Department of Commerce
Cost Estimating Guide

Version 1.1

U.S. Department of Commerce
Office of Acquisition Management (OAM)

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Creation of the Department of Commerce Cost Estimating Guide ("The Guide") began in August 2022. The Department of Commerce (DOC) Cost Working Group, which includes members of the Department and Bureau level cost estimating community, was formed in September 2022 to collaborate on the guide and to foster cost estimating partnerships across the DOC. The guide will be revisited and expanded on an annual basis. The following table lists the changes to the guide following its initial posting.

Revision Number	Date	Log of Changes Made and Description of Reason	Approved By
0.1	01 Nov 22	Initial draft sent to Cost Working Group	Z. Nunziata, OAM
1.0	01 Dec 22	Incorporated Cost Working Group feedback	Z. Nunziata, OAM
1.1	29 Sep 23	Added Baseline Execution Reporting topic	Z. Nunziata, OAM

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Introduction

This document provides guidance for cost estimates and assessments in the Department of Commerce (DOC). A cost estimate is the summation of individual cost elements, using established methods and valid data, to estimate the future costs of an item, product, program, procurement, or task, based on what is known today.[1] Cost estimating is defined as the process of collecting and analyzing historical data and applying quantitative models, techniques, tools, and databases to predict the future cost of an item, product, program, procurement, or task.[2] The Department of Commerce Cost Estimating Guide ("the Guide") is divided into three sections. The first section of the guide clarifies the definitions of the most common types of cost estimates within the Department of Commerce. The second section details the processes associated with the cost estimates. The third section describes practical applications of how cost estimates contribute to the Department of Commerce Acquisition and Budget processes.

A realistic understanding of costs is vital throughout the acquisition process. Underestimated costs lead to budget crunches, cancelled programs, and congressional mistrust of the agency. Overestimated costs may prevent funding of important initiatives. Misrepresented cost-risks lead to poor decisions about which alternative programs the agency should pursue.

Over the years, there have been many highly publicized and criticized failures to adequately estimate costs at agencies across the federal government. The difficulties of accurate cost estimation have been documented by the Government Accountability Office (GAO) for decades, beginning in 1972 with their report titled Theory and Practice of Cost Estimating for Major Acquisitions.

In 2010, Secretary Locke directed a comprehensive review of the acquisition process across Commerce. The end result of this review was the establishment of a family of Acquisition Improvement Projects to address: definition of roles and responsibilities, requirements, risk assessment, acquisition workforce development, sourcing, and many other aspects of acquisition. The Acquisition Improvement Study of 2010 noted need for improvement in cost estimation.

On November 6, 2012, the Department of Commerce issued its acquisition project management policy. On June 24, 2014, the DOC issued its Policy on Commerce Cost Estimation and Independent Cost Estimates (ICEs) for High Priority Programs and Projects. Department Administrative Order (DAO) 208-16 puts both policy memos into one directive, issued May 26, 2015. The Department of Commerce Cost Estimating Guide provides more detailed direction on cost estimation. It includes best practice guidance from the GAO, OMB, and DoD. The purpose of the guide is to not to replace DAO 208-16 but rather to provide more structure on the cost estimating requirements within the acquisition project management framework and to elaborate on DOC-specific cost estimating best practices.

[1] https://www.gao.gov/assets/gao-20-195g.pdf
[2] https://www.iceaa.ca/web/default/files/users/9/ICEAA-Juana%20Collymore.pdf

Section 1. Cost Estimate Definitions

Standard Key Terms

Cost Estimate: The summation of individual cost elements, using established methods and valid data, to estimate the future costs of an item, product, program, procurement, or task, based on what is known today.[3]

Cost Estimating: The process of collecting and analyzing historical data and applying quantitative models, techniques, tools, and databases to predict the future cost of an item, product, program, procurement, or task.

Cost Analysis Requirements Description (CARD): A description of the salient features of the acquisition program and of the system itself. A CARD defines an acquisition program and associated system to be costed. The CARD includes common description of the technical and programmatic features of the program that is used by the teams preparing the Program Office Estimate (POE) and Independent Cost Estimate (ICE).

Work Breakdown Structure (WBS): A decomposition of a project into smaller components. It defines and groups a project's discrete work elements in a way that helps organize and define the total work scope of the project. All acquisitions within the scope of the project should have an associated WBS. The WBS is used by the Program Manager (PM) and cost analysts to structure cost estimates and to track program performance on cost and schedule.

Life Cycle Cost Estimate (LCCE): A LCCE provides a structured accounting of all labor, material, and other efforts required to develop, produce, operate and maintain, and dispose of a program. The development of a life cycle cost estimate entails identifying and estimating all cost elements that pertain to the program from initial concept all the way through each phase in the program's duration. The program LCCE encompasses all past (or sunk), present, and future costs for every aspect of the program, regardless of funding source.[4] There are two types of LCCEs, the Program Office Estimate (POE) and Independent Cost Estimate (ICE).

Program Office Estimate (POE): A POE is the program or project office's LCCE based on the CARD and accounts for all estimated program / project costs, both government and procurement (IGCEs).[5]

[3] https://www.gao.gov/assets/gao-20-195g.pdf
[4] U.S. GAO, GAO Cost Estimating and Assessment Guide. Best Practices for Developing and Managing Program Costs, March 2020, page 17.
[5] Deputy Secretary of Commerce Memorandum, *Policy on Commerce Cost Estimation and Independent Cost Estimates for High-Priority Programs and Projects,* June 14, 2014

Independent Cost Estimate (ICE): An ICE, prepared by an organization independent of the acquisition's program/project chain of command, is based on the same detailed technical and procurement information used to make the baseline estimate-usually the program or project LCCE. ICEs are developed to support DOC milestone decisions for mission critical programs and projects. ICEs are used primarily to validate program or project LCCEs and are typically reconciled with them. Because the team performing the ICE is independent (preferably prepared by federal employees), it provides an unbiased test of whether the POE is reasonable. It is also used to identify risks related to budget shortfalls or excesses.[6]

Independent Cost Assessment (ICA): A non-advocate, outside-the-chain-of-command evaluation of a program life-cycle cost estimate that examines its completeness, accuracy, credibility, and documentation.

Independent Government Cost Estimate (IGCE): An IGCE is conducted for multiple purposes. First, it helps the government to determine budgets for notional contracting actions. Secondly, it serves as a comparison point to check the reasonableness and realism of a contractor's cost proposal. Finally, its details support the contracting officer through the negotiation and award process. IGCEs are helpful to programs in assessing the feasibility of individual emergent tasks to determine if the associated costs are realistic and reasonable.[7]

'Big A': The entire set of decisions and processes that must occur in order to properly synchronize requirements, resources, and procurement to deliver required capabilities.[8]

'Little a': The procurement or contracting side of an acquisition.[9]

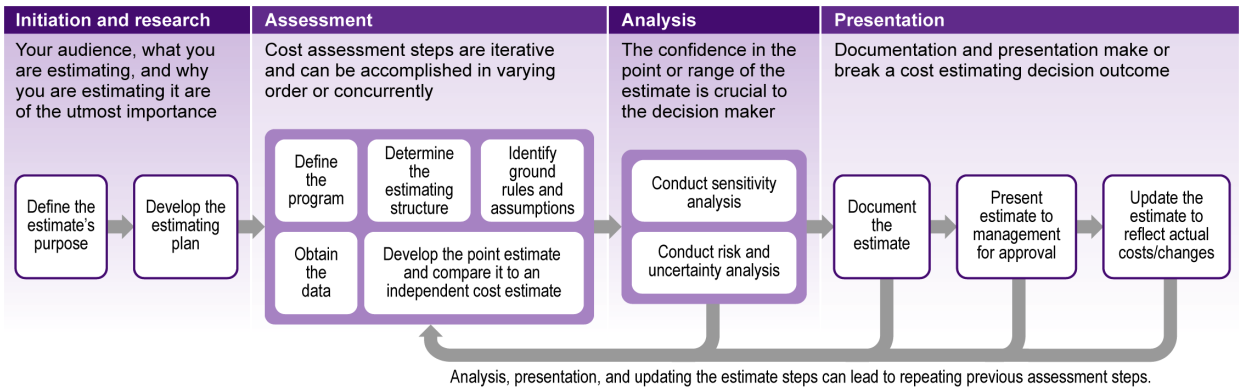
[6] Deputy Secretary of Commerce Memorandum, Policy on Commerce Cost Estimation and Independent Cost Estimates for High-Priority Programs and Projects, June 14, 2014
[7] U.S. GAO, GAO Cost Estimating and Assessment Guide. Best Practices for Developing and Managing Program Costs, March 2020, page 21.
[8] Deputy Secretary of Commerce, DOC Scalable Acquisition Project Management Guidebook Version 1.2, August 31, 2015.
[9] Deputy Secretary of Commerce, DOC Scalable Acquisition Project Management Guidebook Version 1.2, August 31, 2015.

