is the roadmap for project execution:

- It defines when and how long work will occur and how each activity is related to the others
- It provides a time sequence for the duration of a program's activities
- It provides the means by which to gauge progress



Scheduling Best Practices

Our research has identified ten best practices associated with developing and maintaining a reliable schedule

1. Capturing all activities
2. Sequencing all activities
3. Assigning resources to all activities
4. Establishing the duration of all activities
5. Verifying that the schedule can be traced horizontally and vertically
6. Confirming that the critical path is valid
7. Ensuring reasonable total float
8. Conducting a schedule risk analysis
9. Updating the schedule using actual progress and logic
10. Maintaining a Baseline Schedule

Characteristics of a Reliable Schedule

Is all effort included?

Comprehensive

- Capture all activities
- Assign resources to all activities
- Establish durations for all activities

Is the network logical?

Well Constructed

- Sequence all activities
- Confirm the critical path
- Confirm reasonable float (slack)

What is the uncertainty?

Credible

- Confirm vertical and horizontal traceability
- Conduct a schedule risk analysis

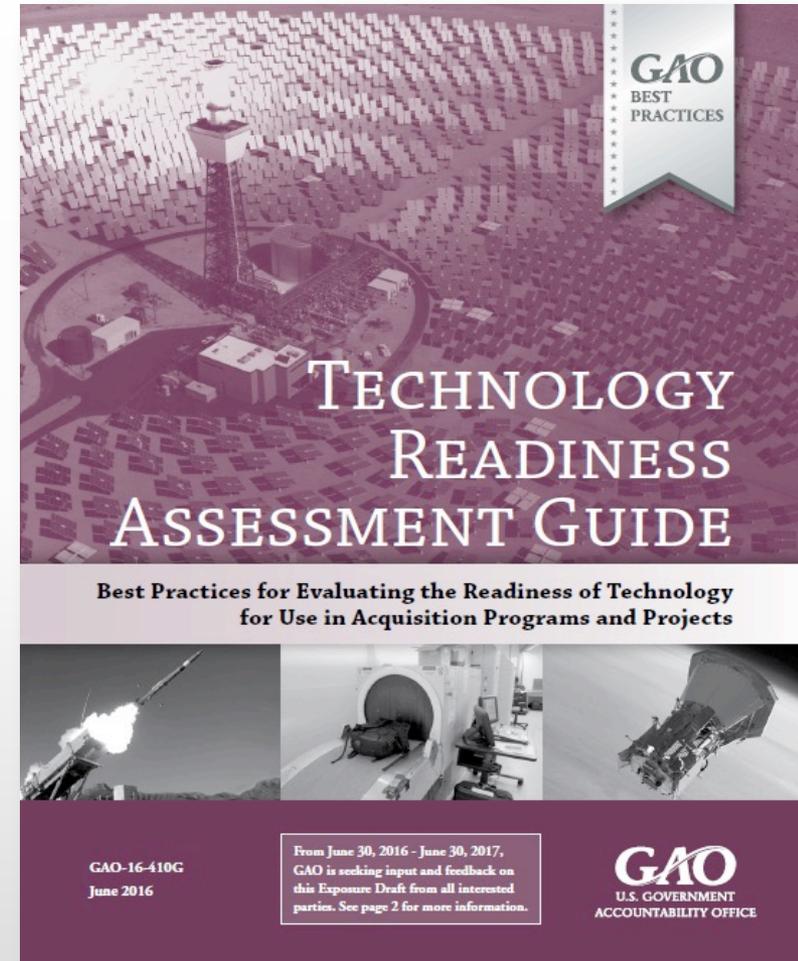
Is progress measured?

Controlled

- Update the schedule with progress
- Maintain a schedule baseline

Technology Readiness Assessment Guide

- Drafted in 2015-2016
- Release of public exposure draft in June 2016 for one year
- Outlines GAO's criteria for evaluating technological readiness assessments
- Contains 10 chapters with supporting appendixes
- Chapters 1 & 2 define TRAs and describe their importance and limitations
- Chapter 3 outlines a reliable process for conducting TRAs
- Chapters 4-10 address the associated best practices
- Provides case studies of prior GAO audits to show typical findings related to technology readiness



Technology Readiness Assessment Guide

- Fills criteria void on “performance” in the “cost-schedule-performance” trio of management elements of capital acquisition programs.
- Designed to bring understanding and practice of technology readiness assessments, invented decades ago by NASA and utilized extensively in DOD, but now available to other agencies without a large technical staff.
- Allows GAO auditors to assess the reliability of the identification and management of technologies critical to the success of a given capital acquisition programs.
- Useful for agencies to create or append existing policies and guidance on creating and maintaining technology readiness assessments, be they for ongoing, day-to-day project management or major milestone decision points.

