

Life Cycle Cost Estimate (LCCE) Assessments

2013 ICEAA Annual Conference
New Orleans, Louisiana
June 17-21, 2013

Casey D. Trail
Colleen Craig
David Brown



Motivation

- A particular program support and cost assessment office needed a systematic framework for evaluating and providing feedback on LCCEs
- To address this need, the office leveraged the *GAO Cost Estimating and Assessment Guide* to identify a set of standard Characteristics, Criteria and Sub-criteria for evaluating LCCEs
- Additionally, to help automate the process the office created an Excel-based “LCCE Scorecard” to facilitate evaluation and documentation of assessment results
- This presentation summarizes the LCCE Scorecard and key lessons learned from over a year’s worth of assessments

Agenda

- Introduction
- LCCE Scorecard Overview
- LCCE Scorecard Sub-criteria
- Conclusions

Introduction

- The purpose of this session is to:
 - Summarize the LCCE Scorecard tool and criteria used to conduct assessments
 - Present Scorecard Characteristics, Criteria, and Sub-criteria
 - Highlight key findings and lessons learned from assessments
- This session will not discuss all of the scorecard sub-criteria in detail
 - Sub-criteria were excluded because they are either straightforward, are non-crucial, or are generally assessed highly
 - Sub-criteria that are particularly important or are generally found to be deficient are discussed in detail

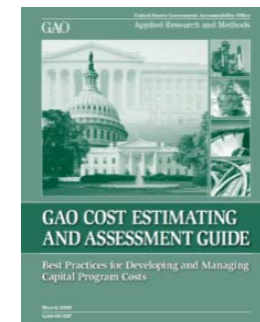
Background

- Need for a structured approach to evaluating Life Cycle Cost Estimates under resource constraints (time, personnel)
- Need for a documented approach that could be communicated to the Program Offices
- LCCE Review Process
 - Provides Program Offices with guidance that helps in Component LCCE Preparation
 - Does NOT replace an Independent Cost Estimate

LCCE Scorecard Overview

LCCE Scorecard

- Based on GAO Cost Estimating and Assessment Guide dated March 2009
- Cumulative assessment rating is based on evaluation of four key characteristics:
 - Comprehensiveness: Does the LCCE have all the required elements?
 - Well-Documented: How complete has the basis of estimate been documented?
 - Accurate: Has the estimate been calculated using appropriate methods?
 - Credible: Is the LCCE accompanied by supporting analysis such as sensitivity and risk analysis that add context and credibility?
- Criteria and sub-criteria for each characteristic provide linkage to the GAO Guide and provide specific guidelines on how to assess an LCCE
- Provides transparency to the customer – “open book exam”
- Includes “Critical Assessment Criteria” that are judged to be the most important.
- Allows for “Drill Down” into specific Assessment Evaluation Questions
- Uses “Stop Light” visuals to communicate results



GAO's 12-steps of a High-Quality Cost Estimating Process

Initiation and research

Your audience, what you are estimating, and why you are estimating it are of the utmost importance

Assessment

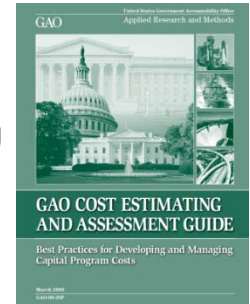
Cost assessment steps are iterative and can be accomplished in varying order or concurrently

Analysis

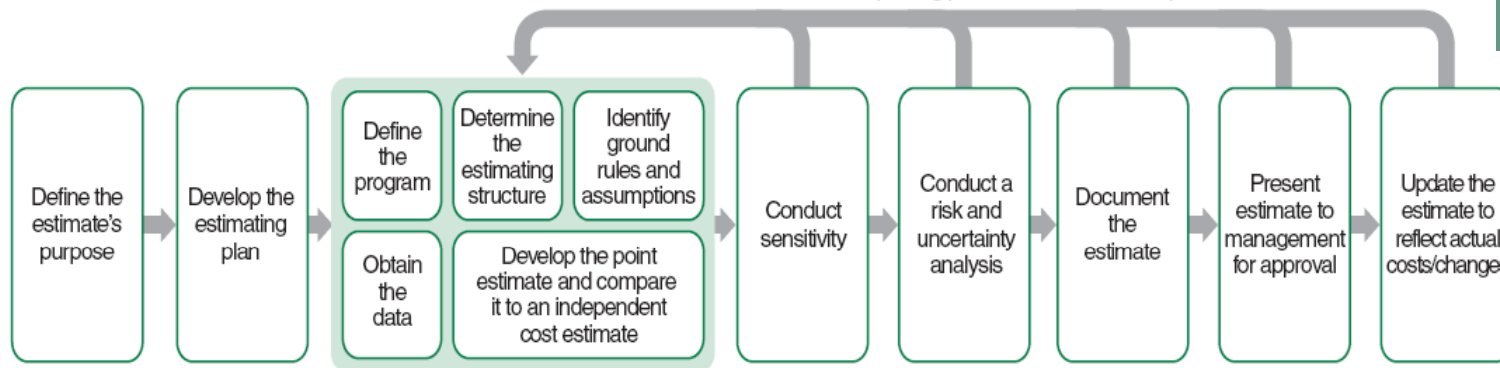
The confidence in the point or range of the estimate is crucial to the decision maker

Presentation

Documentation and presentation make or break a cost estimating decision outcome



Analysis, presentation, and updating the estimate steps can lead to repeating previous assessment steps



Source: GAO.

Each step of the GAO Guide's cost estimating process represent one or more Criteria in the LCCE Scorecard

