

Capability-Based Costing

Approaches to Pre-Milestone-A Cost Estimating

**Office of the Deputy Assistant Secretary of the
Army for Cost and Economics
(ODASA-CE)**

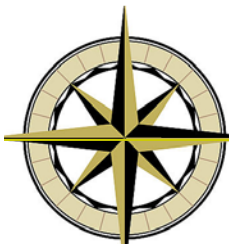
April 10, 2007



Agenda

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- Earlier Cost Analysis: The Changing DoD Culture
- The Capability-Based Costing Concept
- Data Sources and Tools
- Work to Date
- Summary and Future Work

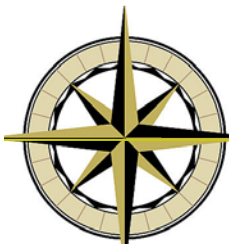


Early Cost Support and Changing DoD Culture

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- **2006 QDR Reported Need For Substantial Changes To How We Make Early Acquisition Decisions:**
 - DOD Must Be More Responsive In Providing Needed War-fighter Capabilities
 - Corporate Decision-Making Must Address These Needs Within Stricter Fiscal and Schedule Constraints
- **Increasing Emphasis on Having Life Cycle Cost Estimates Available for Milestone A and Other Early Decisions**
- **The Concept Decision Experiment**
 - Milestone A Decision To Be Tested On Four (4) Pilot Programs
 - Tri-Chair Group* Reviews the Trade Space to Decide on a Solution to Fill a Capability Gap
 - Evaluation Of Alternatives (EoA) Will Provide Decision-makers a Bounded Trade Space of Material and Non-Material Feasible Solutions

*Includes The Defense Acquisition Executive, The Vice Chairman Of The Joint Chiefs Of Staff, and The Director (PA&E)