Section 2. Cost Estimate Processes

Cost estimates are used throughout the management life cycle of programs and projects including the conceptual phase, project definition phase, project development phase, project execution phase, Operations and Support (O&S) phase, and Disposal phase. As the program or project progresses and matures, so do the cost estimates. Cost estimates are used in numerous ways throughout the life of the program or project including program selection, Analysis of Alternatives (AoAs), establishing a budget for a program, source selection, support to project managers, and performance tracking.

A reliable cost estimate is one that is credible, understandable, transparent, and complete. GAO provides lists of characteristics of a credible cost estimate. Moreover, to help ensure cost estimates are credible, understandable, transparent, and complete, the GAO Cost Estimating and Assessment Guide provides generally accepted Best Practices checklists covering all aspects of the project life cycle applicable across government and industry.

Figure 1 shows the GAO cost estimating process and the related 12 cost estimating steps. Within the guide, all steps from GAO's cost estimating process are included and interpreted for applicability within the Department of Commerce. The GAO Guidebook goes into all these steps extensively; for in depth information for each step, reference the GAO guidebook.[10]



Source: GAO. | GAO-20-195G

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Figure 1: The Cost Estimating Process

Types of Cost Estimates

One goal of the guide is to promote consistent use of terminology and eliminate confusion between the different types of cost estimates. For example, while the ICE and IGCE are different products, underpinned by different sets of policy, the terms are often inappropriately

[10] https://www.gao.gov/assets/gao-20-195g.pdf
[11] *GAO Cost Estimating and Assessment Guide*, March 2020, Figure 5: The Cost Estimating Process, page 34.

used interchangeably. While life cycle cost estimates are required based on the Scalable Acquisition Framework and general program management best practices, IGCEs are required by the Federal Acquisition Regulation (FAR). Regulatory requirements for an IGCE are spread out over several policy documents such as the Commerce Acquisition Manual (CAM) 1307.1[12] and for construction in FAR 36.203.[13]

An IGCE is a cost estimate that is specific to a procurement and includes the government's estimate of all costs associated with the given procurement. On the other hand, POEs and ICEs are life cycle cost estimates that account for all program or project costs, including both government and procurement IGCEs. A mission critical program could include multiple procurements, so an ICE or POE could encompass multiple IGCEs.

A quick reference for the differences between Lifecycle Cost Estimates versus IGCEs is shown below.

Life Cycle Cost Estimates

Program Office Estimate:

- Cost estimate produced by the program or project office based on the Cost Analysis Requirements Description (CARD)
- Accounts for all estimated program / project costs, both government and procurement IGCEs.

Independent Cost Estimate (ICE):

- Cost estimate prepared by an organization independent of the program / project's chain of command, based on the same detailed technical and procurements information used to make the baseline estimate.
- Provides an unbiased test of whether the POE is reasonable and is used to identify risk related to budget shortfalls and excesses.

Contract Related, Not a Life Cycle Cost Estimate

Independent Government Cost Estimate (IGCE)

- Cost estimate conducted to check that offeror's proposed cost estimate is realistic for the work to be performed; reflect a clear understanding of the requirements; and are consistent with the unique methods of performance and materials described in the offeror's technical proposal and to make sure that the offered prices are within the budget range for a particular program.
- Submitted by Program Manager as part of a request for contract funding. It documents the government's assessment of the program's most probable cost and ensures that sufficient funds are available to execute it.

Cost Estimating Processes

The following section describes processes for the most common types of cost estimates within the Department of Commerce. The listed activities are generally associated with producing a cost estimate. The order provided is notional. There is no strict prescription for estimating costs.

[12] https://www.commerce.gov/sites/default/files/2020-10/CAM%201307%201%20-%20Acq%20Planning%20%28RevAug2020%29.pdf
[13] https://www.acq.osd.mil/asda/dpc/cp/policy/docs/sa/DoD_IGCE_for_SA_Handbook.pdf, page 7.

Cost analysis is both a science and an art, and in practice, some steps may be revisited two or even three times. However, there is a general framework for estimating cost.

Program Office Estimate (POE)

The process steps for the POE are pictured in Figure 2 and are further discussed below. Life cycle cost estimates (POEs and ICEs) are iterative and living documents. For simplicity's sake, the guide has combined the 12 GAO steps into higher level buckets.

The arrow that connects the various steps signifies that life cycle cost estimates are living documents that are continually updated as the program progresses, and more information is known. For example, a program may initially establish their POE before major program contracts are awarded. When contracts are awarded, contract specific information would be used to update the POE.

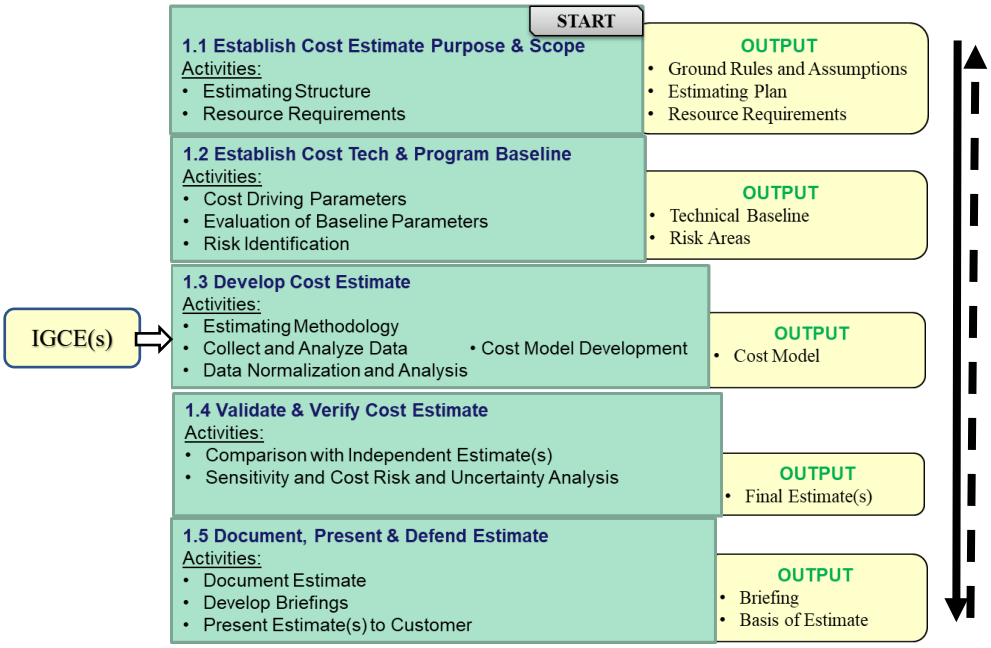

Figure 2. Program Office Estimate (POE) Process Flow

1.1 Establish Cost Estimate Purpose and Scope

The first thing a cost analyst must do is establish the scale and substance of the estimate. A life cycle cost estimate, often referred to as "cradle to grave," includes all costs that the government will incur because of the decision to do this program or project. The cost estimate scope is not limited to any particular contract or agency.