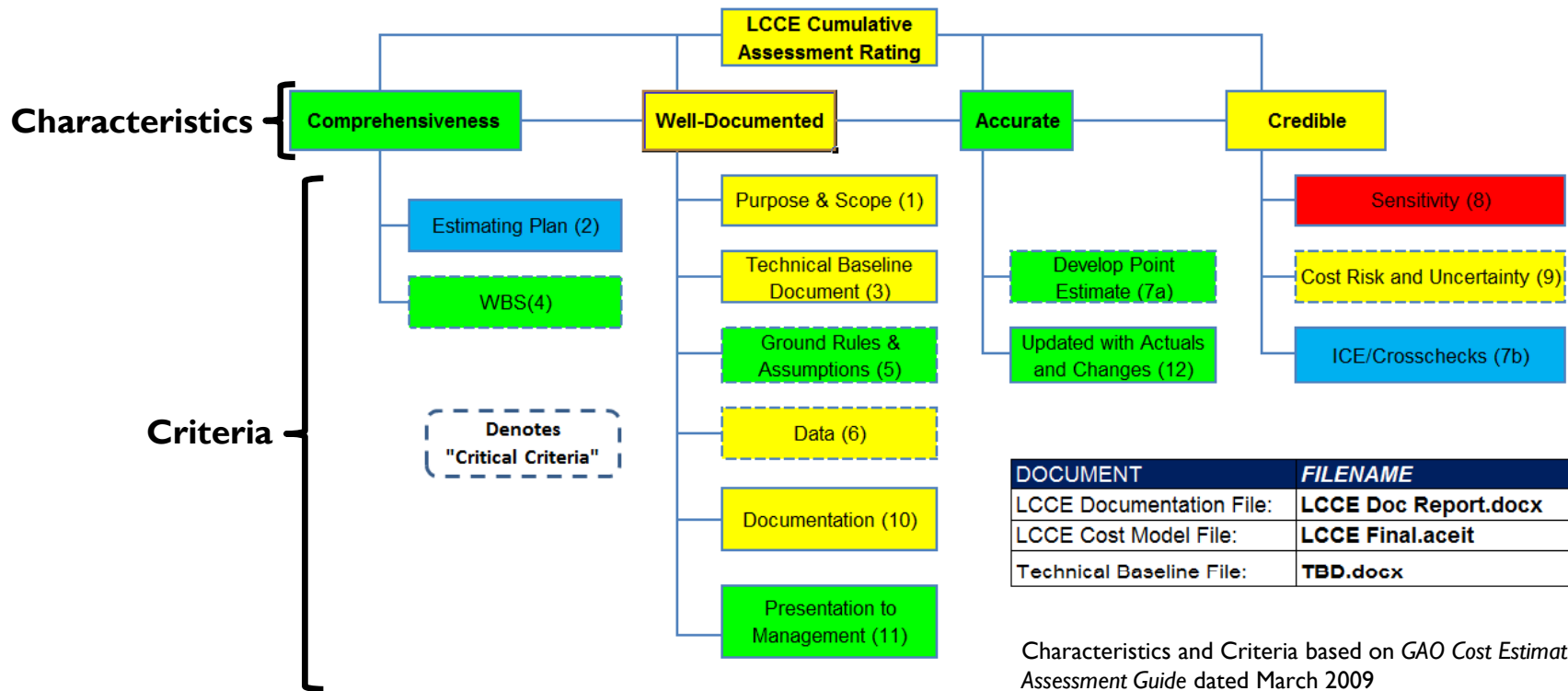
Scorecard Evaluation Criteria

- Each criterion is evaluated and assigned one of the following ratings (based on GAO assessment scale) :
 - **Met:** The LCCE provides complete evidence that satisfies the entire criterion
 - **Substantially Met:** The LCCE provides evidence that satisfies more than one-half of the criterion
 - **Partially Met:** The LCCE provides evidence that satisfies about one-half of the criterion
 - **Minimally Met:** The LCCE provides evidence that satisfies less than one-half of the criterion
 - **Not Met:** The LCCE provides no evidence that satisfies any portion of the criterion
 - **No Data:** There is not enough data to support a rating, or the criterion is not applicable
- Criteria ratings are rolled up to determine ratings for the parent Characteristic
 - Critical criteria mean that the overall characteristic rating cannot exceed the value of a critical criterion

LCCE Scorecard

Life Cycle Cost Estimate Scorecard Program XYZ

Prepared by: J. Doe
Assessment Date: 1-2-2013



Characteristics and Criteria based on GAO Cost Estimating and Assessment Guide dated March 2009

In order for an LCCE to be approved, the cumulative assessment rating must be must be Yellow or Green

LCCE Scorecard Sub-criteria

Scorecard Evaluation Criteria

- Sub-criteria give specific examples of what the assessment analyst should look for within the LCCE and supporting documentation
- Sub-criteria are assessed first and support the criteria ratings
- Each sub-criterion is evaluated and assigned one of the following ratings:

- Uses the same ratings as criteria (e.g., “Met”, “Not Met”), but more colors

Met	Green
Substantially Met	LT Green
Partially Met	Yellow
Minimally Met	LT Red
Not Met	Red
No Data	Blue

- Sub-criteria ratings are rolled up to determine ratings for the parent criteria based on the analyst’s assessment of the sub-criteria ratings and findings, rather than a strict average of the sub-criteria ratings

Scorecard Demonstration: Sub-criteria View

Purpose & Scope (1)				
Are the cost estimate's purpose and scope defined and documented?		Purpose & Scope:	Met	Green
Characteristic:		Purpose. Cost estimates generally have one of the following purposes: support the budgeting process, provide a baseline for evaluation of performance or support affordability and/or comparative analysis.		
<u>Well-Documented</u>	Sub-Criteria	(a) The purpose of the cost estimate should be well-defined and well-documented, and is determined by its intended use (e.g., high level program summary), as it helps determine the scope of the estimate; and	Met	Green
		(b) If the estimate is supporting a particular milestone or program review, it should be clearly identified.	Met	Green
		Scope. A life cycle cost estimate provides a structured accounting of all resources and associated cost elements required to develop, produce, deploy, sustain <i>and dispose of</i> a program. As such, the estimate and documentation should include		
		(c) A defined scope for the estimate that includes all elements suitable to the estimate's type; for example an LCCE includes technical scope, development, procurement, operating and support, and disposal costs; and	Met	Green
		(d) All applicable costs, including all past (sunk), present, and future cost (recommend at least FOC plus 10 years) for every aspect of the program, regardless of funding source;	Met	Green

- Sub-criteria give specific examples of what the assessment analyst should look for within the LCCE and supporting documentation
- Sub-criteria are assessed first and support the criteria ratings
- Criterion rating is based on the analyst's assessment of the sub-criteria ratings and findings, rather than a strict average of the sub-criteria ratings

Sub-criteria Overview

LCCE Scorecard Criteria	Characteristic	# of Sub-criteria
Purpose and Scope (1)	Well-Documented	4
Estimating Plan (2)	Comprehensive	2
Technical Baseline Document (3)	Well-Documented	3
Work Breakdown Structure (4)	Comprehensive	5
Ground Rules & Assumptions (5)	Well-Documented	5
Data (6)	Well-Documented	8
Develop Point Estimate (7a)	Accurate	6
ICE / Crosschecks (7b)	Credible	4
Sensitivity (8)	Credible	3
Cost Risk & Uncertainty Analysis (9)	Credible	8
Documentation (10)	Well-Documented	7
Presentation to Management (11)	Well-Documented	2
Updated with Actuals & Changes (12)	Accurate	3

***Bold criteria are Critical**

Purpose and Scope Sub-criteria

What does it say?

