

Improving Survey Cost Estimates: Lessons Learned Applying GAO Best Practices at the US Census Bureau

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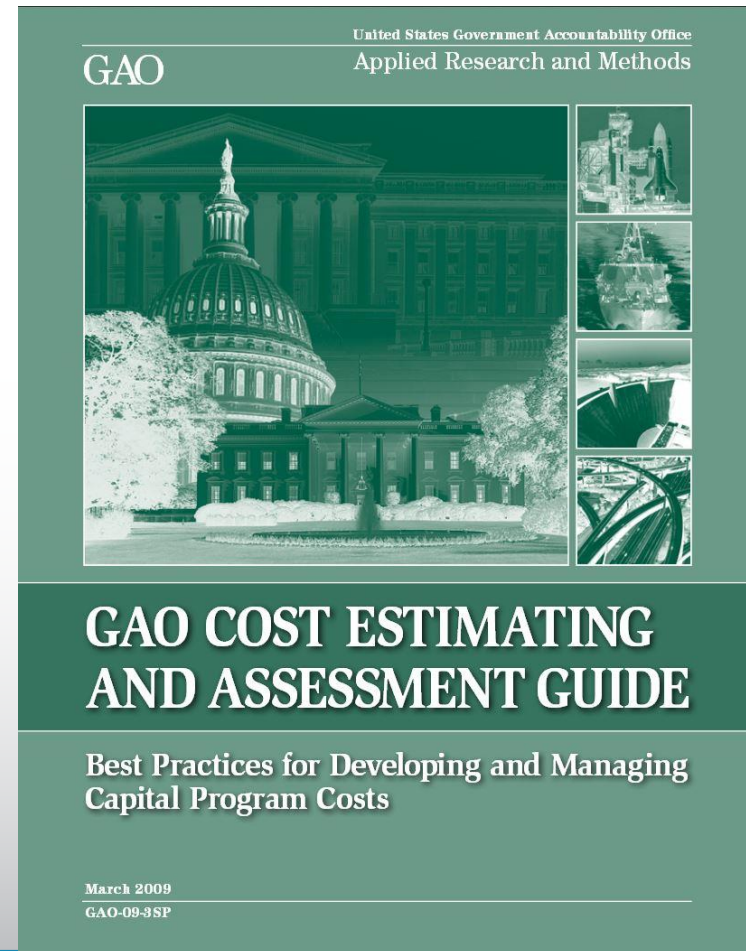
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Objectives

- Introduce the GAO Best Practice Cost Estimation Guide
- Twelve Steps of a High-Quality Cost Estimating Process
- Lessons Learned Applying the Best Practices

The Guide

- Authored by the Government Accountability Office's Applied Research and Methods
- 420 Pages, Published March 2009



“Suggested” Best Practices

- “quality estimating process resulted in unreliable cost estimates throughout each program’s life cycle.”
- “Instead of using a cost model, it used an unsophisticated spreadsheet to extrapolate”

Cost Estimation Is

“Summation of individual cost elements, using established methods and valid data, to estimate the future costs of a program, based on what is known today.”

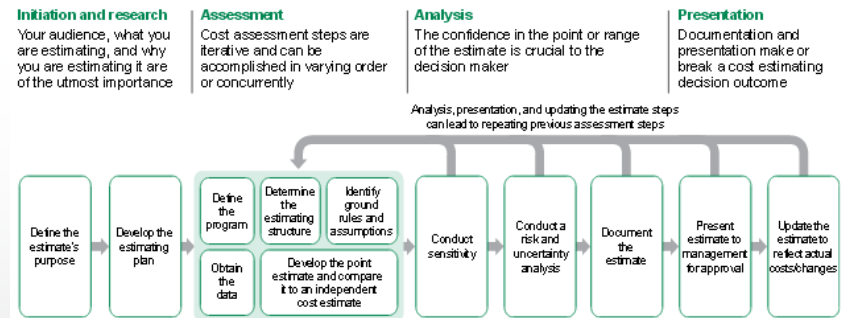
Why Is Cost Estimation Important

- Formulating and explaining budgets
- Set priorities
 - Cost/ Benefit Analysis
 - Evaluations
- Mitigate the risk of:
 - Budget variances
 - Schedule slippage
 - Scope and quality underperformances

Structure of Guide

- 12 Steps of a High-Quality Cost Estimating Process
 - Cost Estimation Best Practices
 - Managing Cost
- 20 Chapters
- 17 Best Practice Checklist
- 48 Case Studies

Figure 1: The Cost Estimating Process



Source: GAO.