During this cost estimating phase, program or project costs are separated into cost elements in the form of a product-oriented Work Breakdown Structure (WBS). The WBS is used by managers and contractors to plan, implement, and manage the program or project including

recording and reporting contractor costs and tracking progress during implementation. The WBS is used by cost analysts as a template of the cost model and is used to collect and interpret historical cost data and track cost and schedule performance. The same WBS must be used by both the cost analyst and the project office.

1.2 Establish Cost, Technical, and Program Baseline

A well-defined and documented program is the basis of a sound cost estimate. At a minimum, the Cost Analysis Requirements Description (CARD) or technical baseline, defines an acquisition program and associated systems to be costed. The CARD must include a system description, including technical and physical descriptions of all acquisitions within the scope of the project, and the WBS. System quality factors and operations concept include the acquisition plan or strategy, the system milestone schedule, and system reliability, maintainability, and availability. The CARD must include cost driving parameters such as weight, power, simple function points, epics, and features,.

The CARD during the conceptual phase will lack detail, but it should identify the entire scope of the project. The CARD during the project definition phase must be stated in terms of physical attributes and functional performance of the system. The CARD during the project development and project execution phase will be much more specific than it was during the project definition phase, reflecting results of systems engineering studies and trade studies.

1.3 Develop Cost Estimate

There are a variety of types of cost analysis as well as a variety of methods (e.g., parametric, analogy, bottom-up, and extrapolation from early actual costs) for performing cost estimates. It is important to remember that type of cost analysis does not imply method. You may use various methodologies to do any given type of estimate. The cost analyst should choose a method based on the available time, data, and required precision.

Because experience is our guide to the future, most of the challenges of cost estimating have to do with finding and using relevant past data and experience. The main challenges of cost estimating include identifying solid analogies in the historical record to use in costing the system at hand, understanding the activities for which we are estimating costs, obtaining useful and accurate historical data, specifying the appropriate level of detail for the estimate, and gauging the uncertainty of the estimate.

One of the most important decisions an analyst makes is what the appropriate level of detail is for a given purpose. How to aggregate or decompose elements is a trade between factors of important, correlation, available time, and available data.

Up to a point, better data means better results in your cost estimate. It is important to remember though, that perfect data (i.e., data that give you exactly what you need to do an ideal cost estimate) does not exist. The best outcome is finding data that meets your needs, gives you insight, lets you answer the key questions, and lets you understand the limitations of the data

you're using. The most efficient and effective approach for leveraging actual cost data is an authoritative data collection and distribution system that makes historical data available electronically to users.

1.4 Validate and Verify Cost Estimate

There are several components to validating and verifying the cost estimate including risk analysis, comparison to the ICE, and sensitivity analysis.

We can't predict the future perfectly. In a large project with many interrelated activities, you can be certain that something unexpected will happen. Meteorologists, economists, physicians, oil geologists, and other experts are often wrong in their predictions. This doesn't keep them from doing their jobs in useful ways, but it does mean that they must take uncertainty into account. The same is true of cost analysts. Risk is the downside of uncertainty. Sometimes, unexpected things are good: winning the lottery or finding that the price of gasoline has decreased. In practice, though, most unexpected things are negative. Prices go up. Labor shortages lead to delays. Bad weather delays or disrupts an activity. These are risks – hazards that may or may not happen. We frequently do not know how likely a hazard is to occur or the consequences of the hazards but in many situations, we can collect data to provide an estimate.

Qualitative risk measures of risk are common in practice. The Department of Commerce utilizes the Risk Matrix to describe and display qualitative risk. Each identified hazard is classified separately according to its probability of occurrence and its potential consequence if it occurs.

Since decision makers want cost analysts to tell them what projects will cost, and the estimate won't be exactly right, decision makers really need to know the chance of making bad decisions. This leads to questions such as how precise is this estimate and what is the chance of completing the project with this much money? Risk analysis is the process of quantifying and displaying the uncertainty associated with point estimates of cost. Risk analysis attempts to put a point estimate in context to make it more meaningful. The tools employed in risk analysis are necessarily statistical in nature. Risk analysis helps to focus attention on things that may go wrong and to quantify these possibilities. By doing so, it provides managers will essential information to manage those risks.

The purpose of risk analysis is to support decision-makers information needs by quantifying the likelihood that project budget goals will be met, allow meaningful conversations of competing alternatives that are not equally risky, and support efficient allocation of contingency.

The Department of Commerce Acquisition Framework adopts the independent cost estimating process as a test of reasonableness on the POE. A substantial difference between the POE and ICE signals the existence of a costing issue that needs to be investigated.

Sensitivity analysis is an assessment of the extent to which costs at various cost estimate levels react to changes in cost drivers. During sensitivity analysis, analysts toggle one input parameter

at a time then observe the change to the overall estimate. If a relatively small change to an input parameter drives a large change to the overall estimate, the input parameter is highly sensitive.

1.5 Document, Present, and Defend Estimate

Robust estimate documentation will be valuable not only to your customers but also to your organization in the future. Your organization needs to remember what was done, for future reference, revisions, and analysis. Within the estimate documentation, the estimators state assumptions, data sources, and methods used. Documentation of the estimate should be sufficiently complete and well organized to enable a cost estimation professional to assess and reconstruct the estimate without recourse to other sources.

The final cost estimate product includes a presentation of the estimate. When preparing the presentation, consider the perspective of your audience. Your estimate could have multiple target audiences. Different consumers will be looking for different things in your estimate. Typical members of the audience include decision makers, cost analysts, program advocates, foes, and competitors. It is sometimes important not only to inform your leaders, but also to consider how your findings might be interpreted by other groups.

Decision Makers are the primary audience for any cost estimate. Typically, they have asked for the cost estimate and know how they will use it. Make sure you answer their main questions, which are typically: How much will be spent to do this? What is the uncertainty? What data was used to generate the estimate? Give them their answers without wasting too much of their time. Convince them that your cost estimate is more reliable than others. Often, this involves showing your data in a way that makes your case more compelling.

Independent Government Cost Estimate (IGCE)

The IGCE is the Government's estimate of the resources and their projected costs that a contractor would incur in the performance of a contract. The IGCE is required prior to contract negotiations by the Federal Acquisition Regulations (FAR). The minimum required steps for all cost estimates, including an IGCE, is pictured in Figure 3. The scope and process to build the IGCE is more targeted and pared down compared to the life cycle cost estimate. With that said, the IGCE is an invaluable part of the acquisition process. The government is entitled to receive quality supplies and services at fair prices. The contracting officer relies on the IGCE to assist in the determination of the acquisition strategy and as the estimated cost for the proposed effort.

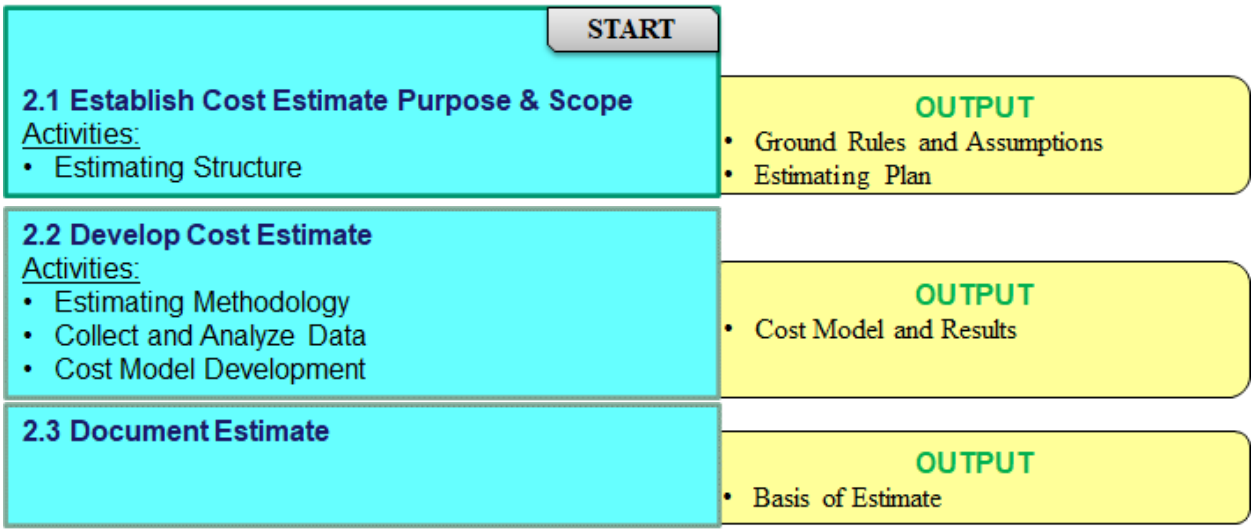

Figure 3. Minimum Steps for all Cost Estimates, including the Independent Government Cost Estimate (IGCE)

The IGCE process is more reflective of a snapshot in time rather than the iterative process used for the life cycle cost estimate. The IGCE will be updated if the contract requirements are updated driving Statement of Work (SOW) changes. So, while the IGCE may be updated, it is finalized when the procurement is finalized. The life cycle cost estimate on the other hand is continually updated for the life of the program, from the conceptual phase through Operations and Support (O&S) phase and Disposal phase and spans all procurements.