“(c) A defined scope for the estimate that includes all elements suitable to the estimate’s type; for example an LCCE includes technical scope, development, procurement, operating and support, and disposal costs; and

(d) All applicable costs, including all past (sunk), present, and future cost (recommend at least FOC plus 10 years) for every aspect of the program, regardless of funding source;”

What are we looking for?

- A clearly stated scope section for the estimate
- Include
 - All phases of the program
 - All aspects of the program “...*regardless of funding source.*”
 - Timeframe of the program
 - Start Date, End Date, etc.

Example

- “Scope
This LCCE reflects the costs to the program required to procure, sustain and support 13 mission aircraft and electronic system platforms to meet short range surveillance mission needs. This includes all Acquisition costs to reach FOC (FY18) as well as all Operating and Support costs through FY70, the assumed end of the program.”

Estimating Plan Sub-criteria

What does it say?

“(a) The cost team - the team should have an appropriate number and mix of resources; and
 (b) The estimate schedule - the cost team should be allotted adequate time for the scope of the estimate;”

What are we looking for?

- Appropriate resources for the estimate to be completed
- Names and contact information for the estimating team
- An estimate schedule
 - Reflective of the estimate scope
 - Does the team have enough time?
- Estimating tools used
 - e.g., ACE, CO\$TAT

Examples

Name	Organization – Role	Telephone
John Doe	Level III cost Analyst	571-366-1400
Jane Roe	ICEAA – CCEA	571-366-1400

Products	Planned	
	Start Date	End Date
Cost Estimating Plan	10 Feb 2012	12 Apr 2012
CEBD	20 Apr 2012	15 Jun 2012
Cost Model	25 May 2012	05 Sep 2012
LCCE Presentation	29 Aug 2012	20 Sep 2012
LCCE Report	20 Sep 2012	30 Oct 2012

- Professional Cost Certifications

Technical Baseline Document Sub-criteria

What does it say?

- “(a) Have a technical baseline, contained in a single document, that is signed by the PM;”
- (b) The technical baseline document should include descriptions of the following: requirements, purpose, technical characteristics, development plan, acquisition strategy, operational plan, and risk; and
- (c) Explain the scope of the work in a manner consistent with the approved program of record as defined in the MNS, ORD, AP, APB, IMS, TEMP, ILSP.

What are we looking for?

- Include a Technical Baseline Document (TBD) with the submission of the LCCE
 - PM signature included
- TBD includes a sufficiently detailed description of the program
- TBD consistent with supporting approved program documents
 - Mission Needs Statement, Operational Requirements Document, etc.
- Evaluation of consistency between the TBD and the estimate is performed in the “Ground Rules & Assumptions” criterion

Work Breakdown Structure Sub-criteria

What does it say?

“(a) Be product-oriented at the parent-level and decomposed to an appropriate level of detail (at least three levels of decomposition) to ensure that cost elements are neither omitted nor double counted;...

(d) Provide a standardized way for collecting data across the program - leverages, uses or is mappable to a standard WBS such as the examples shown in the *GAO Guide* to provide a standard way for collecting data across the program; and”

What are we looking for?

- A WBS sufficiently detailed for the state of the program
- Standardized way of collecting data for updating the current estimate and creating future estimates
- Use of standard WBSs, with program customization as appropriate

Example

- Standard WBSs by commodity
 - IT WBS, Facilities WBS, Ship WBS, Aircraft WBS, etc.

WBS	Element Name
1.0	Investment
1.1	System XYZ
1.1.1	Program/Project Management
1.1.1.1	Planning Phase Program/Project Management
1.1.1.1.1	Government Personnel
1.1.1.1.2	Contractor Personnel
1.1.1.1.3	Government TDY
1.1.1.1.4	Indirect Support
1.1.1.1.5	Non-labor

Ground Rules & Assumptions Sub-criteria

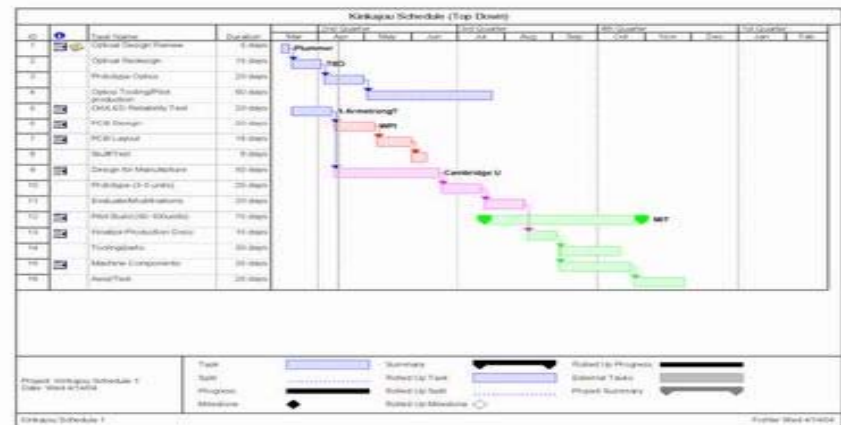
What does it say?

“(a) The estimate should document global GR&As that apply to the entire estimate. Global GR&As should include, at a minimum, the following items: (a-1) Program Schedule, (a-2) Base Year, (a-3) Inflation Indices, (a-4) Dependencies on other organizational entities, and the effect on the estimate if the assumptions fail, (a-5) Government-furnished equipment”

Examples

- “The base year of the estimate is 2012.”
- “The inflation rate is 2.4% This is based on interpolating the rates provided in Table 2-2 of the FY2012 Analytical Perspectives provided by the Office of Management and Budget.”
- “As the technology component of both programs, the XYZ Program is tightly interwoven with the ABC Program. These programs own the defense technologies which are deployed to the field, therefore the XYZ Program inherits enablement requirements and technology schedules from the ABC Program.”

- Program schedule
 - Program Start Date
 - FOC Date
 - IOC Date
 - Hardware/Software Refresh
 - End of life
 - etc....



Ground Rules & Assumptions Sub-criteria

What does it say?

“(b) The estimate should also define element specific GR&As which are unique to each program. These element-specific items could include items such as: operations concept, quantities, maintenance concepts, technology refresh schedules, and items specifically excluded from the estimate.;

(c) Both global and element specific GR&As should identify and explain items that have been excluded from the estimate;”

What are we looking for?

- Assumptions and ground rules that are not included in the global GR&As
- Element-specific GR&As listed with each WBS element as part of the basis of estimate
- Clear indication of those cost elements excluded from the estimate

Examples

- 2.4.5 Maintenance Refresh: “The system’s hardware refresh is scheduled for every three years beginning two years after FOC.”
- 1.1.6 Central Data Center Investment: “Data center services will be provided and are excluded from this estimate.”