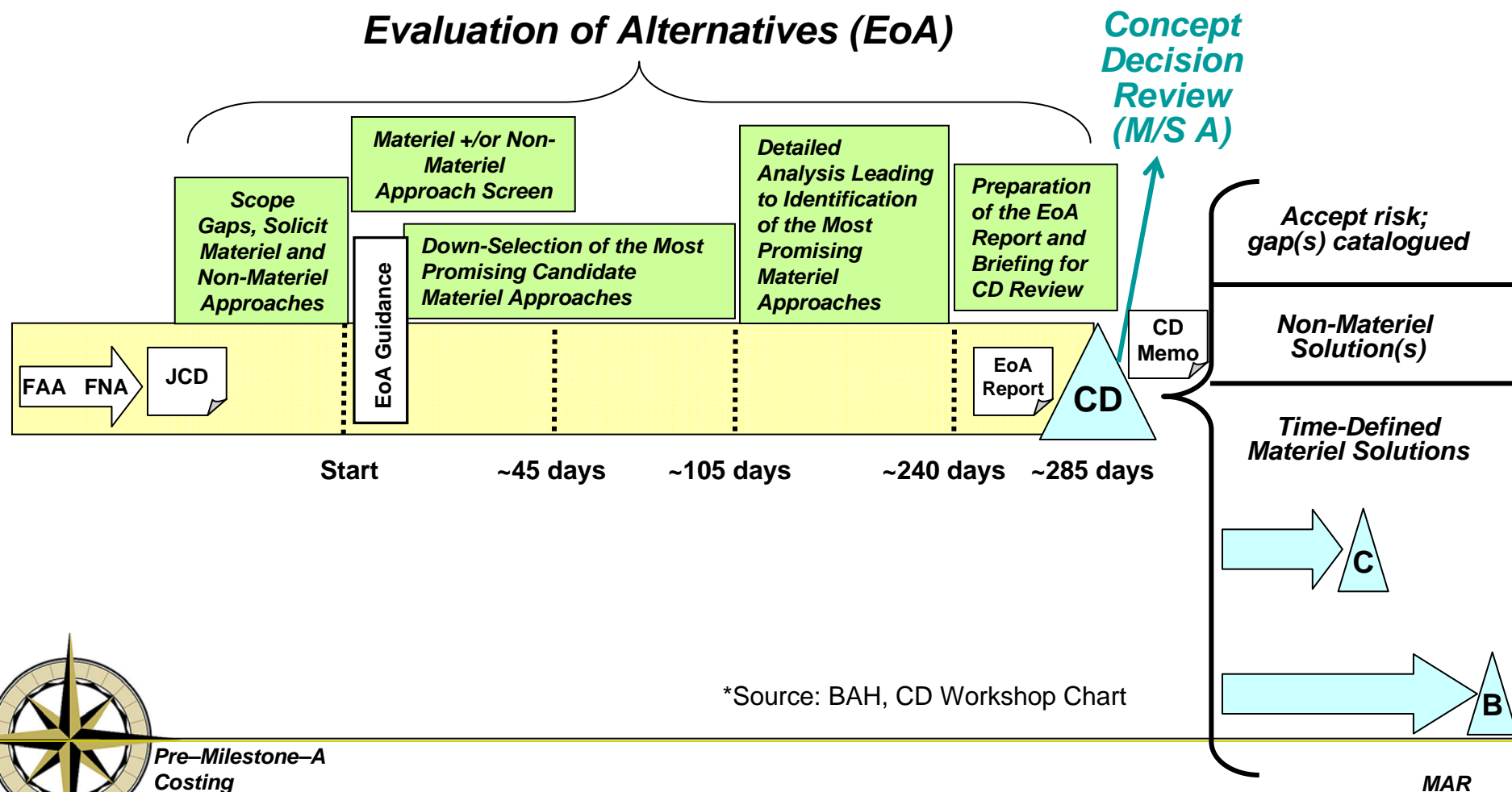


Pre-Milestone-A
Costing

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Proposed Concept Decision and EoA Process

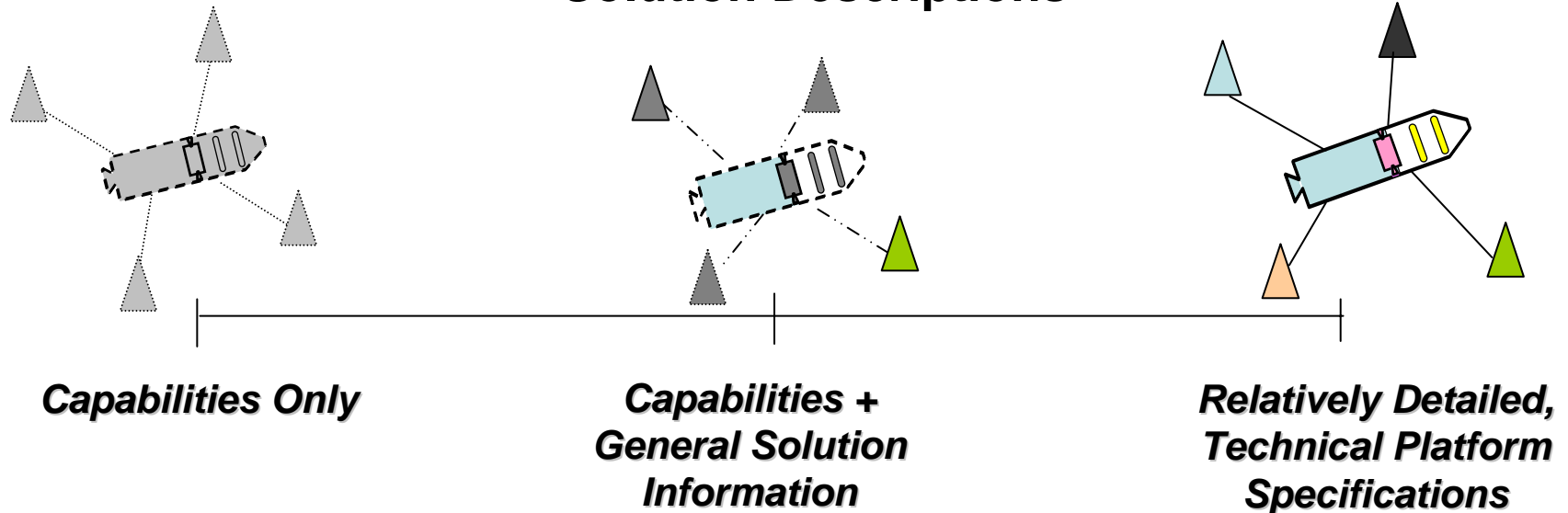
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Estimating Cost in Information-Poor Environments

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- Solutions Identified to Fill Capability Gaps are Very Often Poorly Defined. Available Information Can Range From a Listing of Desired Capabilities to (in Some Cases) High-Level Materiel Solution Descriptions