More details on each step are described below.

2.1 Establish Cost Estimate Purpose and Scope.

The first step to build the IGCE is to establish the estimate purpose and scope. This includes defining the product or service to be acquired, the deliverables associated with the procurement, the appropriate level of detail and overall scope, the customer of the procurement, and the period of performance. Determine if the procurement will include labor, material, equipment, or a combination. Determine the procurement scope, the contract type (e.g., Time & Materials (T&M), Firm Fixed Price (FFP), Cost Plus, or a combination) and the phases estimated (e.g., Indefinite Delivery / Indefinite Quantity (IDIQ) vs. Task Order), and the major task areas of the SOW (Test & Evaluation (T&E)) vs. Operations & Maintenance (O&M)).

During this step, identify the cost team who will create the IGCE. The IGCE team will typically be smaller than the team required to build a life cycle cost estimate. Define the roles and responsibilities for the IGCE team members and develop the estimate timeline.

While the CARD defines the content and structure of a life cycle cost estimate, the contract Statement of Work (SOW) defines the content of the IGCE. The IGCE estimating structure must map to the SOW structure.

2.2 Develop Cost Estimate

The second step to establishing an IGCE, developing the cost estimate, includes identifying the methodology for each element then calculating estimate results. During this step, define the ground rules and assumptions that form the basis and content of the estimate, collect historical cost data, conduct market research, and develop a cost estimating methodology. Analyze, normalize, and tailor market research to build the IGCE cost elements.

Market research includes evaluating labor rates. There are several publicly available sources that can be leveraged to assist with market research, including a calculator published by General Services Administration (GSA) and wage estimates published by the Bureau of Labor Statistics (BLS). Ensure the IGCE is built using fully burdened labor rates, or wrap rates, which include both direct employee wages and indirect costs which include employee fringe benefits, overhead costs, General and Administrative (G&A), Facilities, and G&A Cost of Money (COM). The IGCE must account for vendor profit or fee which is an incentive provided to a contractor.[14] Moreover, historical spending data can be pulled from USASpending.gov, the official open data source of federal spending information.

Next, create a cost model to calculate estimate results using the data collected. The GSA Acquisition Gateway publishes numerous tools and resources including an IGCE creation tool which includes labor rates for multiple categories of GSA labor categories (LCATs).

Distribute costs based on the procurement schedule. Escalation rates should be applied to each year of the contract period. The BLS provides data and resources, including the Employment Cost Index (ECI), which can be used in contract escalation. On its website, BLS provides guidance on how to use the ECI for contract escalation. Links to publicly available resources are provided in the Appendix.

As the acquisition process matures, update the IGCE as necessary.

2.3 Document Estimate

The final step in creating an IGCE is to document the estimate. Well documented cost estimates describe the purpose and scope of the estimate, sources of cost inputs including data sources used, known limitations or gaps in data utilized, underlying ground rules assumptions, and the estimating methodologies used to derive costs. The IGCE documentation will be provided to OAM as part of the acquisition package.

[14] https://www.fai.gov/sites/default/files/periodic_table/CPSG_Activity04.pdf

Independent Cost Estimate (ICE)

The process steps for the ICE are pictured in Figure 4 and are further discussed below. An ICE is a lifecycle cost estimate performed by a disinterested third party. "Disinterested" means that the organization performing the estimate has no stake in what the project will cost and is not in the decision chain. The ICE process contains many of the same steps as the POE process however there are a few key differences. This section will focus on aspects of the process that are unique to the ICE. Like the POE, the ICE is a living documents that is continually updated.

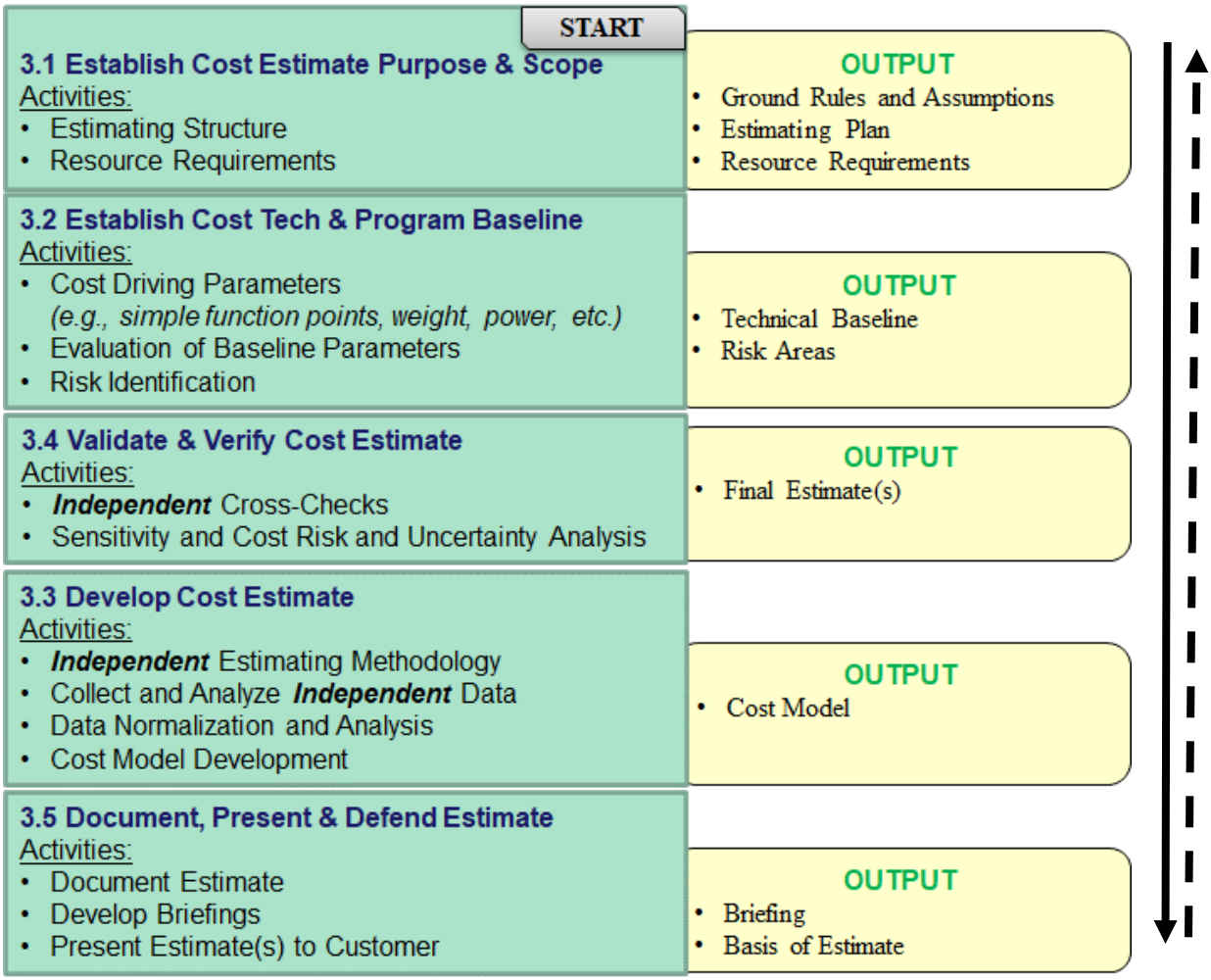

Figure 4. Independent Cost Estimate (ICE) Process Flow

3.1 Establish Cost Estimate Purpose and Scope.

Independent estimates are undertaken to minimize the bias of program advocates or foes on the cost estimate. It is a way to test the degree of optimism in an estimate. For decision-makers, an ICE provides an objective check on whether other estimates are reasonable. Moreover, the differences between an ICE and other estimates can be examined to improve understanding of overall program risk.