Data Sub-criteria

What does it say?

“(a) Data should be collected from primary sources, if possible; (see GAO guide page 92 for a list of primary sources);

(b) Expert opinion/engineering judgment should be used sparingly as a data source (<20% of total estimated cost). Preferred data sources include the follow (in order of decreasing preference) - actual from completed programs, estimates at complete (EAC) for contracts greater than 90% complete, contract line item prices, historical budget data;”

What are we looking for?

- Well-documented and referenced sources
- Primary Sources
 - Basic accounting records
 - Data collection input forms
 - Cost reports
 - Historical databases
 - Interviews
 - Program briefs
 - Subject matter experts
 - Technical databases

Examples

- Primary Sources (unaltered data)
 - Actual costs, actual man hours
- Secondary Sources (altered data)
 - Estimates at completion, factors, studies

WBS	Element Name	Data Source
1.0	Investment	Rollup
1.1	System I	Rollup
1.1.1	Program/Project Management	Rollup
1.1.1.1	Planning Phase Program/Project Management	Rollup
1.1.1.1.1	Government Personnel	Interview with Mrs. Janet Doe on 01-18-2013
1.1.1.1.2	Contractor Personnel	Contract #1224-5464-996B
1.1.1.1.3	Government TDY	-
1.1.1.1.4	Indirect Support	2011-2012 Cost Reports from Program JKH

Data Sub-criteria

What does it say?

“(c) Raw data used as the basis for a CER, analogy or engineering build up should be included in the documentation;

(d) The data’s source, content, time, and units should be documented and traceable back to the source document;”

What are we looking for?

- Appendix of raw data attached
 - Unaltered data
- Traceability of the data to its original source

Examples

- *Partially Met* rating
 - “Cost Reports”
 - “IT Subject Matter Expert”
- *Met* rating
 - “Subject Matter Expert J.Doe interview on 1/14/2012”
 - “2011-2012 Program XYZ cost reports”
 - “Contract # 1234-54321B-576”

Point Estimate Sub-criteria

What does it say?

- “(a) The estimate should use the most appropriate cost estimating methods (page 183 of GAO Guide).
 (a-1) Analogy early in the life cycle
 (a-2) Build-up when the scope is well defined
 (a-3) Extrapolation from actual cost data towards the start of production;
 (a-4) Cost Estimating Relationships and Parametric models should also be considered.
 (a-5) Engineering Judgment or Expert Opinion is only appropriate very early in the life cycle and should compose no more than 20% of the estimate”

Examples

Analogy

System	S-100	S-200
Size	12k ft ²	16k ft ²
Cost	\$5.2M	\$6.9M

$$\$5.2M * (16,000/12,000) = \$6.9M$$

After normalizing between the two systems.

Parametric / CER

- CER for Site Activation as a function of Number of Workstations:

$$\text{SiteAct}(\$K) = 82.8 + 26.5 * \text{NumWkstn}$$

- Estimated based on 11 data points for installations ranging from 7 to 47 workstations

Engineering Buildup

Item	Qty	Est. Cost/Unit (\$K)	Est. Total Cost
Small Servers	7	\$10.0	\$70.0
Medium Servers	3	\$25.0	\$75.0
Large Servers	5	\$100.0	\$500.0
Windows 7 Licenses	1200	\$0.2	\$240.0
MS Office Licenses	1000	\$0.1	\$100.0
Integration FTEs	10	\$150	\$1500.0
Total Year 1 Cost			\$2,485.0

Point Estimate Sub-criteria

What does it say?

“(b) Estimates of software costs should be based on software cost estimating best practices (i.e. should be based on software sizing, using SLOC, FP, object, use case or other counts);

What are we looking for?

- Use of software sizing methods
 - Software Development
 - Software Maintenance

Examples

- Sizing
 - Function Point Analysis (FP)
 - Source Lines of Code (SLOC)
 - Object Point Analysis
- Complexity
 - Intended use
 - Language
- Development Team Capability
 - Developer skill
 - Schedule constraints

Point Estimate Sub-criteria

What does it say?

“(e) The point estimate should be adjusted properly for inflation;”

What are we looking for?

- The base year estimate accurately inflated to then year values
- Inflation based on the indices presented in the ground rules and assumptions
- Do not add BY and TY dollars to each other

Example

Program XYZ BY2011\$			FY2010 (sunk)	FY2011	FY2012	FY2013	FY2014	FY2015	TOTAL
1.0	Planning and Program Management (PMO)		5,460,116	3,547,610	3,868,411	3,868,411	3,839,851	3,782,731	20,584,397
	Program XYZ TY\$		FY2010 (sunk)	FY2011	FY2012	FY2013	FY2014	FY2015	TOTAL
2.0	1.0	Planning and Program Management (PMO)	5,353,054	3,547,610	3,945,779	4,024,694	4,074,880	4,094,549	20,946,018
2.1									
2.1.	2.0	Acquisition	42,362,654	30,822,194	34,972,596	37,218,793	17,719,934	9,250,298	163,096,170
2.	2.1	System Development	12,063,080	16,875,662	25,078,054	27,126,360	17,334,998	9,250,298	98,478,154
2.	2.1.1	System 1	5,052,054	4,449,723	5,724,428	5,607,770	-	-	20,833,975
2.	2.1.1.1	SW Dev - Project Initiation	-	-	-	-	-	-	-
2.	2.1.1.2	SW Dev - SELC	3,600,035	2,648,558	4,009,517	4,089,708	-	-	14,347,819
2.1.	2.1.1.3	Independent Testing	667,045	201,224	665,392	447,553	-	-	1,981,214
2.	2.1.1.4	Training	784,974	1,599,940	1,049,519	1,070,509	-	-	4,504,942
2.	2.1.2	System 2	6,376,573	9,474,078	9,100,430	9,260,585	4,561,018	-	38,772,684
2.	2.1.2.1	SW Dev - Project Initiation	-	-	-	-	-	-	-
	2.1.2.2	SW Dev - DBMS SELC	5,879,259	8,781,281	7,638,933	7,791,712	3,413,280	-	33,504,465
	2.1.2.3	Independent Testing	497,314	692,797	665,392	447,553	105,992	-	2,409,048

Independent Cost Estimate and Crosschecks Sub-criteria

What does it say?

- “(i) An independent cost estimate was performed; and
- (j) The point estimate was compared to the ICE, and any significant differences were identified and reconciled.”

What are we looking for?

- An ICE report
- Reconciliation of differences between the ICE and the Program’s initial LCCE

Example

- Rated “Blue” if no ICE was performed.

