



BOE Development: Evaluation and Criteria

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▶ Introduction

- How can we improve the current BOE process?
- What is CRITERIA?
- Common BOE Definitions
- Examples of Criteria
 - Services
 - Hardware
 - Software
 - IT Network Hardware
- Metrics Building
 - FTE Composition
 - Effort
- Final Thoughts
- Questions?

▶ How can we improve the current BOE process?

- Usually the BOE process is murky and not streamlined
 - Dependent on proposal process
 - Estimates may be built subjectively as opposed to objectively (grading scale)
 - Lack of documentation and source data
 - Time consuming (time limitations)
- How heavily are the BOEs weighed in the proposal submission? How do we suggest to improve?
 - Use consistent processes and methodologies between proposals
 - Ultimately, let's think about CRITERIA
 - Use BOE engineering and cost experts that are knowledgeable
 - Implement a BOE grading process using CRITERIA as your cornerstone
 - *Think about different types of criteria to help with your basis*

Use Engineers/Cost Experts with Product Familiarity

► What is 'Criteria'?

- **Criteria:** - a principle or standard by which something may be judged or decided
-but what makes us choose one criteria over another?
- Why choose Software Lines of Code (SLOC)? What else adds to the complexity?

4. Estimation Methodology

Step 1: Standard Tasking

The process provides the initial forecast basis of estimate (from analogy of similar projects) against the technical framework. Estimates assume usage of methods for this step. The model includes: 1) FTE range estimates for “small”, “medium” and “large” projects for given state and project phase, 2) Tasking performed for each state and project phase against the technical framework, and 3) Associated technical framework element percentages.

Step 2: Mission Understanding

Project Size: The project size is an aggregate function of SLOC'd and project complexity

SLOC'd	Result (S/M/L)	Estimate SLOC	Auto-generated	New	Heritage	Equip SLOC	Coverage	Covered Project SLOC
	Medium	110,000	0%	93%	7%	106,150	95%	100,843

Project Complexity	Mission Complexity	Architecture/Design	# Software Systems	NPR 7150.2	NPR 7120.5D	NPR 8705.4
	8	Formal data/documentation (UML Models, design documents)	13	A, B	1	A (Very High to High)

JR Factor = 9

Risks and Challenges shown under Project Optimization

Resulting Project Size:
“Medium”

Standardize the Approach

▶ **Our Goal.....**

- Get you thinking about appropriate 'CRITERIA'
- Helps you evaluate/determine what drives the BOE
- Develop Criteria for grading BOEs
- **Identify Criteria Driving Cost**
 - Services, Hardware and Software have different criteria, but they all deal with:
 - Scope
 - Complexity
 - Magnitude
 - Criteria needs to fit the product

Criteria should reflect the scope, complexity and magnitude

▶ Common BOE Definitions

- **Scope:** Range or area covered by a certain activity. *Ex. Project size, goals, requirements, budget limitations*
- **Complexity:** Degree of contingency for difficulty
 - Easy
 - Medium
 - Hard
- **Magnitude:** Greatness of size, amount, extent and significance. Determines how many projects under specific SOW
- **Effort:** Something done through a determined attempt
- **Work:** Something produced, accomplished through effort; amount of activity done or required
- **Activity:** A specific action or function
- **Criteria:** a principle or standard by which something may be judged or decided

Develop criteria that reflects what drives the effort

▶ Examples of Criteria

■ Services

- Labor mix
 - Program Manager 2, Program Manager 4
 - System Engineering 4, System Engineering 2
- Staffing
 - Four Program Manager 2s, two Program Manager 4s
 - One System Engineering 4, three System Engineering 2s
- Tasks
 - Difficulty—easy, medium or hard
 - Has this task been done before? If not, probably more difficult than one that has been done in the past.
- Criteria can be varied as your imagination, must make sense

Optimize the most efficient use of manpower

► Defining Full-Time Equivalent (FTE) Composition

- FTE – Ratio # hours for particular effort *DIVIDED BY* working hours by week (typically 40 hours)

Size	Laydown	Labor Categories (Program Optimized)
L	15.95	- 0.2 PM1 - 1 PL 2 - 2 SMEs, one system, one sw - 4.25 Sr Engineers - 2.25 system, 2 sw - 4.5 Mid Engineers - 2.5 system, 2 sw - 4 Jr Engineers - 2 system, 2 sw

- Competition differentiators
 - Improved performance
 - Skill mix
 - Do more with less
 - Efficient Subject Matter Expert (SME) guidance
 - Reduced program risk

	Rate	No SME	FTE	W/SME guidance	FTE
SME	\$ 200.00	0 \$ -	-	0.5 \$ 100.00	1.00
Senior	\$ 150.00	3 \$ 450.00	4.50	2 \$ 300.00	3.00
Mid-Level	\$ 100.00	6 \$ 600.00	6.00	3 \$ 300.00	3.00
Junior	\$ 50.00	12 \$ 600.00	6.00	15 \$ 750.00	7.50
		21 \$ 1,650.00	16.50	20.5 \$ 1,450.00	14.50
		Reduce costs		12%	