Capabilities Only

*Capabilities +
General Solution
Information*

*Relatively Detailed,
Technical Platform
Specifications*

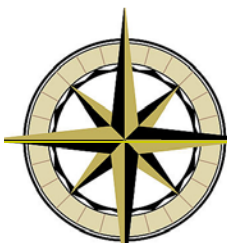
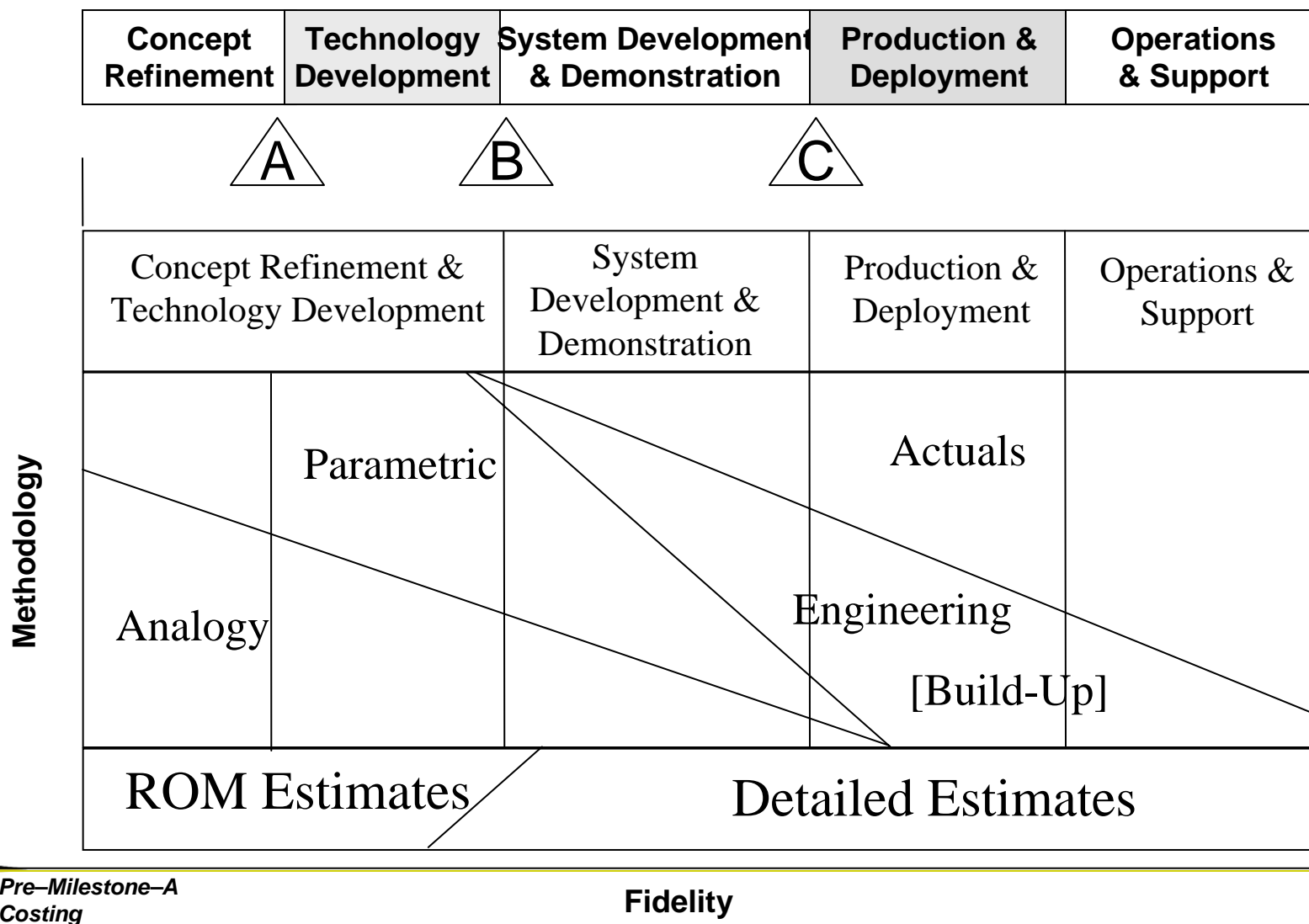
- How Can We Provide This Early-Stage Cost Information if We Have Little More Than a Set of Desired Capabilities?



Pre-Milestone-A
Costing

The Life Cycle Costing Spectrum

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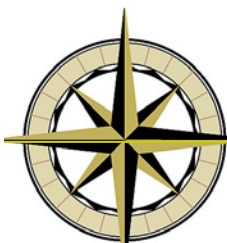
Capability-Based Costing Concept

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- We Can Use the Capabilities of Current Systems and Their Associated Costs to Provide ROM (Rough Order Of Magnitude) Estimates For Capability-filling Solutions to Decision-makers Early in the Acquisition Life Cycle