The ICE and POE costing teams are neither collaborators nor competitors. Each team should be kept aware of what the other is doing. Information on the project, data, models, and methodologies is common property.

Both the POE and ICE must use the same WBS. To the extent that they do not, the two estimates cannot be compared below the top line.

3.2 Establish Cost, Technical, and Program Baseline.

The CARD provides the statement of the technical baseline content costed by both the POE and ICE team. The CARD helps make sure that the development and reconciliation of POE to ICE is an apples-to-apples comparison. Within reason, the ICE team may take issue with aspects of the CARD (e.g., the length of the development schedule, the number of test assets or test time required, or the number of simple function points required to provide some functionality). In such cases, the ICE needs to provide its estimate of the cost of the content assumed in the CARD and provide a clear statement of the basis of disagreement.

3.3 Develop Cost Estimate.

Both the POE and ICE leverage actual costs. Where possible, the ICE leverages independent data and methodologies. Actuals, or real costs from real programs including the context in which they were incurred and recorded, are the gold standard for developing cost estimates. Actuals capture what was done, how it was done, and how it turned out. Moreover, actuals allow cost analysts to get a handle on the uncertainty of an estimate and give us a way to calibrate predictions. It is extremely rare that a project will be exactly like a past project, and scaling actuals up and down is not a trivial process.

3.4 Validate and Verify Cost Estimate

One of the most informative parts of the cost estimation process is the reconciliation between the POE and ICE. The ICE team chairs reconciliation of the ICE and POE. During reconciliation, the ICE is used as a "reasonableness check" of the POE. Since the POE is normally considered the baseline estimate, reconciling it with the ICE should provide enough detail about the POE to assist decision makers.

An affordability assessment is done as part of reconciliation. The ICE team and program office work with the budget office to determine if the baseline/reconciled costs are either affordable through the lifecycle or if there are potential funding issues.

3.5 Document, Present, and Defend Estimate

The ICE team is responsible for identifying its differences with the POE and explaining their basis in a way that is intelligible to Bureau and Department of Commerce leadership. Clearly explaining to a decision maker why two cost estimates of the same project differ is perhaps the hardest part of cost analysis.

The Acquisition Framework specifies a template for a summary report to the Milestone Review Board (MRB) of the Independent Cost Review (MS 1) and the ICE reports (MS 2 and 3) which is a separate artifact from the ICE documentation.

Independent Cost Assessment (ICA)

An alternative to the ICE is the Independent Cost Assessment (ICA). The ICA is developed as needed to support leadership at the headquarters or Bureau level. Also, program or project managers may desire the support. The ICA is a non-advocate, outside-the-chain-of-command evaluation of a program life-cycle cost estimate that examines its completeness, accuracy, credibility, and documentation. Like the ICE, the ICA is typically performed by a disinterested third party. Unlike an ICE or a POE, the ICA does not build up a cost estimate from the baseline and is not a stand-alone product. Rather, the ICA reviews and interprets data collection and analyses underway as the POE is built. The process flow for the ICA is pictured in Figure 5.

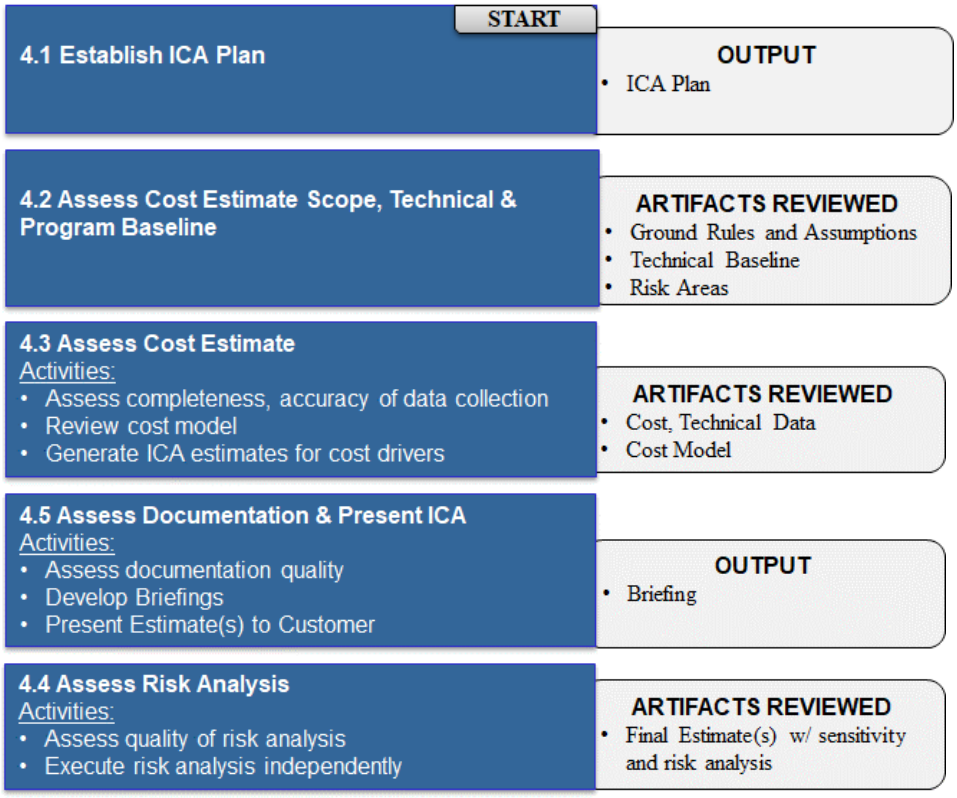

Figure 5. Independent Cost Assessment (ICA)

The ICA looks specifically at a program's technical approach, risk, and acquisition strategy to ensure that the program's cost estimate captures all requirements.[15] The ICA is related to but is different from a Sufficiency Review, which is a review to ensure a program or cost estimate has sufficient information for a formal milestone review. A sufficiency review is typically Bureau specific and addresses topical issues.

Given the inherently difficult job of producing credible life cycle cost estimates of complex projects and programs in a dynamic acquisition environment, the ICA provides the following benefits to Bureau leadership prior to advancing the program to review by the Department of Commerce:

- Objective, independent appraisal of the life-cycle costs of the solution under consideration
- Increased understanding of the underlying postulates of the cost estimate, where sources of cost growth usually originate
- Improved visibility into the strengths, weaknesses, and limitations of the cost estimate
- Deeper understanding of major cost drivers and elements of cost risk, and
- Reduced errors in the cost estimate[16]

The steps for completing the ICA are further discussed below.

4.1 Establish ICA Plan.

The ICA Plan should include a review of scope and expectations, an outline of tasks required to complete the assessment including reliance on the POE, a schedule with milestones, deliverables, and peer reviews, initial specification of data requirements, deliverables and cooperations required from other organizations, and a list of ICA team members.[17]

The intent of the ICA is to inform the POE. Waiting until the delivery of the POE for the POE team to engage the ICA team would provide minimal value and would force the POE team to revisit steps. The ICA Plan should assume engagement between the POE and ICA teams throughout each step in the cost estimating process.