Independent Cost Estimate and Crosschecks Sub-criteria

What does it say?

“(h) For high dollar cost elements, the cost estimate should be cross-checked using a different methodology;”

What are we looking for?

- Crosschecks on key cost drivers
- Second estimating methodology

Example

- “The average application cost is based on the CER described above in section 5. Subjective parameters were established using ACEIT’s built-in “Advanced” risk modeling functionality. These parameters were cross-checked referencing the Air Force Cost Analysis Agency (AFCAA) Cost Risk Handbook (CRH).”

Sensitivity Analysis Sub-criteria

What does it say?

- “(a) The analysis should identify key cost drivers and their parameters and assumptions should be examined;
- (b) The analysis should not be based on arbitrary plus or minus percentages, rather the ranges should be based on well-documented data sources; and;”

What are we looking for?

- Inputs based analysis of cost sensitivity
- Key cost drivers and parameters identified
- Discussion regarding assumptions from GR&As
- A matrix of parameters varied in the sensitivity analysis
 - Range of values (high, low)
 - Justification for ranges

Example

Cost Driver	Low	Most Likely	High	Source
Operations & Maintenance Start Date	2014	2016	2017	Based on analysis of the IMS.
# of Software Development Contractors	1	2	3	Based on acquisition strategy and number of contracts use on an analogous program.
Software Development Growth Percent	0%	0%	15%	Based on average SLOC growth for programs X, Y, and Z.
Number of Users	6,400	7,200	7,900	Based on analysis of variance on user population.
Software Development Complexity Factor	1.1	1.2	1.3	Based on SME analysis of software requirements

Sensitivity Analysis Sub-criteria

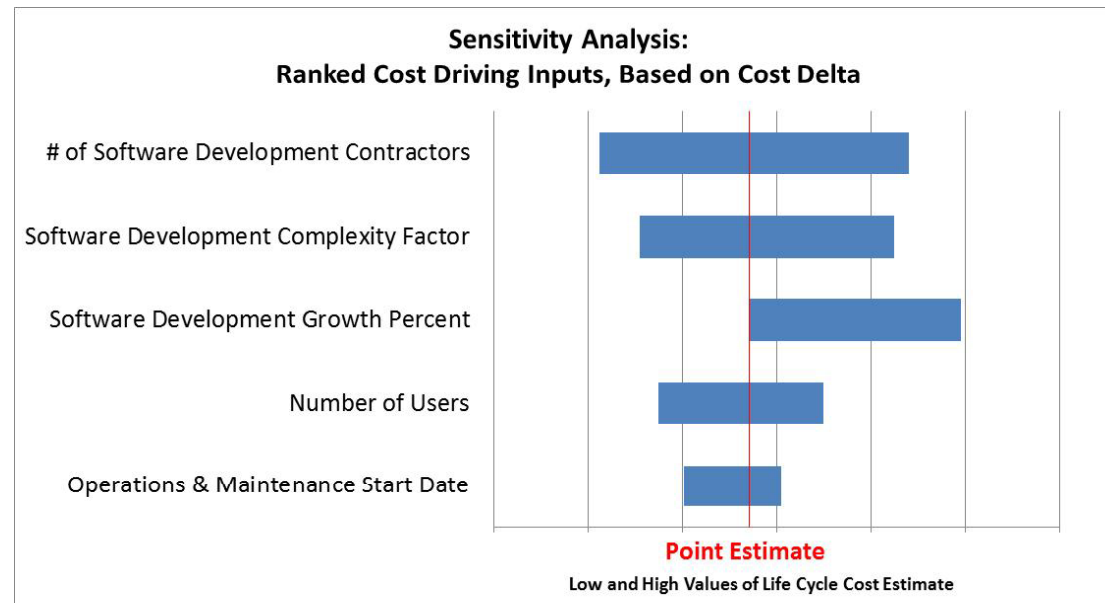
What does it say?

“(c) The analysis should be documented, and the re-estimate should be repeated for parameters associated with key cost drivers (e.g., Tornado Chart).

What are we looking for?

- Documentation of parameters varied in the sensitivity analysis
- A discussion of the analysis results
 - Primary cost drivers

Example



Risk and Uncertainty Analysis Sub-criteria

What does it say?

- “(b) For each WBS element or GR&A input, risk associated with the source of the data and the methodology in the estimate, should also be considered;
- (c) A probability distribution for each cost element’s uncertainty or each input variable’s uncertainty should be modeled to identify risk;”

What are we looking for?

- A complete list of variables used in the risk analysis
 - Variable name
 - Distribution used
 - Distribution parameters
 - Justification for distribution

Example

Variable or WBS Elements	Distribution Type	Parameter 1	Parameter 2	Parameter 3	Data Source(s)
# of Govt FTEs	Triangular	Low = 15	ML = 22	High = 42	Engineering Judgment
# of Contractor FTEs	Triangular	Low = 30	ML = 38	High = 50	Engineering Judgment
Contractor Labor Rates	LogNormal *	m = \$145	s = \$34	N/A	Contract Data (2007 – 2011)
SLOC Count	LogNormal *	m = 800K	s = 350K	N/A	Program Office Requirements (ORD)
Tech Refresh Rate (Med servers)	Triangular	Low = 50% per 3yrs	ML = 80% per 3yrs	High = All per 3yrs	O&M Data (2002 – 2011)
Cost per Med Server Upgrade	LogNormal *	m = \$18K	s = \$6.5K	N/A	Contract Data (2007 – 2011)

Risk and Uncertainty Analysis Sub-criteria

What does it say?

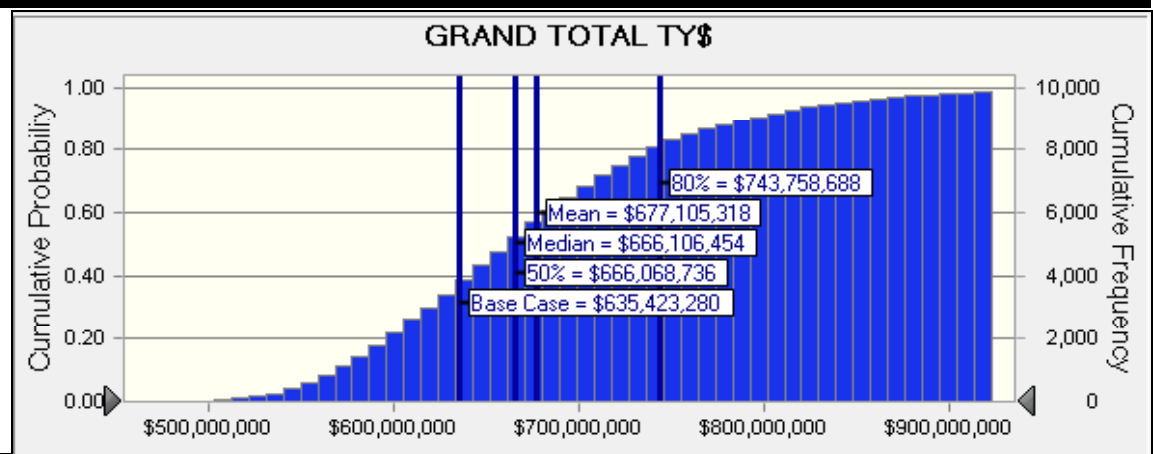
- “(e) An S-curve of total possible costs, with alternative cost estimate probabilities, should be developed by applying an acceptable risk method such as Monte Carlo simulation or scenario based risk analysis;
- (f) A cumulative probability should be associated with the point estimate;”

What are we looking for?