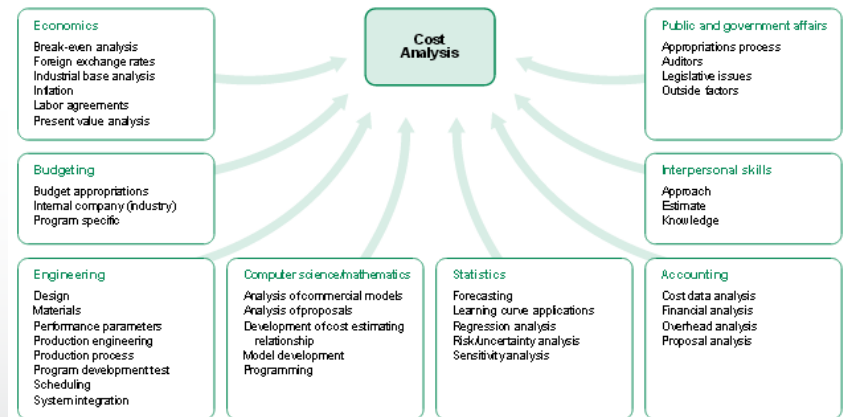
Define estimate's purpose

- Who needs the estimate and how will the estimate be used?
- What level of detail is needed?
- When is the estimate due?

Develop estimating plan

- Experience and trained members
- Subject Matter Experts
- Timeline and schedule

Figure 9: Disciplines and Concepts in Cost Analysis



Source: GAO.

Define program characteristics

- Establish scope of work
 - Technical Requirements
 - Predecessors and successors
 - Quantities and frequency
 - Development, test, training and production
- Personnel
- Risk

Determine estimating structure

- Through Work Break Down Structure = Good Best Practice
- Results or product based WBS, not activity
- WBS matches scope of program
- WBS feeds schedule, EVM and cost estimate

Identify ground rules and assumptions

- Each assumption as a risk
- In-scope/ out of scope
- Start and end date
- Identify any schedule or budget constraints, inflation assumptions, and travel/ travel costs;
- Determine technology refresh cycles;
- Effects of new rules and regulations

Obtain data

- Data collection plan
 - technical, schedule, cost, and risk data;
- Adjust data for trends. inflation, learning, and quantity adjustments cost drivers;
- Determine data reliability and accuracy;
- Store data for future estimates

Table 10: Basic Primary and Secondary Data Sources

Data type	Primary	Secondary
Basic accounting records	x	
Data collection input forms	x	
Cost reports	x	x
Historical databases	x	x
Interviews	x	x
Program briefs	x	x
Subject matter experts	x	x
Technical databases	x	x
Other organizations	x	x
Contracts or contractor estimates		x
Cost proposals		x
Cost studies		x
Focus groups		x
Research papers		x
Surveys		x

Source: DO Daid NASA.

Develop point estimate

- Estimate the cost of each WBS section
 - Analogy (A is like B)
 - Engineering Build-Up
 - Parametric (Cost = Quantity x Effort)
 - Extrapolating
 - Expert Opinion (Not recommend)
- Organizational learning curve
- Statistical testing of estimate

Conduct sensitivity analysis

- Sensitivity analysis = Cost implications changes
 - Key assumptions and factors on cost
 - Schedule and quantities changes

Conduct risk and uncertainty analysis

- Determine and discuss with technical experts the level of cost, schedule, and technical risk associated with each WBS element;
- Analyze each risk for its severity and probability;
- Develop minimum, most likely, and maximum ranges for each risk element;
- Determine type of risk distributions and reason for their use;
- Ensure that risks are correlated;
- Use an acceptable statistical analysis method (e.g., Monte Carlo simulation) to develop a confidence interval around the point estimate;
- Identify the confidence level of the point estimate;
- Identify the amount of contingency funding and add this to the point estimate to determine the risk-adjusted cost estimate;
- Recommend that the project or program office develop a risk management plan to track and mitigate risks

Document the estimate

- Document all steps used to develop the estimate so that a cost analyst unfamiliar with the program can recreate it quickly and produce the same result;
- Document the purpose of the estimate, the team that prepared it, and who approved the estimate and on what date;
- Describe the program, its schedule, and the technical baseline used to create the estimate;
- Present the program's time-phased life-cycle cost;
- Discuss all ground rules and assumptions;
- Include auditable and traceable data sources for each cost element and document for all data sources how the data were
 - normalized;
- Describe in detail the estimating methodology and rationale used to derive each WBS element's cost (prefer more detail over
 - less);
- Describe the results of the risk, uncertainty, and sensitivity analyses and whether any contingency funds were identified;
- Document how the estimate compares to the funding profile;
- Track how this estimate compares to any previous estimates