4.2 Assess Cost Estimate Scope, Technical, and Program Baseline.

The ICA assessment of scope, technical, and program baseline includes a thorough review of the POE scope, to ensure consistency with stakeholder requirements, a review of the CARD to ensure accuracy and completeness, a review including cross-checks of the baseline parameters, and a review of the program artifacts to ensure consistency across the program's "Big A" story. The ICA assesses if the WBS is accurate, complete, and in sync with the baseline. Moreover, the ICA assesses whether the POE describes and explains global and program-specific assumptions

[15] *GAO Cost Estimating and Assessment Guide*, March 2020, Table 2, "Other Types of Cost Estimates," page 21.

[16] *Department of the Navy Independent Cost Assessment Manual*, March 2013, page 14

[17] *Department of the Navy Independent Cost Assessment Manual*, March 2013, page 25

and assesses whether ground rules and assumptions are consistent with those from other programs and meet stakeholder requirements.

4.3 Assess Cost Estimate.

The ICA includes a review of the POE data collection and normalization effort to ensure data collection is accurate, complete, validated, and documented; a review of the POE to ensure the estimate was built using documented, sound methods, with peer reviews and cross checks; and a review of the POE model to ensuring it is complete, accurate, and credible and meets requirements while minimizing use of throughputs. Finally, the ICA includes independent cross checks to substantiate the POE.

4.4 Assess Risk Analysis.

The ICA includes a review of the POE risk and sensitivity analysis. The ICA ensures that the POE covers all sources of risk and uncertainty, ensures that the POE risk model is well-constructed, executed, and documented. Moreover, the ICA ensures that the ICA team's independent risk analysis supports the POE, ensures that the POE S-curves pass a reasonableness test, ensures that the POE model supports analyses of trade space, and ensures that tradeoffs have been performed to understand cost sensitivity.

4.5 Assess Documentation and Present ICA

The ICA ensures that the POE documentation (Basis of Estimate) allows for easy reconstruction of the estimate. Moreover, the ICA report explains reasons for deltas between the POE and ICA cross checks and highlights areas of risk.

Section 3: Cost Estimate Applications

Cost Estimate Requirements

The definitions, processes, and requirements for the various types of cost estimates in the guide are all distinct. The table below lists the types of cost estimate products and the requirement it satisfies. The cost estimate should be scaled as appropriate to the size of the program.

Cost Estimating Product	**Required For:**
Program Office Estimate (POE)	Any program, project management activity
Independent Government Cost Estimate (IGCE)	Contracting actions
Independent Cost Estimate (ICE)	Mission Critical programs or as required by leadership or Congressional direction
Independent Cost Assessment (ICA)	As needed to support leadership at Headquarters or Bureau level Also, PMs may desire the support

Cost Estimates within "Big A"

We do not do cost estimates for the sake of doing them, and we do not have programs for the sake of programs. Programs and supporting estimates of cost/schedule exist solely to support the stated mission of their organizations. Below we will discuss how the Big A framework helps synchronize and deliver program capabilities and supports appropriate governance to that end. Cost estimates are not created in isolation. This section provides context for cost estimation within the Department of Commerce 'Big A' concept and framework.

Conceptually, the 'Big A' framework synchronizes processes to deliver program capabilities and support Bureau and Department governance. Figure 6, below, represents the separate but integrated processes for resources, requirements, and acquisition interact which converge within "Big A." As the processes converge, artifacts (including cost estimates) emerge. No processes exist in isolation nor are the processes mutually exclusive. All exist as best practices and part of successful acquisitions and programs.

The middle of the graphic contains review and decision points, the Milestone Review Board (MRB), Acquisition Review Board (ARB), and Commerce IT Review Board (CITRB). Again, the review boards do not exist in isolation and artifacts presented to the Boards should represent program reality. Moreover, programs exist to provide capabilities in support of mission needs and strategic objectives (and cost estimates are inputs and artifacts of the framework). No program exists to satisfy review board requirements although programs and projects are expected to navigate the processes.

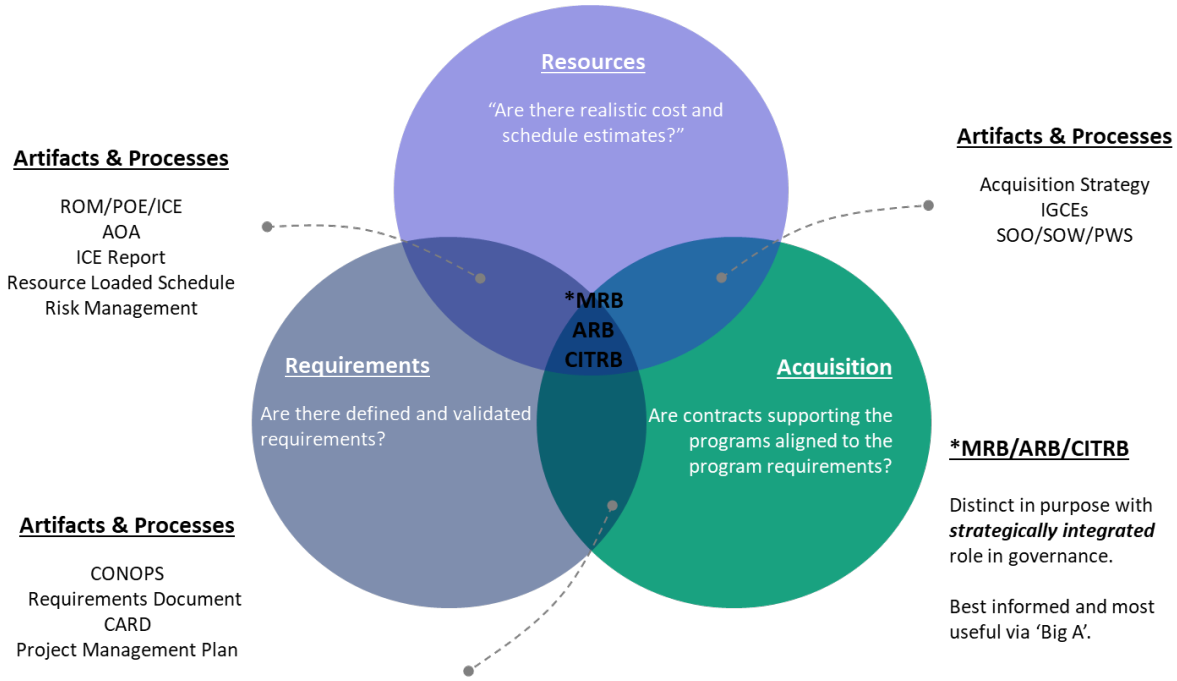

Figure 6. 'Big A' in Concept

Within the 'Big A' framework, every brief is the PMs opportunity to showcase how their program's end state and capabilities align to the bureau and DOC mission. If you approach the review boards with the 'Big A' in mind, you will be sure to state program objectives, define the 'why', your cost, schedule, and dependencies. Tying the latter to the former provides you and your leadership the linkages to show how and why the resources your request is vital to the organizations mission.

Topics for Program and Project Managers

Cost estimation within the Commerce Scalable Acquisition Program Management Framework

During the acquisition process, decisions must be made on how best to consume labor, capital equipment, and other finite resources. A realistic cost estimate facilitates tradeoffs among cost, schedule, and requirements which allow better decision making in order to increase a program's probability of success.[18] This section is written specifically for Program and Project Managers (who are typically responsible for developing them) to highlight how the various types of cost estimates are used to make informed, data-driven decisions within the Commerce Scalable Acquisition Project Management Framework ("the Framework"). Ideally, this section will serve to strengthen the invaluable relationship between Project Manager and cost estimator.

[18] https://www.gao.gov/assets/gao-20-195g.pdf

The Department of Commerce Acquisition Framework adopts a scalable review approach to project management and prescribes processes and minimum standards for approval. The principals of the Framework should be employed by all projects; however, the effort applied should be rationally scaled to the project's scope and risk. The process and documentation requirements need to be appropriate to the investment. This logic is also true for cost estimates. The process and documentation for the cost estimate should be appropriate to the investment. But, regardless of size or complexity of a project, the Framework provides a systematic and well-documented project management approach and can be used as a guide to things a program manager should consider. The Acquisition Framework is pictured in Figure 7, below.

