

Maturing Cost Estimation in Rapid Acquisitions

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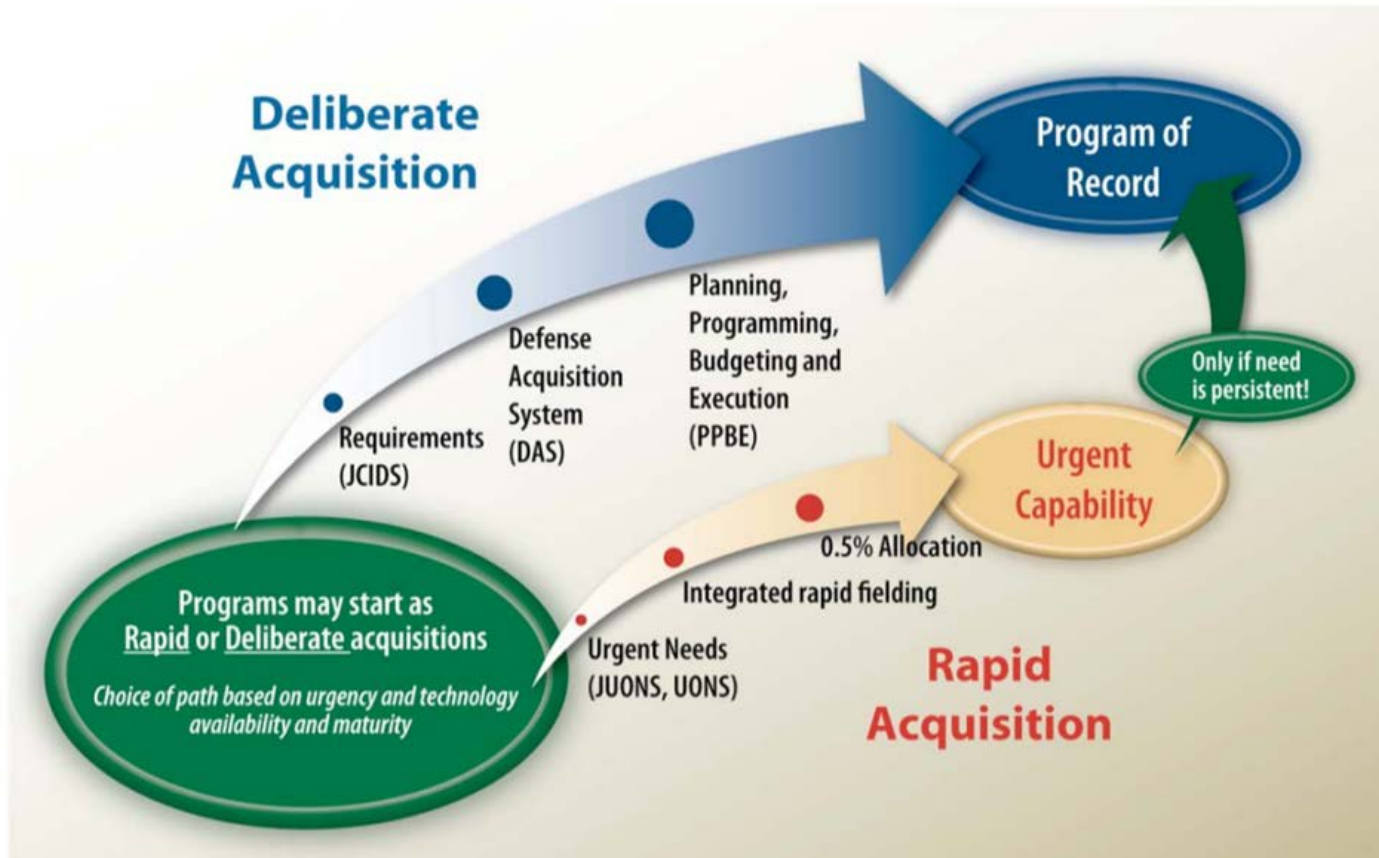
- **Research Idea, Historical Findings, and Scope**
- **Research Methodology, Data Analysis, and Normalization**
- **Findings, Recommendations, and Considerations**