Present estimate to management for approval

- Develop a briefing that presents the documented life-cycle cost estimate;
- Include an explanation of the technical and programmatic baseline and any uncertainties;
- Compare the estimate to an independent cost estimate (ICE) and explain any differences;
- Compare the estimate (life-cycle cost estimate (LCCE)) or independent cost estimate to the budget with enough detail
 - to easily defend it by showing how it is accurate, complete, and high in quality;
 - Focus in a logical manner on the largest cost elements and cost drivers;
 - Make the content clear and complete so that those who are unfamiliar with it can easily comprehend the competence that underlies the estimate results;
 - Make backup slides available for more probing questions;
 - Act on and document feedback from management;
 - Request acceptance of the estimate

Update the estimate to reflect actual costs and changes

- Update the estimate to reflect changes in technical or program assumptions or keep it current as the program passes through new phases or milestones;
- Replace estimates with EVM EAC and independent estimate at completion (EAC) from the integrated EVM system;
- Report progress on meeting cost and schedule estimates;
- Perform a post mortem and document lessons learned for elements whose actual costs or schedules differ from the estimate;
- Document all changes to the program and how they affect the cost estimate

Lessons Learned

- Cost Estimation Professionals
 - Project management experience
 - Business Analysis
 - Survey methodology experience
- Establishing a cost estimation plan

Lessons Learned (continued)

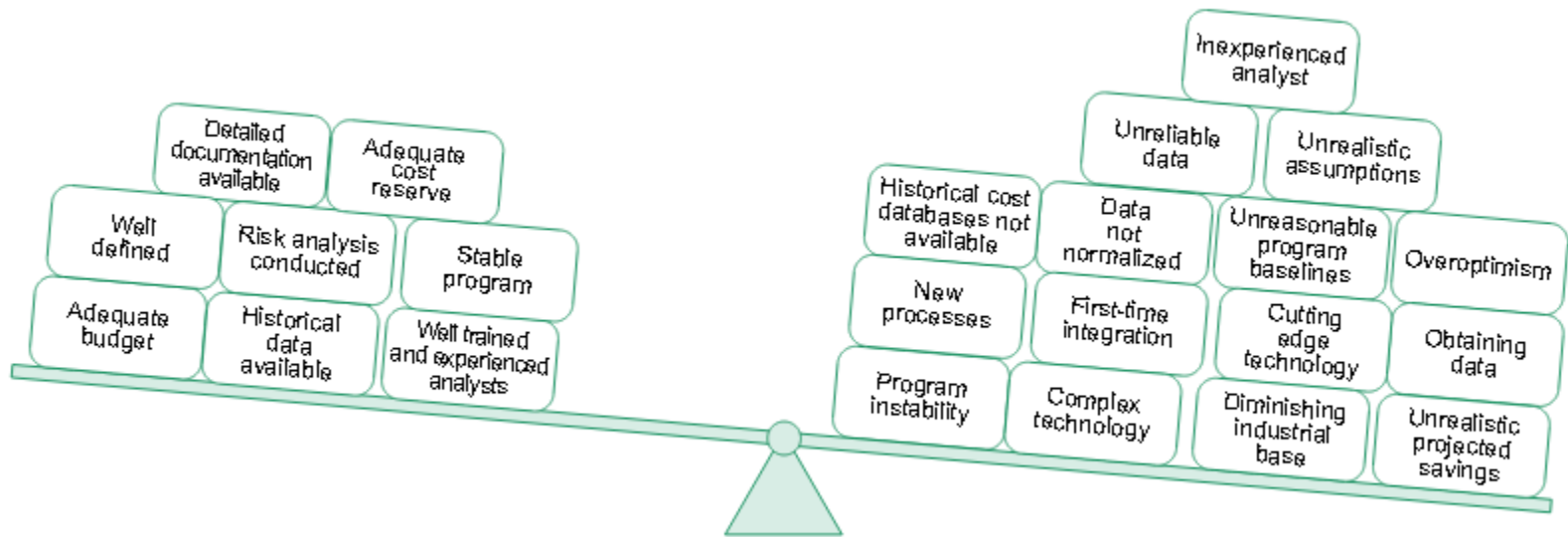
- Importance of reliable data
- Treat IT systems as IT systems
- Relationship between Total Survey Error and cost drivers

Summary

- Effort put into cost estimation = importance of accuracy
- Good cost estimates allow for better cost management
- Good management of cost allow for better cost estimates

Identify and Address Challenges

Figure 2: Challenges Cost Estimators Typically Face



Source: GAO.

Contact Information

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