- An S-Curve based upon the Risk and Uncertainty Analysis identifying the point estimate (and its associated percentile), 80th percentile, 50th percentile and the mean

Examples

“The point estimate of \$635.42M has a confidence level of 39.4%.”



	Point Estimate	Confidence Level	50% CL	80% CL
Total Program Cost	635.42M	39.4%	\$666.07M	\$743.76M

Documentation Sub-criteria

What does it say?

“(a) Supporting data and their sources to ensure traceability;”

...

“(d) Each of the following sections: executive summary, introduction, descriptions of methods, sensitivity analysis, risk and uncertainty analysis.”

What are we looking for?

- Inclusion of raw data and sourced with references detailed enough to retrieve the data
- Documentation consistent with the best practices described in the *GAO guide* (Chapter 16)

Examples

- Partially Met rating
 - “Cost Reports”
 - “IT Subject Matter Expert”
- Met rating
 - “Subject Matter Expert J.Doe interview on 1/14/2012”
 - “2011-2012 Program XYZ cost reports”
 - “Contract # 1234-54321B-567”

Documentation Sub-criteria

What does it say?

“(b) Step by step descriptions of estimate methodology, for each WBS element, so that a cost analyst could replicate the estimate;

What are we looking for?

- Enough detail to allow for reproducibility of the estimate
- Inclusion of the cost model helps, but is not, in itself, sufficient
- This extends to an understanding of the methodology behind the calculations

Examples

- *Minimally Met*
 - “(EMRelCER*EMRelUnits)*.2”
- *Met*
 - “The cost of Engineering Change Proposals was calculated as a percentage of total airframe cost. This percentage was assumed to be 10% as the airframe constitutes a ill-defined system as per the guidance in the POM-Initiative Handbook.

$$ECP=(0.10)*(airframe\ cost)”$$

Documentation Sub-criteria

What does it say?

“(c) The results of the estimates, shown in narrative and tabular form, specifically the time-phased Base Year estimate by WBS element (with base year identified), time-phased Then Year estimate by WBS element, the risk-adjusted 50% CL Then Year estimate by WBS element, and the risk-adjusted 80% CL Then Year estimate by WBS element;”

Examples

Program XYZ 50% Risk Adjusted				FY2010 (sunk)	FY2011	FY2012	FY2013	FY2014	FY2015	TOTAL		
1.0	Program XYZ 80% Risk Adjusted			FY2010 (sunk)	FY2011	FY2012	FY2013	FY2014	FY2015	TOTAL		
1.0	Program XYZ TY\$			FY2010 (sunk)	FY2011	FY2012	FY2013	FY2014	FY2015	TOTAL		
2.0	1.0	Program XYZ BY2011\$			FY2010 (sunk)	FY2011	FY2012	FY2013	FY2014	FY2015	TOTAL	
2.0	2.0	1.0	Planning and Program Management (PMO)			5,460,116	3,547,610	3,868,411	3,868,411	3,839,851	3,782,731	20,584,397
2.0	2.0	2.0	Acquisition			43,209,907	30,822,194	34,286,858	35,773,541	16,697,890	8,545,846	160,790,390
2.0	2.0	2.1	System Development			12,304,341	16,875,662	24,586,327	26,073,011	16,335,156	8,545,846	96,174,498
2.0	2.0	2.1.1	System 1			5,153,095	4,449,723	5,612,184	5,390,014	-	-	20,605,016
2.0	2.0	2.1.1.1	SW Dev - Project Initiation			-	-	-	-	-	-	-
2.0	2.0	2.1.1.2	SW Dev - SELC			3,672,036	2,648,558	3,930,899	3,930,899	-	-	14,182,393
2.0	2.0	2.1.1.3	Independent Testing			680,386	201,224	652,345	430,174	-	-	1,964,129
2.0	2.0	2.1.1.4	Training			800,673	1,599,940	1,028,940	1,028,940	-	-	4,458,494
2.0	2.0	2.1.2	System 2			6,504,104	9,474,078	8,921,990	8,900,985	4,297,950	-	38,099,107
2.0	2.0	2.1.2.1	SW Dev - Project Initiation			-	-	-	-	-	-	-
2.0	2.0	2.1.2.2	SW Dev - DBMS SELC			5,996,844	8,781,281	7,489,150	7,489,150	3,216,410	-	32,972,835
2.0	2.0	2.1.2.3	Independent Testing			507,260	692,797	652,345	430,174	99,878	-	2,382,455

Documentation Sub-criteria

What does it say?

“(g) In addition, an electronic copy of the cost estimate should be provided. The electronic copy of the cost estimate should be consistent with all aspects of the documentation including ground rules and assumptions, estimating methodology, calculations, and data sources.”

What are we looking for?

- Electronic copy of cost model
- Electronic copy of Risk and Sensitivity analysis
- Consistency with the LCCE
 - Accuracy of calculations for large cost elements
 - Spot checks for remainder of the estimates' calculations

Examples

- Cost model tools
 - Excel
 - ACE
 - MS Access
- Risk analysis tools
 - ACE
 - @RISK
 - Crystal Ball

Presentation to Management Sub-criteria

What does it say?

- “(a) The briefing should include an overview of the program’s technical foundation and objectives, the life cycle cost estimate in time-phased constant year dollars,
- (b) Feedback from management should be acted upon and documented, along with management’s approval of the estimate.”
-

What are we looking for? / Examples

- A presentation consistent with the best practices described in the *GAO Guide* (Chapter 17)
- Change log for the LCCE
 - If applicable

Version	Date	Author	Change Description
1.1	Nov 2012	C.Trail	Added actuals from FY2012 to version 1.1

- PM Signature on the LCCE

Updated with Actuals and Changes Sub-criteria

What does it say?