Research Idea, Historical Findings, and Scope

Research Idea

- **Provide acquisition, cost, system engineering, and programmatic communities with a deeper understanding of cost implications in rapid acquisition environments**
- **Provide insights needed to fully understand both near-term and long-term cost estimating challenges in a rapid acquisition environment**
- **Develop methods for cost estimating rapid acquisition projects in a consistent and repeatable way**
- **Identify key areas of cost difference and uncertainty compared with traditional programs of record (PoR) improving stakeholder decisions in a rapid environment**

Rapid vs. Deliberate Planning



“Rapid” generally entails reduced documentation, empowered decision making, and less oversight to meet shortened schedules

Source: Defense Science Board Joint Task Force, “Fulfillment of Operational Needs” 2009.

Historical Findings

- **Audits, reviews, and untracked spending resulted in OSD mandates to update the urgent needs process**
 - “Bureaucratic inertia prevents rapid response; Does not access full range of commercial options available to resourceful adversaries¹”
- **Years of filling urgent needs created an ad-hoc rapid acquisition culture**
 - Shorten the development life-cycle of a large weapons system
 - Capitalize on technology innovation and short innovation life-cycle
 - Full urgent need guidance from OSD improved JEUN/JUON process
- **Little guidance or processes are in place to improve cost estimation/affordability aspects of the decision process**
- **Cost Estimating is critical to the decision process**
 - Establish a repeatable process through lessons learned, best practices, and case study analysis

Research Scope

- **Deliberate planning (traditional acquisition process) uses multiple decision making systems to define requirement, acquisition strategy, and affordability**
- **Deliberate planning is not feasible for rapidly resolving urgent needs or fielding technology quickly**
- **A rapid approach to acquisition incorporates accelerated and synchronized processes in order to respond to adversarial threats or introduce new technologies quickly**
- **Rapid approaches to acquisition are being implemented in a variety of ways, including urgent needs processes, leveraging of S&T efforts, and within PoRs**
- **This research includes all aspects of rapid acquisition**

“All of DOD’s needs cannot be met by the same acquisition process¹”

¹: Defense Science Board Joint Task Force, “Fulfillment of Operational Needs” 2009.

Research Methodology & Data Analysis

Analysis Approach

- Identify programs that have utilized rapid acquisition approaches

- Conduct case studies that provide information and data

- Compile and analyze case study data
- Augment findings with open source data and expert judgment

- Characterize and validate findings

- Compile and document results and guidance in a comprehensive Rapid Acquisition Cost Report

Case Study Data Collection:

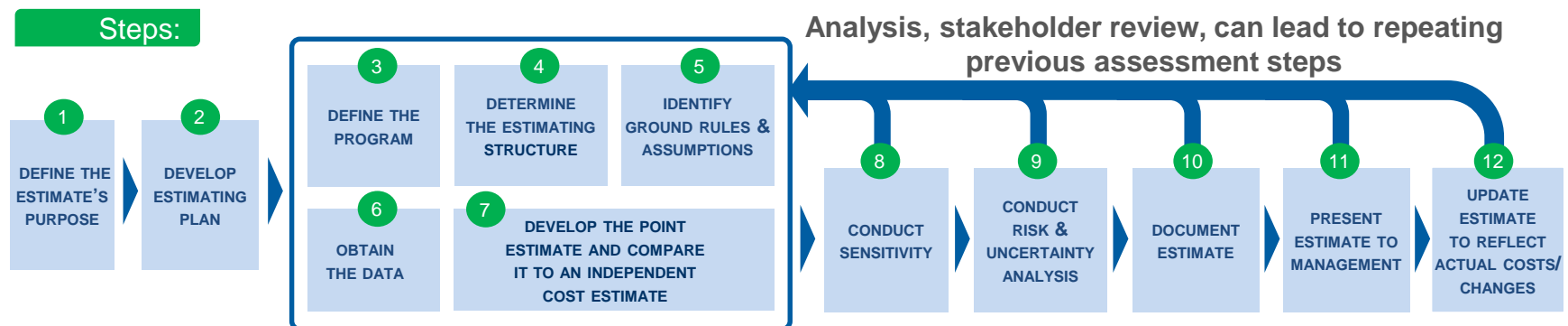
- Programmatic and technical baseline activities
- Cost, acquisition, and engineering processes utilized
- Cost, acquisition, and engineering challenges
- Cost drivers
- Trade space analysis conducted
- Risks and areas of uncertainty

