Implications of Capability-based Planning on Requirements Engineering

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Requirements Development & Management Session
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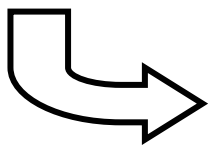
Scope of this Presentation

- Capability-based planning
- The problem and solution space interface
- The dual roles of measures of effectiveness (MOEs)
- Capability feedback process
- Issues, challenges and trends

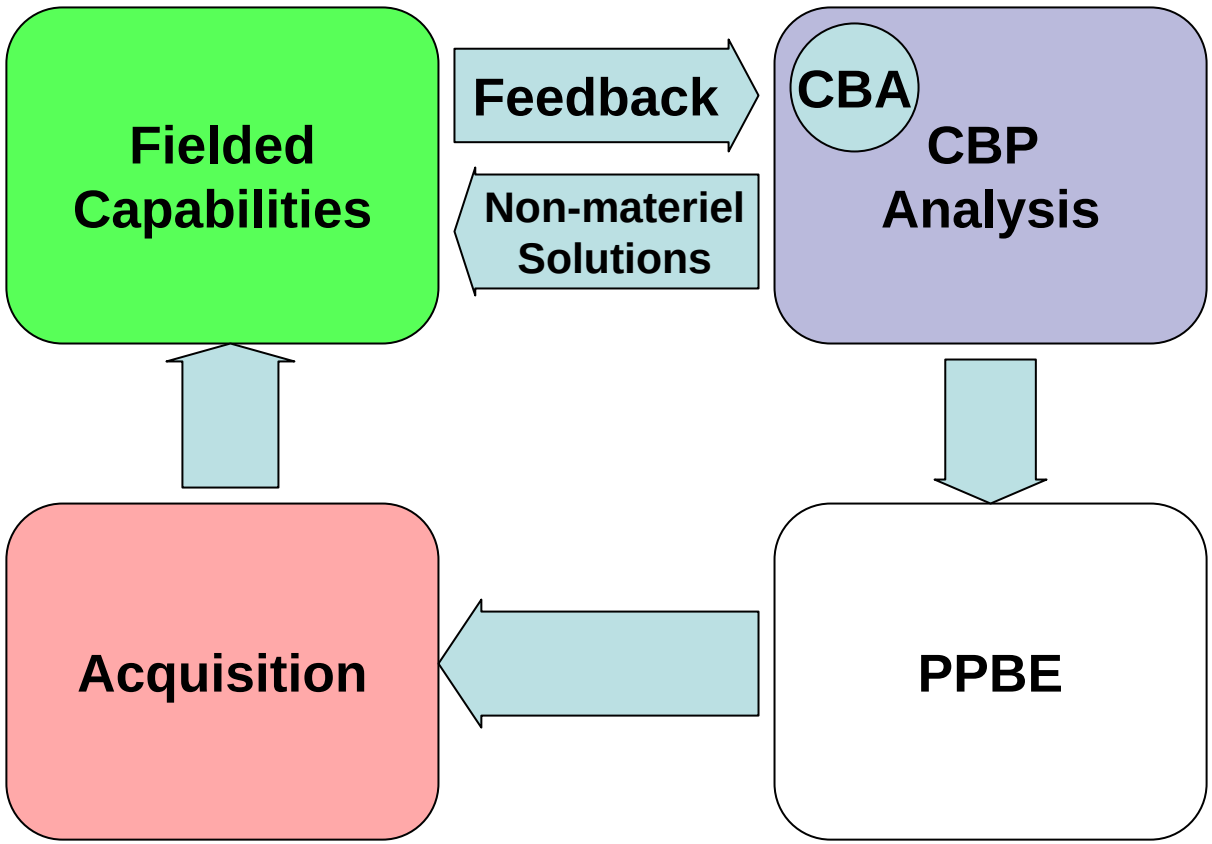
Definitions

- Capability-based planning (CBP):
  - An overarching framework for planning under uncertainty that provides capabilities suitable for a wide range of modern-day challenges and circumstances while working within an economic framework that necessitates choice
- Capabilities-Based Assessment (CBA)
  - Study that identifies the capabilities (and operational performance criteria) required to successfully execute missions
- Capability:
  - The ability to execute a specified course of action
    - Move troops rapidly