- “(a) The estimate should be regularly updated to reflect changes in technical or program assumptions or new program phases of milestones;
- (b) The estimate should replace estimates with actual costs from annual updates and report progress on meeting cost and schedule estimates; and
- (c) The estimate should include results of lessons learned, with precise reasons for why actual costs or schedules differ from the estimate.”

Example

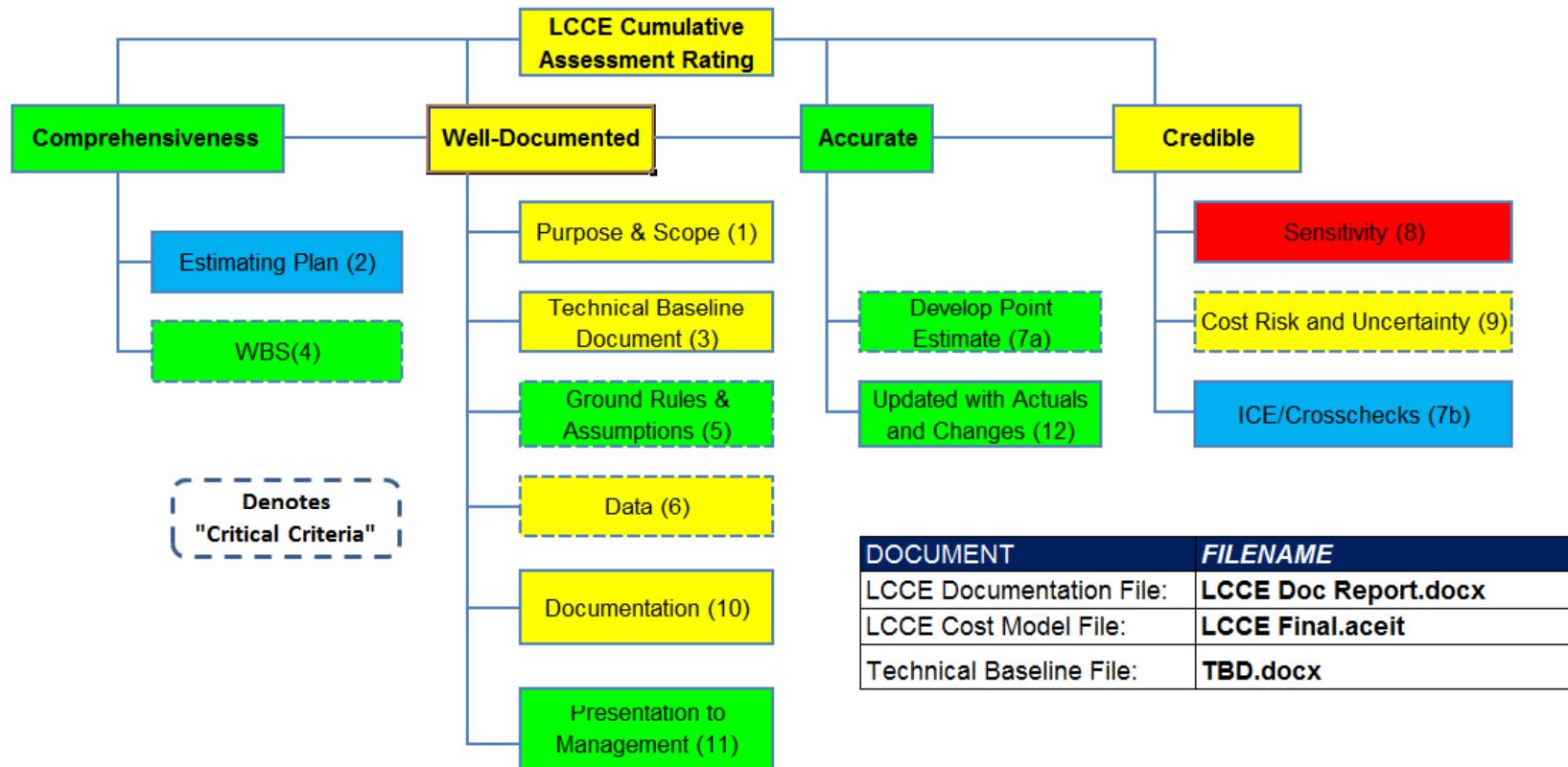
Program XYZ BY2011\$				FY2010 (sunk)	FY2011	FY2012	FY2013	FY2014	FY2015	TOTAL
1.0	Planning and Program Management (PMO)			5,460,116	3,547,610	3,868,411	3,868,411	3,839,851	3,782,731	20,584,397
2.0	Acquisition			43,209,907	30,822,194	34,286,858	35,773,541	16,697,890	8,545,846	160,790,390
2.1	System Development			12,304,341	16,875,662	24,586,327	26,073,011	16,335,156	8,545,846	96,174,498
2.1.1	System 1			5,153,095	4,449,723	5,612,184	5,390,014	-	-	20,605,016
2.1.1.1	SW Dev - Project Initiation			-	-	-	-	-	-	-
2.1.1.2	SW Dev - SELC			3,672,036	2,648,558	3,930,899	3,930,899	-	-	14,182,393
2.1.1.3	Independent Testing			680,386	201,224	652,345	430,174	-	-	1,964,129
2.1.1.4	Training			800,673	1,599,940	1,028,940	1,028,940	-	-	4,458,494
2.1.2	System 2			6,504,104	9,474,078	8,921,990	8,900,985	4,297,950	-	38,099,107
2.1.2.1	SW Dev - Project Initiation			-	-	-	-	-	-	-
2.1.2.2	SW Dev - DBMS SELC			5,996,844	8,781,281	7,489,150	7,489,150	3,216,410	-	32,972,835
2.1.2.3	Independent Testing			507,260	692,797	652,345	430,174	99,878	-	2,382,455