Recommendations can be used to improve cost estimation capabilities of rapid acquisition projects

Case Study Methodology*

- **Applied research design and methods specific for case study research**
 - Established theoretical framework to guide research and map findings
 - Standardized data process and collection tools
 - Removed unintentional bias; and ensured recommendations and findings are applicable to the broader community
- **Theoretical Framework is based on best practice in cost estimating community**

GAO Cost Estimating and Assessment Guide¹



*Adapted from Case Study Research Design and Methods by Robert Yin (2014)

¹References: GAO Cost Estimating and Assessment Guide (GAO-09-3SP) (March 2009)

Data Collection and Normalization

- **Collected source data through interviews with subject matter experts**
 - Broad information gathering and pre-screening of cases across diverse rapid acquisition program experiences
 - Detailed Case Studies interviews with various competencies (PM, Cost Analyst, and SE functions) specific with rapid projects
 - High level Case study analysis specific to cost analyst embedded in rapid programs
- **Conducted data analysis to ensure findings and recommendations are sound**
 - Data reviewed and coded for relevance to each of the 12 GAO steps
 - Themes, patterns, and trends identified in each step by group discussion and consensus
 - Findings and recommendations linked to ensure connections established and derived from data

Key findings and recommendations determined by independent ranking, group consolidation, and discussion

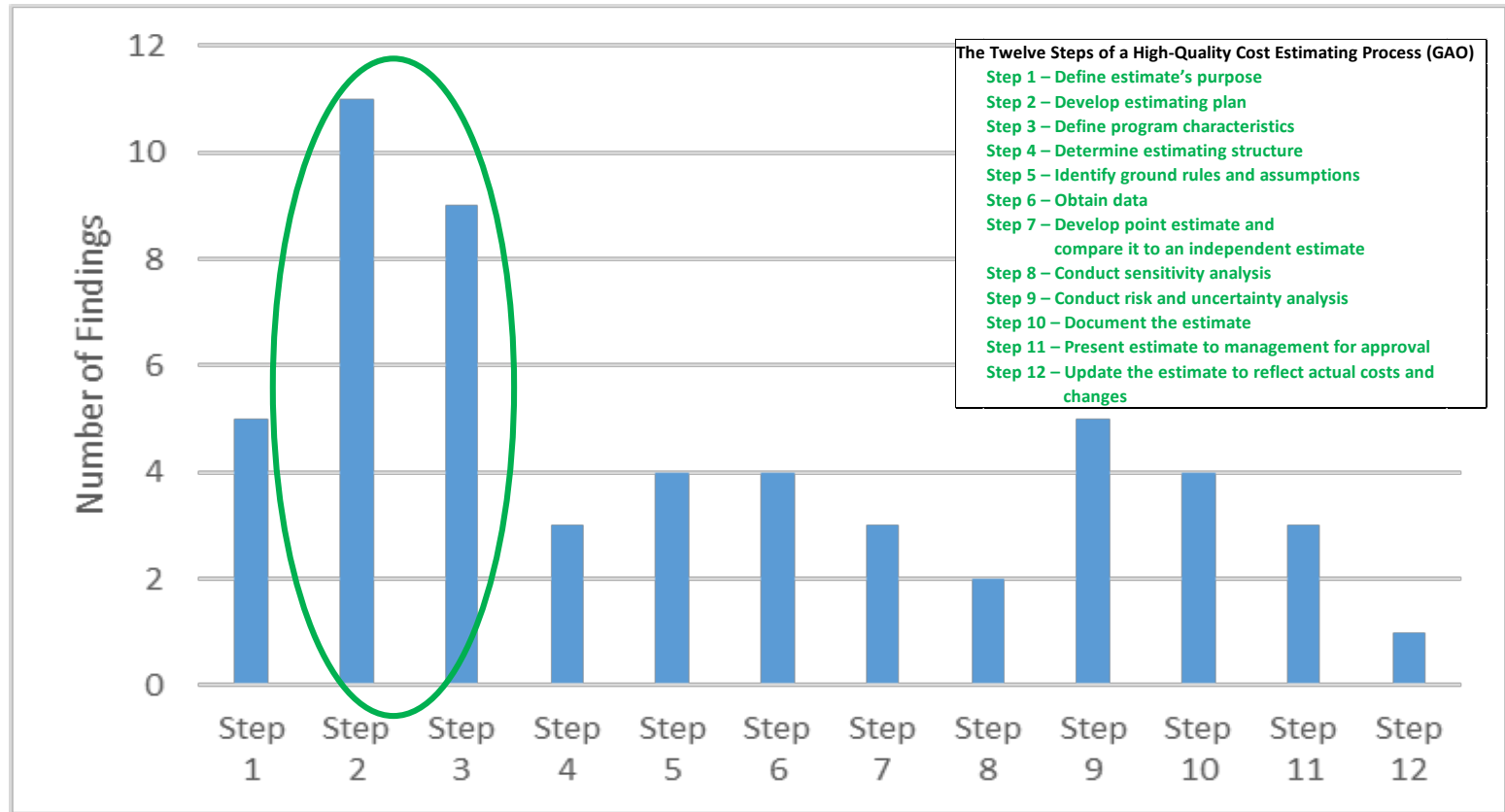
Findings, Recommendations, and Considerations