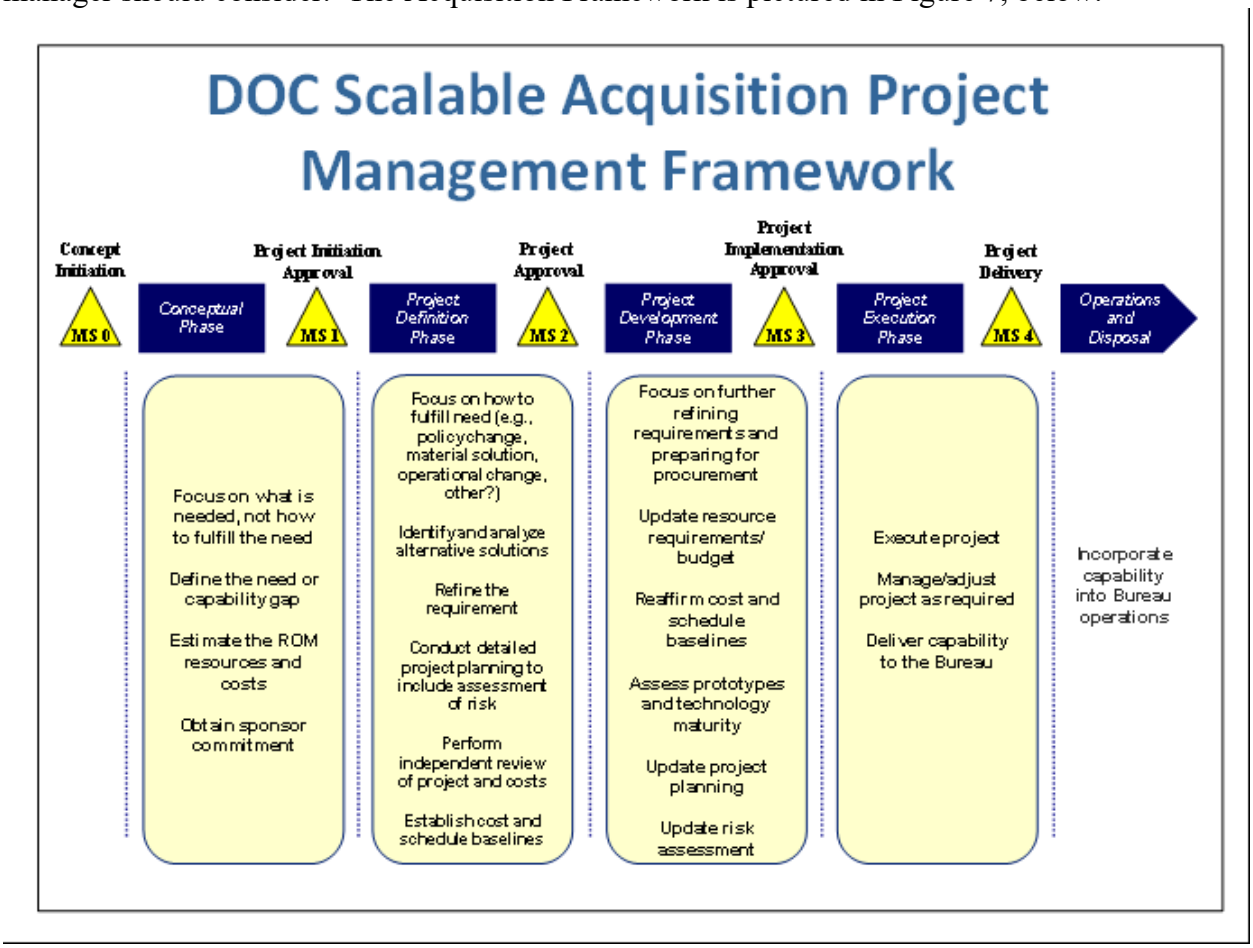

Figure 7. Acquisition Framework

The goal of the Framework is to ensure adequate management. The Framework is not meant to be a paper drill that overburdens a project with artifact creation or a one size fits all. The Framework is meant to be utilized for procurements, acquisitions, project, and programs and incorporated throughout the acquisition lifecycle.

The establishment of a program cost estimate is required by Department Acquisition Order (DAO) 208-16 but is also an integral component of good program and project management. The

life cycle cost estimate is not meant to be a static artifact submitted as part of the milestone review. Treating the life cycle cost estimate in this way leaves value on the table.

The life cycle cost estimate is the "one stop shop" connection between requirements, schedule, performance, and risk. By establishing a life cycle cost estimate, continuously updating the life cycle cost estimate, and utilizing cost estimate details in the day-to-day execution, the life cycle cost estimate becomes a valuable tool for program performance management. With the life cycle cost estimate, the program and project manager can make data driven decisions on cost, schedule, and performance that are anchored by established metrics.

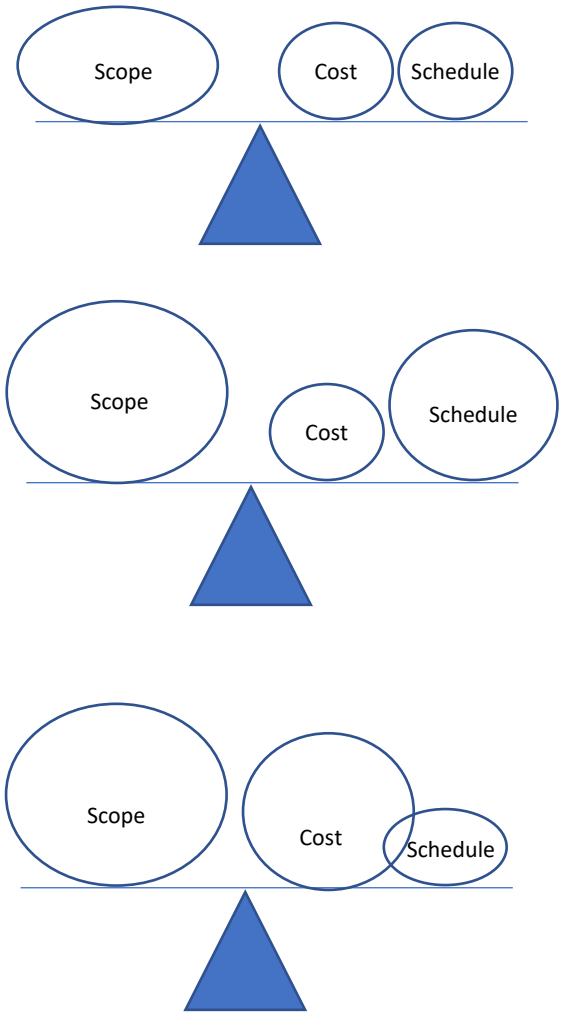

Figure 8. Cost, Schedule, Scope Balance

Figure 8, above, depicts the delicate balancing act of cost, schedule, and scope that PMs must strike. Life cycle cost estimating informs decision making, especially in the early planning and formulation of an acquisition program. A lifecycle cost estimate can support budgetary

decisions, key decision points, milestone reviews, and investment decisions.[19] For example, if scope / performance parameters increase, you will need an integrated cost and schedule to assess whether the PM can:

- Incur cost growth
- Schedule growth
- Both or neither (the latter being where the triangle "breaks")

As a PM, you do not need to know how to set up a cost model. However, you do need to be aware of who to turn to and how to utilize your life cycle cost estimate throughout the life of the program. To assess if your cost estimate is best serving your needs, ask yourself:

- ✓ Do my cost and schedule estimates help me as the PM make decisions?
- ✓ Does my cost estimate include the appropriate inputs related to my constraints?
- ✓ Do I know what levers I can toggle if I don't get all my funding?
- ✓ Am I confident that I have requested adequate funding?
- ✓ Does my cost model help me make decisions if my development parameters change?