Conclusions

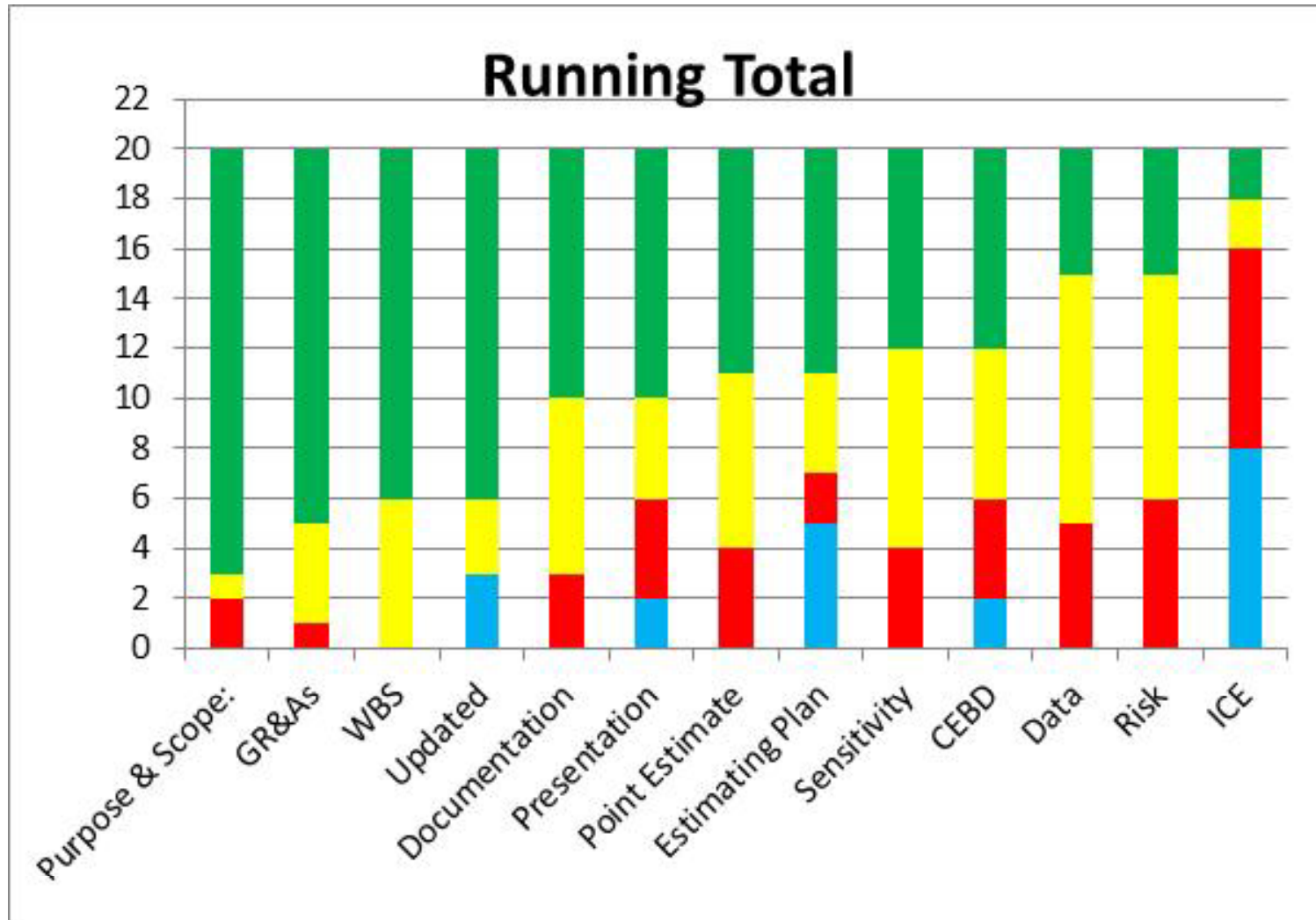
Example Scorecard

Life Cycle Cost Estimate Scorecard Program XYZ

Prepared by: J. Doe
Assessment Date: 1-2-2013



Cumulative Scorecard Review



Applications of Scorecard Results

- Identify key findings from LCCE assessments
 - Lack of Traceability: The LCCE documentation and the model should be detailed enough that the analyst performing the estimate can reproduce the Point Estimate, the Sensitivity Analysis, and the Risk and Uncertainty Analysis
 - Including a technical and programmatic baseline, Cost Model, and properly sourced Data are crucial
 - Missing or Incomplete Risk & Uncertainty Analyses: Comprehensive, data-driven risk and uncertainty analysis is needed to produce a reasonable coefficient of variation (CV)
- Support Acquisition and Financial Decisions
- Use as a Program Management Tool
 - Clearly Communicates LCCE Assessment Process & Criteria
 - “Open book” philosophy gives PM’s advance insight as to how LCCE’s will be assessed
 - Represents implementation of best practices found in the *GAO Cost Estimating and Assessment Guide*

Summary

- The scorecard provides a structured approach to evaluating Life Cycle Cost Estimates under resource constraints (time, personnel)
- The scorecard documents the assessment in a way that can be communicated to Program Offices
- The scorecard provides summary-level guidance for development of LCCEs based on the *GAO Cost Estimating and Assessment Guide*
- Facilitates knowledge of collective LCCE quality across organizations

Next Steps...

- Tracking LCCE scores to quantify progress and identify areas most in need of improvement
 - Across organizations (departments, divisions, components, etc.)
 - At varying scorecard levels (Cumulative ratings, Characteristics, Criteria, Sub-Criteria)
 - A single program's LCCEs over time
- Revisions to the scorecard
 - Increased clarity in sub-criteria where necessary
 - “Raising the bar” in areas of consistently high performance
- Training within programs based on areas identified as deficient by tracking of LCCE scores
- Training of analysts performing scorecards to ensure consistency of scorecard ratings

Questions?

Casey D. Trail (ctrail@technomics.net)
Colleen Craig (ccraig@technomics.net)
David Brown (dbrown@technomics.net)

THANK YOU!

Backup

Scorecard Demonstration: Criteria View

Characteristics			Current Status	Description of Characteristics
LCCE Cumulative Assessment Rating			Yellow	
Characteristics	Comprehensiveness (2,4)		Yellow	The estimate's level of detail ensures that cost elements are neither omitted nor double-counted. The estimate is thoroughly documented, including source data and significance, clearly detailed calculations and results and explanations for choosing a particular method or reference.
	Well-Documented (1,3,5,6,10,11)		Yellow	
	Accurate (7,12)		Green	The estimate is quantitatively unbiased, is neither overly conservative nor overly optimistic, and is based on an assessment of most likely costs.
	Credible (8,9,7)		Red	Discusses any limitations of the analysis from uncertainty or biases surrounding data or assumptions.

Section 1

Comprehensiveness		Importance	Practice Met?	Current Status	Justification for Current Status
<i>Justification for Current Status</i>					
Criteria	<u>Estimating Plan (2)</u>	Non-critical	No Data	Blue	
	<u>WBS(4)</u>	Critical	Partially Met	Yellow	

- Justification for each criterion rating are added to the summary view, clearly identifying what was met and what was not met
- Criteria ratings and justification are used to inform the ratings of the four key characteristics, which are then used to determine the cumulative assessment rating
- If any of the characteristics are rated blue, then the LCCE cumulative assessment rating is blue. Otherwise, the cumulative assessment rating is decided by the analyst based on the characteristic ratings.