How Rapid Affects Cost Analysis

- **Rapid acquisition characteristics that impact cost analysis**
 - Rapid acquisition emphasizes delivery of a capability quickly which causes very short acquisition timelines
 - In order to achieve these shortened timelines, rapid programs operate at a fast pace and have a great concurrency of efforts
 - Schedule is the top priority; cost and capability are flexible to support desired schedule
 - There are many rapid acquisition approaches that vary in solution maturity, size, type, timeline, and acquisition strategy
- **Rapid acquisition compressed timelines pose unique challenges to cost estimating process**
- **Recommendations made to specifically address these challenges while considering constraints of rapid environments**

Findings

- Total of 54 findings across all 12 GAO Steps



- Step 2 and Step 3 had greatest number of findings

Cost Estimating Challenges in a Rapid Environment

Little time to collect data
Quick turnaround initial estimates
Adjusting for abbreviated processes
Fast pace
Increased uncertainty/risk
Many trade-offs required
Technical baseline maturity
Documentation not top priority
Transition planning varies

Key Findings and Recommendations

- Findings assessed and key recommendations identified, organized, and aggregated

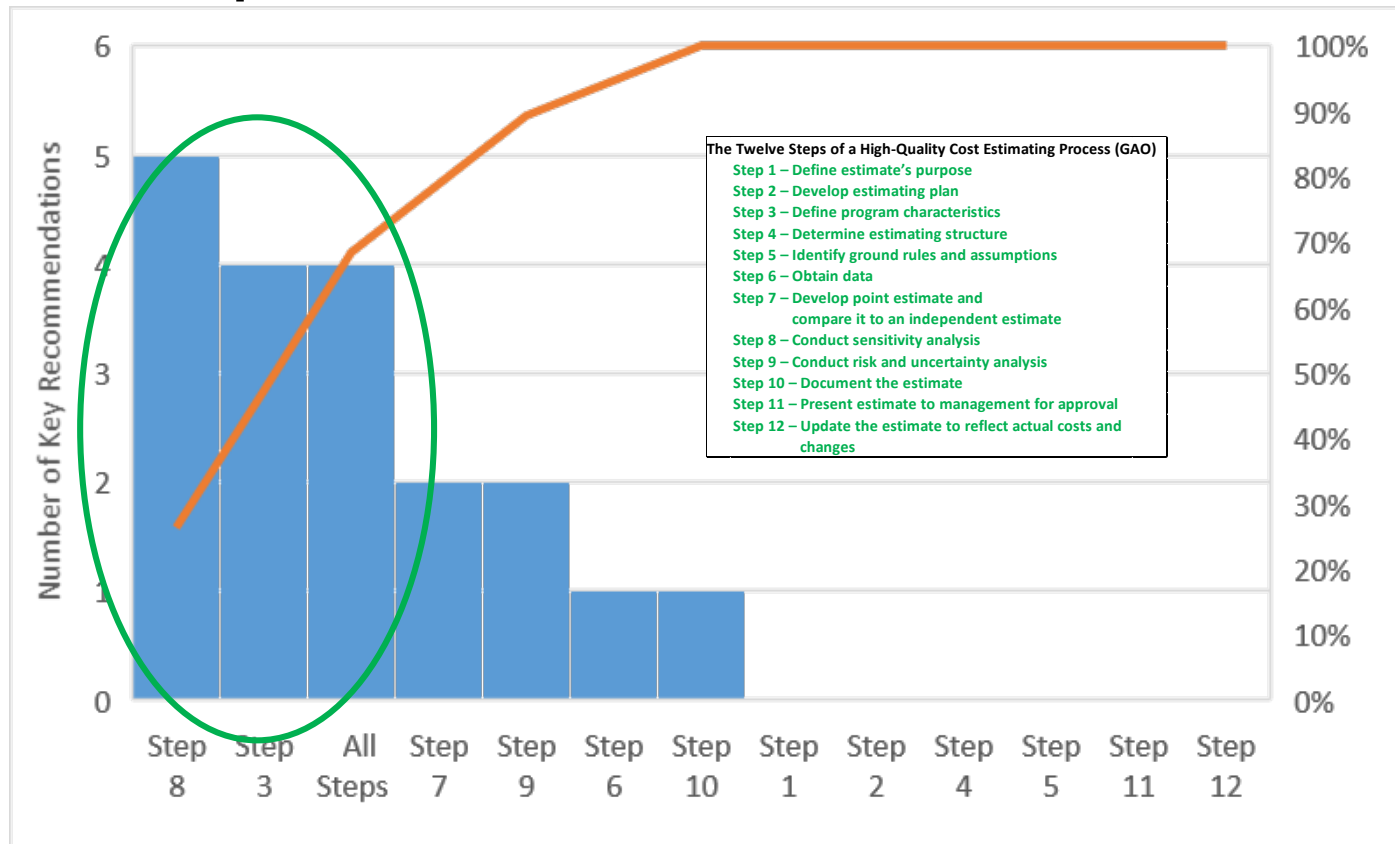
- Six major themes emerged:
 - Cost Estimating Process
 - Cost Analyst
 - Documentation
 - Uncertainty/Risk
 - Trade-offs
 - Scope/Baseline

- 10 key findings and 15 key recommendations were identified across the major themes

- Recommendations made to specifically address these challenges while considering constraints of rapid environments

Key Recommendations by GAO Step

- Number of key recommendations were counted for each of the 12 GAO Steps



- Step 8, Step 3, and ‘All Steps’ had greatest number of key recommendations

Theme: Cost Estimating Process

Key Findings:

- Cost estimating processes, approaches, and constraints vary **(All Steps)**
- Initial estimates are typically developed quickly to obtain funding then continue to be refined over time **(All Steps)**
- Cost data collection is especially challenging in shortened timeline **(Step 6)**

Key Recommendations:

- Initial and follow-on estimates should follow the GAO 12-step high-level process at an appropriate level, given time constraints and the demands of rapid acquisition **(All Steps)**
- Initial estimates should be broken out into life-cycle phases (development, production/procurement, and sustainment), and investment phases broken out to WBS level 3, where feasible **(All Steps)**
- Begin data collection early, and allow for as much time as possible to collect desired data; where possible, consider identifying and collecting data that can be used for future rapid acquisitions (business intelligence) **(Step 6)**
- Identify cost drivers and conduct sensitivity analyses on them as soon as possible. Initial estimates should identify high-level cost drivers and conduct some level of sensitivity analysis on them **(Step 8)**
- Conduct cross-checks and cross-verification of at least major cost elements and cost drivers **(Steps 7 and 8)**
- Conduct high-level schedule analysis to ensure capability can be delivered as planned **(Step 7 and 8)**

Theme: Cost Analyst

Key Findings:

- Trained cost analysts are often brought in after initial estimates are developed and are often not adequately resourced **(All Steps)**

Key Recommendations:

- Trained cost analysts should be engaged early on, and continue to be embedded within a program to handle the rapid pace of change **(All Steps)**
- Cost analysts need to be adequately resourced to support initial and follow-on estimates **(All Steps)**

Theme: Documentation

Key Findings:

- Acquisition and cost documentation are not a top priority **(Step 10)**

Key Recommendations:

- Cost estimate, and what is known about the programmatic approach and technical solution should be reasonably documented within timeline constraints **(Step 10)**
 - Rapid timeline should allow for flexibility in documentation medium and level of detail (focus on the most important pieces of the estimate)

Theme: Uncertainty/Risk

Key Findings:

- Initial estimates have the greatest uncertainty and risk, but generally only point estimates are developed when cost analysts are not involved **(Step 9)**

Key Recommendations:

- Key areas of uncertainty and risk should be identified, and all estimates should be risk-adjusted **(Step 9)**
- Specific areas of uncertainty and risk to consider for rapid programs include: scope definition, ground rules and assumptions (GR&As), solution options, software development, integration, fielding, sustainment, and supply chain - SCRM **(Step 9)**

Theme: Trade-offs

Key Findings:

- Trade-offs may be required; particularly on requirements **(Steps 3 and 8)**

Key Recommendations:

- Key cost, schedule, performance, and functional trade-offs that the program will need to evaluate should be incorporated upfront into the estimating plan **(Steps 3 and 8)**
- Requirements should be continuously prioritized early in order to justify trade-offs that may be needed to deliver capability quickly **(Steps 3 and 8)**