Validate and Verify FTE Build-Up

▶ Examples of Criteria (continued)

- Hardware
 - Electronic components
 - Structure
 - Propulsion
- Example: Number of drawings
 - What made you choose ‘# of drawings’ as opposed to ‘the time it takes to evaluate’ or ‘the difficulty of drawings’?
 - # of drawings is only a starting point, but can be adjusted
 - Complexity, new design, new technology are examples

Criteria can be as varied as your imagination....must make sense

► Examples of Criteria (continued)

■ Software

- Dependent on Operating System (MAC, Windows, iOS)
- Integration—Does this save time and cost?
- Supportability—Does it cost more than other types of software? Phone support or on-site support?
- Reliability—prone to glitches, length of downtime for resolution
- Credibility—Historical satisfaction ratings, liked or loathed industry-wide?
- Scalability—Licensing costs go higher or remain the same?

■ Example: Lines of code per hour

- Software language: difficulty 3rd order, 4th order
- Integration to other software components
- Experience of team

Any relative criteria can work. Choose the best fit.

▶ Examples of Criteria (continued)

- IT Network Hardware (Bill of Material)
 - Servers
 - Difficulty of integration between platforms
 - Architecture (MAC, Windows, iOS)
 - Processing power (CPU)
 - Memory storage (Hard-disks, swap space, RAM)
 - Graphics display, computer graphics
 - Peripherals (CD-ROM drives, keyboards)

- Example: Integration of additional servers
 - Unique stand alone, common software interface, management tool that automates process to integrate
 - Cisco's management tool automatically adds and configures server to the system

Be able to defend these criteria during BOE write-up

▶ Developing Metrics

- Based on historical actuals
- Calculated on allocation schema
 - FTE
 - Funding Constraints
 - Skill level
 - Experience
 - Skill level, skill mix, years performing, quality
- Experience
 - Senior, Mid, Junior Level
 - Specific knowledge of product, general knowledge of product
 - Extensive training, certifications, years performing task
- Quality
- Degree of difficulty

Metrics applied consistently are meaningful

► What Determines the Criteria?

	Services			Hardware			Software		
	Scope	Complexity	Magnitude	Scope	Complexity	Magnitude	Scope	Complexity	Magnitude
Staffing	Experience	Req'ts # of Users # of Seats	# of FTE's \$/FTE (mix)	Experience	# of FTE's \$/FTE (mix)	# of FTE's \$/FTE (mix)	Experience	# of FTE's \$/FTE (mix)	# of FTE's \$/FTE (mix)
Bill-of-Materials (BOM)	N/A	Automated Integration Tools	# Servers	Long Lead # Parts	Redundancy Cross Strapping	N/A	COTS GUI	N/A	N/A
RDT&E	Experience Design	Program Plan IV&V # of Seats	Dev Training	SWAP KTPP's	'ilities % New Des Integration	# of Drawings # of Comp'nts	Experience Design # of SLOC	'ilities Integration	Rework - Reimplement Retest
Production	# of Docs	'ilities Integration # of Seats	# Service Lines # Seats	SWAP	'ilities Integration	# of Units	N/A	N/A	N/A
O&M	# Activities KTPP's	Amount of training	# Actions Allowed	Repair Facilities	# LRIP	Parts Obsolescence	Quality of Docs # of Defects and Type	# of SLOC	N/A

What drives the Criteria?

► Understanding the Criteria (grading scale)

- Understanding why we pick what we choose as our 'Basis'
- What made you choose # of drawings OR labor mix?
 - It is indicative of its complexity
- Determining the Effort Needed
 - How would you or how do you determine 'complexity'?
 - How do you determine what is 'EASY', 'MEDIUM' OR 'HARD' in terms of complexity?
- Give it a GRADE (Basis of Estimate)
 - Red = Poor
 - Yellow = Good, but could be better
 - Green = Very good
 - Blue = Excellent

Develop criteria that reflects what drives the effort

► Final Thoughts

- Similar does not equal 'same'.
 - The criteria must identify the differences
- Criteria must establish an objective assessment
- Identify sufficient criteria to give the analysis fidelity
- Determine if the data needs to be normalized or criteria added
 - Criteria needs to be consistent throughout historical data
- Consistency, accuracy, relevancy, objectivity
 - CEBoK provides the methodologies necessary for analysis
 - e.g. Modules: Cost Estimating Basics, Data Analysis, Earned Value Management
- Price realism and reasonable
 - Justification and eliminating doubts
 - Process and methodology
 - Validate and verify
 - Drivers
 - Historical data (analogous programs)
 - Criteria (Metrics, Parameters, Technical and Physical aspects)

► Ask yourself.....

- How does the scope, complexity and magnitude of the project determine the types of criteria needed?
- Is the criteria easy to identify and collect data on?
 - Is the criteria common among programs?
- Have appropriate metrics and parameters been identified?
 - Can you do a statistical analysis of data points collected?
- What determines the standards to be used for the BOE?
 - Proposal Manager
 - Size of the effort
 - Time allowed to do proposal
 - Data availability
- Define how these fit in your BOE
 - Criteria, Metrics, Parameters

BOE development is determined by proposal requirements

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