Six Steps to Develop a High Quality TRA

1. Define Purpose

- Determine purpose, level of detail, scope, TRL definition
- Obtain pertinent information
- Align assessment strategy to SE management plan

2. Develop Strategy, Plan, and Assemble Team

- Develop schedule and events
- Determine specific team members and needed expertise
- Outline the approach
- Identify a plan for handling dissenting views

3. Select Critical Technologies

- ID purpose, system, and performance characteristics in a technology baseline document
- Use a Work Breakdown Structure that characterizes the system to select critical technologies
- Use key questions and environment to determine if a technology is critical

Six Steps to Develop a High Quality TRA

4. Evaluate Critical Technologies

- Determine TRL definitions and required evidence prior to assessment
- Determine acceptability of test articles and environments
- Determine if testing results are sufficient and acceptable
- Document all relevant information

5. Prepare and Submit the TRA Report

- Prepare an official report that documents actions from previous steps
- Obtain report comments and explain dissenting views

6. Use TRA Results and Develop a Technology Maturation Plan

- Use TRA results to make decisions about the program's development priorities
- Program management identifies TRA-related concerns and risks, including potential effects on cost and schedule estimates
- Develop a technology maturation plan to track progress

Software Agile Guide – In development

- **Purpose**: to identify and address leading practices and structural barriers to overcome when implementing Agile methodologies at the agency level and to discuss the relationship of those methodologies to common program control disciplines.
- GAO is relying on an Agile Expert Panel to review chapters and provide input in order to establish an exposure draft
 - To volunteer for the Agile Expert Panel contact Jennie Leotta (leottaj@gao.gov) or Mat Bader (baderm@gao.gov)
 - Exposure Draft Goal Date: late FY18
- The exposure draft will be released on the GAO website for comment from the general public

Software Agile Guide

- Tentative Outline:
 - Agile Background
 - Compliance and Past Work
 - Agile Adoption Best Practices
 - Team activities, Program Processes, Organizational Environment
 - Agile Implementation Challenges
 - Agile Metrics
 - Requirements Decomposition
 - Agile and the Federal Acquisition Process
 - Contracting and Budgeting
 - Agile and Program Management Factors
 - Cost estimating, Scheduling, Project Performance
 - Debunking Agile Myths

This list is tentative and not exhaustive; please contact us if there is something missing that you'd like to see!

EVM is an Important Management Tool

- EVM indicates how past performance may affect future performance
 - The data isolates cost and schedule variances by WBS elements allowing for:
 - An understanding of technical problems
 - Opportunities to reallocate effort to mitigate risk or address issues
- The two main purposes for implementing an EVM system are to:
 1. Encourage the use of effective internal cost and schedule management controls
 2. Allow the customer to rely on timely and accurate data for determining contract performance

The Thirteen Steps in the EVM Process

1. Define the scope of work using a WBS
2. Identify who in the organization will perform the work
3. Schedule the work
4. Estimate the labor and material required and authorize budgets including MR
5. Determine objective measure of earned value
6. Develop the performance measurement baseline
7. Execute the work plan and record all costs
8. Analyze EVM performance data and record variances from PMB plan
9. Forecast EACs using EVM
10. Conduct an integrated cost-schedule risk analysis
11. Compare EACs from EVM in Step 9 with EAC from risk analysis in Step 10
12. Take management action to mitigate risks
13. Update the PMB as changes occur

Examine EVM Data for Reliability

For EVM data to be of any value it must be reliable

- The data should be generated by a system that has been deemed compliant with the ANSI 32 guidelines
- The performance measurement baseline should be validated by an Integrated Baseline Review in a timely manner
- EVM surveillance by independent and qualified staff should be continually monitoring the implementation of the system
- The contractor's financial accounting system has received an unqualified opinion
- Data anomalies like negative values for BCWS, BCWP, and ACWP or missing performance data (e.g., BCWP with no BCWS or ACWP) should be rare
 - If these anomalies occur they should be fully explained in the variance analysis portion of the report

Characteristics of a Reliable EVM System

Is the EVM system certified and comprehensive?



Comprehensive

- Certified EVM system
- IBR conducted
- Reliable schedule
- EVM surveillance

Is the EVM data reliable?



Accurate

- No data anomalies
- Consistent data
- Realistic EAC

Is Management using the EVM data?



Informative

- Regular reviews conducted
- Corrective action plans
- Updated PMB

EVM Findings from Recent Audits

- Many civil agency programs do not use product-oriented Work Breakdown Structures
- Schedules underpinning the EVM system are not meeting many best practices
- IBRs are not occurring in a timely manner and are often not robust reviews
- Programs often rebaseline due to overly optimistic cost and schedule estimates
- EVM data anomalies are widespread and recurring
 - Government program offices are not rejecting the EVM reports
- Format 5 variance analyses are too vague to be useful and do not address corrective actions
- EVM data are not being used to proactively manage the program
- Program managers do not integrate EVM data with the risk management process
- Civil agencies do not have access to independent surveillance functions
- Government and contractor staff need additional training on EVM
- Contractors are not properly implementing their EVM systems