Theme: Scope/Baseline

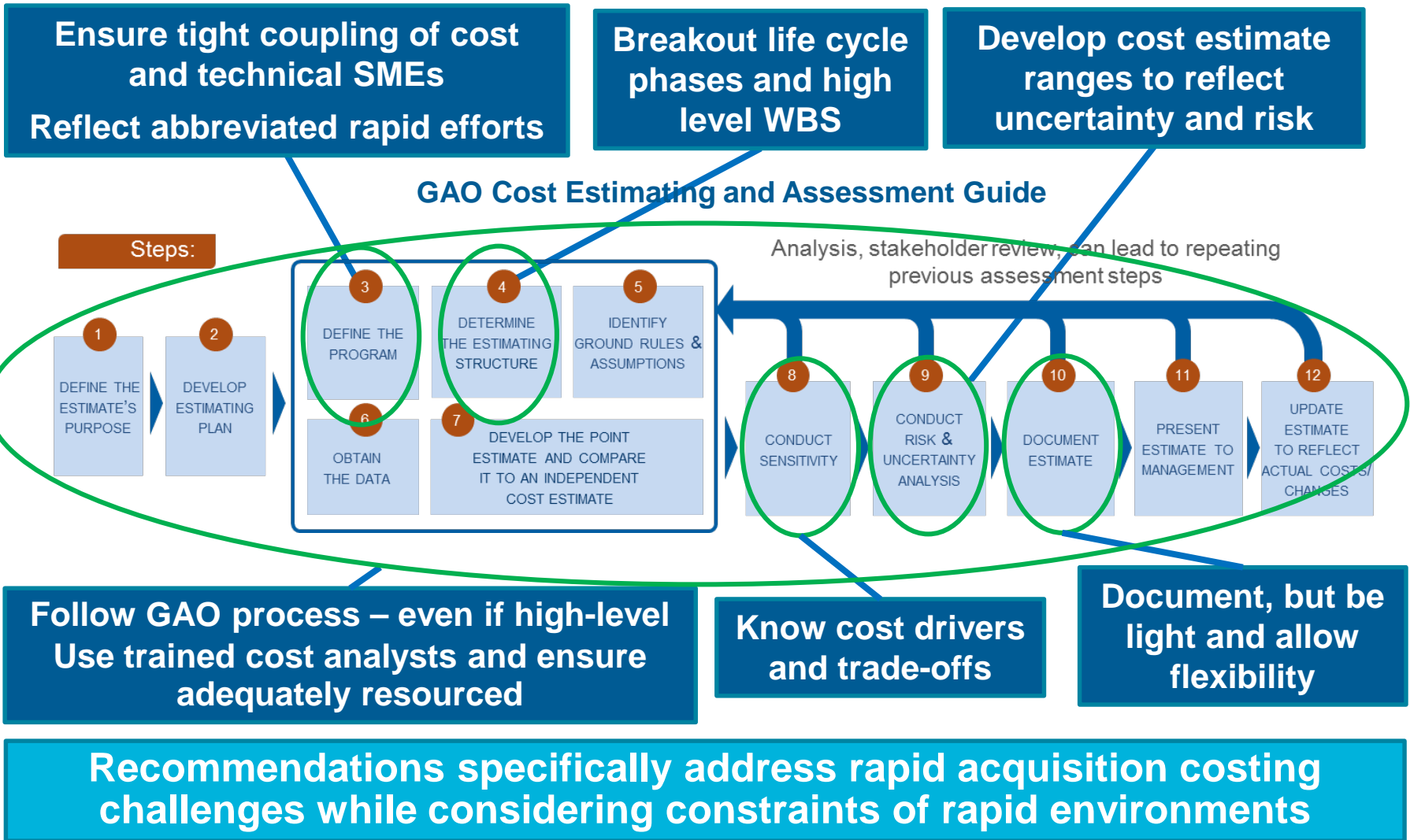
Key Findings:

- Acquisition and cost documents are developed in parallel **(Step 3)**
- Acquisition and technical efforts are abbreviated or developed in parallel in certain areas to accommodate rapid timelines and field solution quickly **(Step 3)**
- Transition planning to PoR varies from unknown to well understood **(Step 3)**

Key Recommendations:

- Programs ensure a tight coupling of cost, programmatic, and technical SMEs and should hold regular GR&A discussions to ensure key program personnel agree with GR&As and to keep up with fast pace of change in rapid programs **(Step 3)**
- Consider cost estimate adjustments to reflect reductions in documentation, integration, testing, and training efforts in a rapid environment and plan for full efforts in these areas when programs transition to PoR **(Step 3)**

Key Recommendation Summary



Application Considerations

- **Consider the following factors when applying recommendations:**
 - Rapid acquisition approach (e.g., S&T, RCO, RCD, RTI, Urgent Needs, and PoR rapid innovations (such as Agile development and technology insertion))
 - Size of program (\$)
 - New program start vs established program
 - Timeline
 - Solution maturity
 - Solution complexity

Summary

- **Multiple programs resources and SMEs interviewed across a variety of rapid acquisition program types and solutions**
- **54 Findings and 45 Recommendations developed**
- **Key recommendations include:**
 - Apply the GAO 12 step process – even if high-level
 - Use trained cost analysts and engage them early and ensure they are adequately resourced
 - Develop cost estimate ranges to reflect uncertainty and risk in rapid acquisitions
 - Know cost drivers and trade-offs
 - Understand and reflect abbreviated acquisition and technical efforts
 - Document, but be light and flexible
- **Recommendations are easily applied and adaptable to the variety of rapid acquisition approaches**
- **Recommendations align with established cost estimating best practices that help ensure confident, credible, and reliable cost estimates are developed to improve stakeholder decisions in a rapid environment**