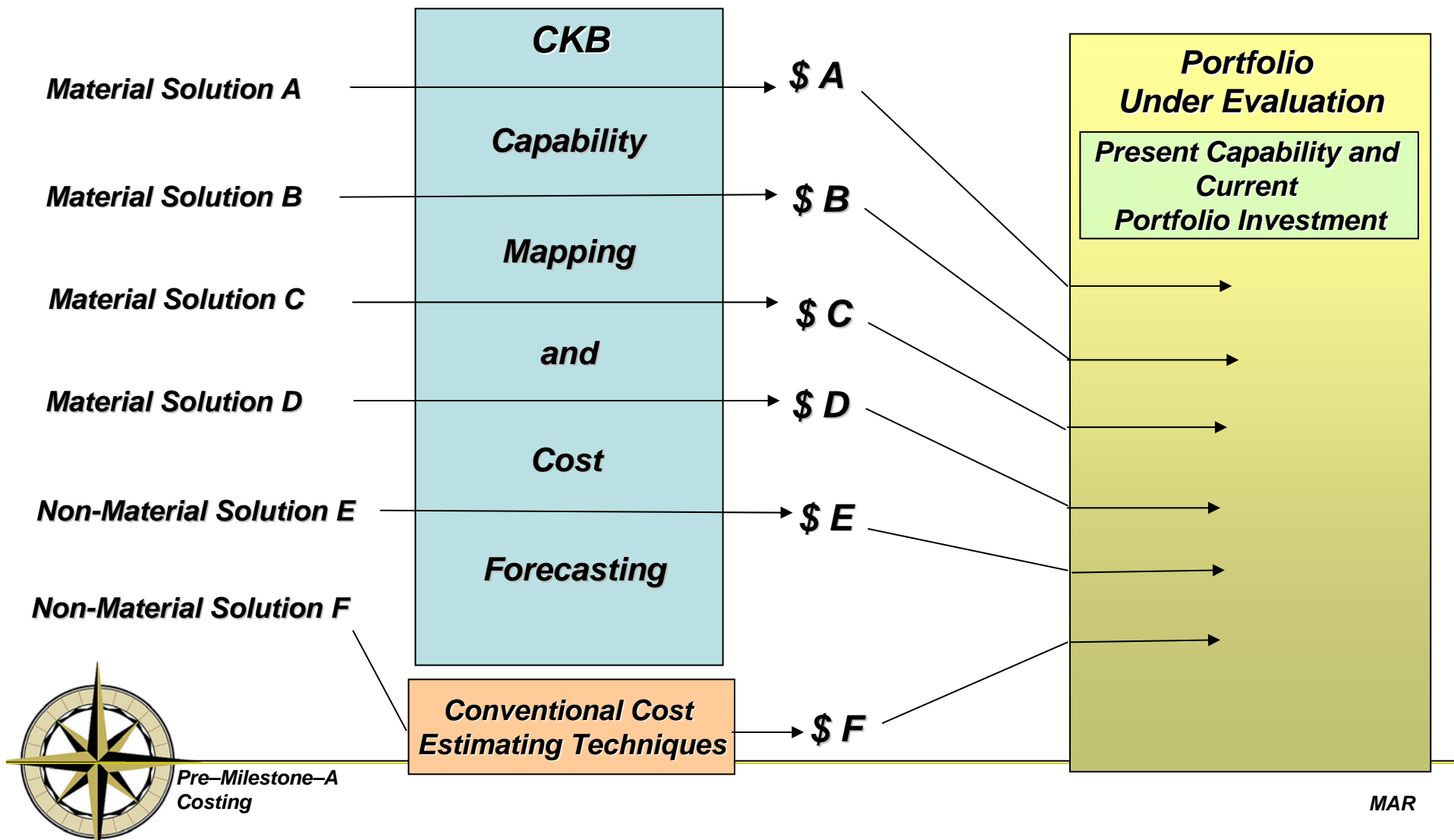


Capability Mapping and Forecast Development Enabled by the Capability Knowledge Base



Alternatives Evaluation Using the Capabilities Knowledge Base (CKB)

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The Capabilities Knowledge Base

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The Capabilities Knowledge Base Provides the High-Level System Capability, Cost, and Performance Data Required to Produce Cost Forecasts Within Stricter Timelines