If not, then you don't have a decision-making tool, and this could be the difference between reacting to defensible tradeoff decisions you've made as the PM versus simply reacting to decisions you end up having to defend. Engage with Bureau level and Department level cost estimating resources to learn what options might be available to inform your program's cost estimating capabilities.

Aligning the Life Cycle Cost Estimate to Budget Formulation and Execution

A key interface of the Acquisition Framework is with the Department's budget process. Consistent and complete information exchanges between the Framework and the budget processes are essential to the efficient and effective functioning of the Department in its management of projects and the application of resources to fulfill its mission.

To fully leverage the tenets of the Acquisition Framework, and to leverage the benefits of the milestone review process, the life cycle cost estimate must tie directly to the Bureau budget submissions and appropriations, without the use of erroneous mapping schemas. The program must be able to identify who can charge against program appropriations and who did charge against the funds. Program traceability, from budget formulation to program cost estimate, to budget execution provides numerous benefits. It provides the program manager with the ability to measure program performance against a funding baseline and manage carryover funds. Moreover, the comparison of actual costs to estimated costs by year allows the cost team the ability to "grade its own homework," or assess the degree of accuracy of the team's cost estimate. This comparison allows the cost team to continually improve its estimating capabilities and methodologies, allowing for better decision support to program and Department of Commerce leadership.

[19] https://www.gao.gov/assets/gao-20-195g.pdf

Aligning the life cycle cost estimate to budget formulation and execution requires that the program cost reporting structure be established so that each element can be identifiable in both budget and execution space. For example, one cost element might be a single contract, a single Contract Line Item Number (CLIN), or a single federal branch which can be identified in a system of record such as the Department of Commerce financial system of record, Commerce Business Systems (CBS). Obligations and actual costs must be discretely identifiable for each cost element without the use of erroneous mapping schemas.

Sometimes, programs utilize umbrella contracts which provide support and staff to multiple other programs. In these cases, program must utilize a mechanism (e.g., cost reporting, unique lines of accounting) to identify program specific costs. Without this mechanism, program traceability, from budget submission to program cost estimate to budget execution, is impossible without the use of erroneous mapping schemas.

Life cycle cost estimates are the "one stop shop" connection between requirements, schedule, performance, and risk and are an invaluable input to the budget process. The process of thoroughly defining the program cost, schedule, and performance metrics, provides a strong basis for program funding stability. OAM analysis has shown that historically, programs that have been baselined through the MRB process, received at least 95% of their requested funds. Many baselined programs were fully funded. Without complete cost estimates, there is a possibility of required work content not being funded. When budgets are formed without integration to cost estimates, it may lead to difficulty assessing affordability, decreased ability to assess the impact of changes, and decreased PM control.

Baseline Execution Reporting

The DOC Acquisition Program Management Framework, as elaborated in the DOC Acquisition Program and Project Management Guidebook ("the Guidebook"), prescribes a disciplined, repeatable, and comprehensive acquisition management process by which the Department manages programs. As described in the Framework and the Guidebook, DOC review of mission critical programs will be conducted by the Milestone Review Board (MRB). The Milestone 2 approval establishes the Department's program baseline (e.g., cost, schedule, and performance), and the associated Milestone Decision Memorandum (MDM) outlines the applicable requirement to report cost, schedule, and performance execution against the baseline to OAM.

Annual program baseline reports are collected in the beginning of the calendar year and reflect actuals through the prior fiscal year. After collecting and analyzing the reports, OAM conducts meetings with the reporting programs, then finally documents the internal review and program status. The internal memorandum is completed by the end of March to coincide with the President's Budget submission.

For each reporting program, the internal memorandum includes a narrative section with the program mission and description, baseline, and major program events of the past year, as well as summary comparison tables, as described below. The baseline execution reports include more

detail than the summary tables described below which are meant to provide a concise and focused status check of the program.

The resource table (Table 1, below) compares the DOC budget baseline versus funds and planned expenditures versus actual expenditures. Actual funds reflect appropriated funds through the current reporting year and latest budgetary information (i.e., the President's Budget or appropriated funds) for the following year. Per the Guidebook, Program and Project Managers are required to notify Bureau leadership, the OAM, and the Milestone Review Board (at a minimum) if there is a deviation of 20% or more in any program baseline. If total program funds increase more than 20% beyond what was originally baselined, or if the Cost Budget Performance Index (CBPI) is above 1.2, a baseline breach process will be initiated.

Table 1. Resources

TY $M	Prior Year to [REPORT YEAR – 1]	[REPORT YEAR]	[REPORT YEAR] CUM to date	[REPORT YEAR + 1]	To Complete	Total	CBPI
DOC Baseline							**Funds / Baseline**
Funds							
Planned Expenditures							
Actual Expenditures							

The schedule table (Table 2, below) compares the baselined versus actual operational delivery date.

Table 2. Schedule

Milestone	Baseline Estimate	Current Estimate
Operational Delivery		

The requirements table (Table 3, below) is a status of program requirements versus the baseline.

Table 3. Requirements

	Status
Requirements	

Due to the sensitive nature, program baseline reports and the internal memorandum are stored internally to OAM.

A recurring theme in the DOC Cost Estimating Guide is that life cycle cost estimates (POEs and ICEs) are iterative and living documents. This theme is reinforced with the discussion on baseline execution reports. Execution reports are the backbone of good, continuous cost estimating practices. Although the tables shown above are at the summary level, detailed WBS reporting, to include traditional Contractor Performance Reports (CPR) (Cost Performance Index

(CPI) and Schedule Performance Index (SPI)), may occur at lower levels if the right contract mechanisms were put in place for cost type contracts. The data in baseline execution reports forms an internal relevant database used both to update the program's cost estimate with its own actuals and inform cost estimates for future programs. The disciplined and repeatable annual baseline execution reporting process outlined above can be mimicked and applied to projects and programs of various sizes and complexities.

Appendix. Cost Estimation Resources

Publicly available resources for life cycle cost estimates and IGCEs are provided in the table below.

Cost Estimate	Policy	Available Resources
Life cycle cost estimates (POE, ICE)	U.S. Department of Commerce, *Department Administrative Order (DAO) 208-16 Acquisition Project Management*, May 26, 2015 (or latest version)	U.S. GAO, GAO Cost Estimating and Assessment Guide. Best Practices for Developing and Managing Program Costs (GAO-20-195, March 2020 (or latest version) https://www.gao.gov/products/gao-20-195g U.S. Air Force Instruction 65-508, Cost Analysis Guidance and Procedures, December 06, 2018 (or latest version) https://static.e-publishing.af.mil/production/1/saf_fm/publication/afi65-508/afi65-508.pdf Office of the Secretary of Defense Cost Assessment and Program Evaluation, DOD Cost Estimating Guide Version 2.0, February 02, 2022 (or latest version) https://www.cape.osd.mil/files/Reports/DoD_CEGuidev2_FINAL_PR.pdf Department of Defense Standard Practice, Work Breakdown Structures for Defense Materiel Items (DoD MIL-STD-881F), May 13, 2022 (or latest version) https://quicksearch.dla.mil/Transient/A8EE4C9226B441BA9BD4DD0E2DFE3BBC.pdf Office of Management and Budget, The Capital Programming Guide: Supplement to OMB Circular A-11: Planning, Budgeting, and Acquisition of Capital Assets, January 2021 (or latest version) https://www.whitehouse.gov/wp-content/uploads/2021/01/capital_programming_guide.pdf
IGCE	Federal Acquisition Regulation (FAR) Commerce Acquisition Manual (CAM)	GSA Acquisition Gateway https://hallways.cap.gsa.gov/app/#/doclib GSA Pricing Central https://buy.gsa.gov/pricing/ U.S. Bureau of Labor Statistics Contract Escalation https://www.bls.gov/ncs/ect/escalator.htm U.S. Bureau of Labor Statistics National Occupational Employment and Wage Estimates https://www.bls.gov/oes/current/oes_nat.htm USA Spending, Official open data source of federal spending information https://www.usaspending.gov/