**Capabilities-Based
Dictionary
and
Architecture**



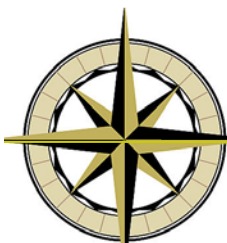
**Performance
Specification
Archive**



**Cost Forecasting
Toolboxes**

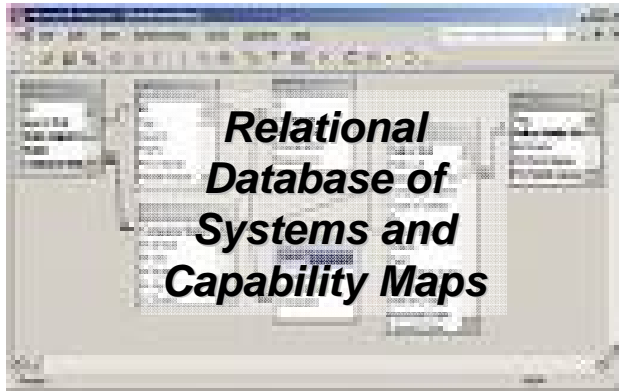


**Relational
Database of
Systems and
Capability Maps**

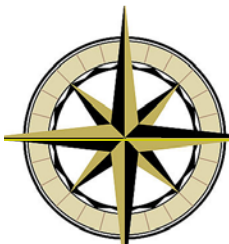


Capabilities Knowledge Base (CKB): Relational Database and Performance Specification Archive

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- The CKB Relational Database Currently Houses Data For Over 200 Current and Historical Systems
- CKB Construction Requires Collection of Current/Historical Data To Populate Over 20 Fields
- For Each Data Point, Capabilities Are Mapped
- Standardized List Of *Capability Categories* To Classify Entities
- Performance Specifications (KPPs, Other Technical Parameters) Housed in System Archive



The System Capabilities Dictionary

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1.0 Move

- 1.1 Maneuver Air
- 1.2 Maneuver Ground
- 1.3 Maneuver Water
- 1.4 Maneuver Manned
- 1.5 Maneuver Space
- 1.6 Maneuver Unmanned
- 1.7 Deploy
- 1.8 Transport

2.0 Shoot

- 2.1 Smaller-scale Effects
- 2.2 Larger-scale Effects

3.0 Communicate

- 3.1 Electronic Hardware and Software
- 3.2 Non-Electronic Systems
- 3.3 Battle Command Systems

4.0 Sense Environment

- 4.1 Electronic Sensor System
- 4.2 Non-Electronic Sensor System

5.0 Sustain

- 5.1 Supply
- 5.2 Maintain
- 5.3 Reconstitute

6.0 Protect

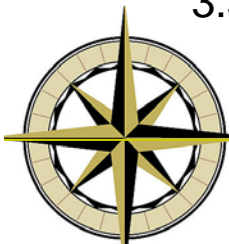
- 6.1 Survivability Systems
- 6.2 Data
- 6.3 Environment

7.0 Train

- 7.1 Training
- 7.2 Leader Development
- 7.3 Enroute Rehearsal

8.0 Data Entry

**Capabilities-
Based
Dictionary
and
Architecture**



Cost Forecasting Tools

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- **Bin And Bump Up**
 - **Current Systems are Binned and Weighted Using a Correlation Matrix and Individual Capability Weights**
 - **Proposed Solution is Estimated Using the Compilation of Relevant Systems and Their Respective Weights**

- **Jaccard Indexing**
 - **Tool That Measures How Alike/Different a Current System is From the Proposed Solution by Comparing Capabilities**
 - **Commonly Used in the Data-Mining Community**

- **CER-Based**
 - **Uses Capability and Performance Cost Drivers to Derive High-Level Costs**
 - **Most Appropriate When Some Technical Specifications Are Known**

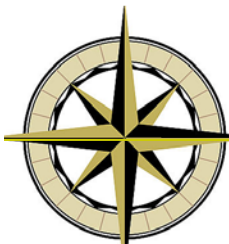
Early Cost Estimating Should Not Be Standardized; Tailored Analysis is Required



Work To Date

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- **CKB Development and Implementation**
 - **Over 200 Data Points Mapped**
 - **Corresponding Performance Archives**
 - **Rudimentary Toolboxes Developed**
 - **CKB Version 1.0 Available to ODASA-CE at H:/CR/Capabilities Knowledge Base**
- **JLTM Cost Pilot**
 - **Proof of Principle Research Effort**
 - **CER-Based Cost Estimate Used to Validate/Verify EoA Results**
 - **Capability Forecast Developed Using Significantly Fewer Staff-Hours Than Those Required for the More Traditional Cost Approach for the JLTM EoA**



Summary and Future Work

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- **Capability-Based Cost Estimating Can Provide Pre-Milestone-A ROM Estimates to Support the Concept Decision**
- **CKB Architecture Developed and Data Collection Effort Ongoing**
- **Proposed Methodologies are Under Development and Testing**
- **Future Work:**
 - **Continued CKB Expansion and Data Collection**
 - **Methodology and Toolbox Testing and Evaluation**
 - **IAMD Cost Pilot Underway**