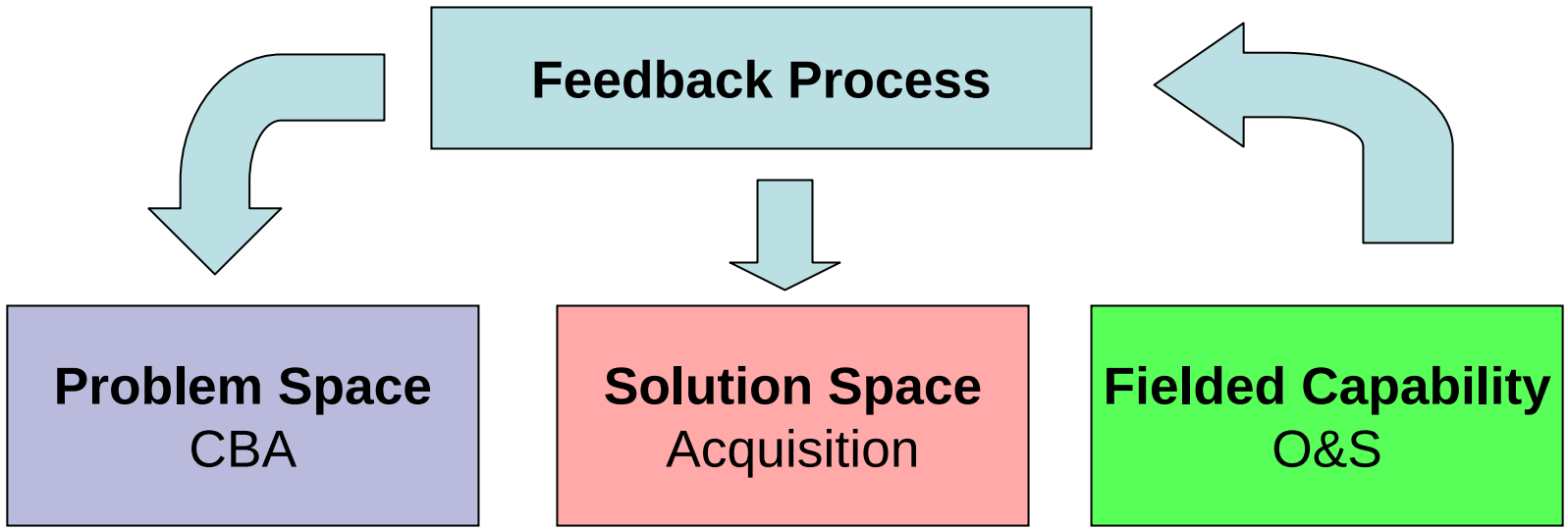


Candidate Solutions:
- **Truck**
- **Ship**
- **Aircraft**

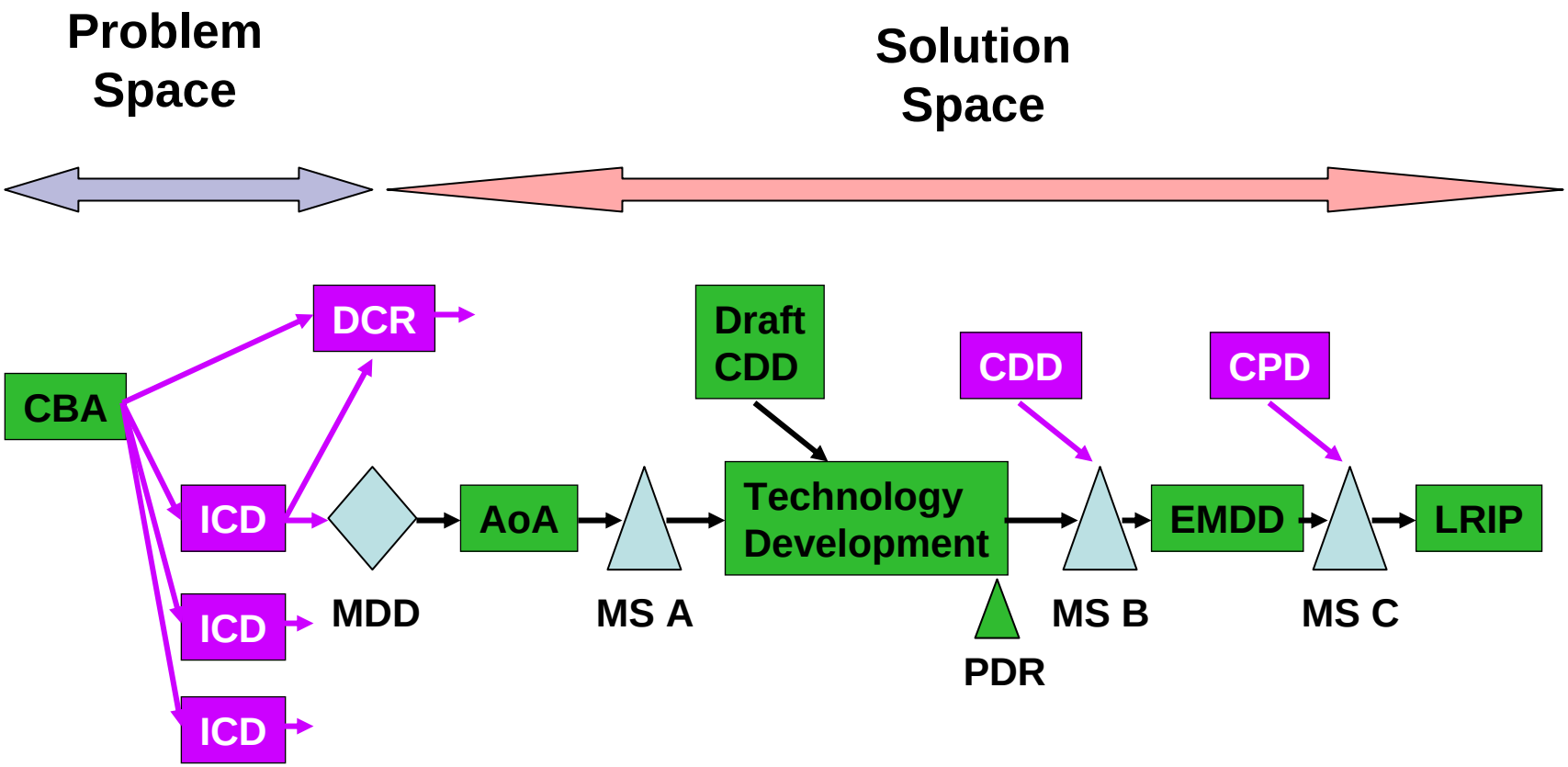
Capabilities-based Planning Framework (work in progress since 2003)



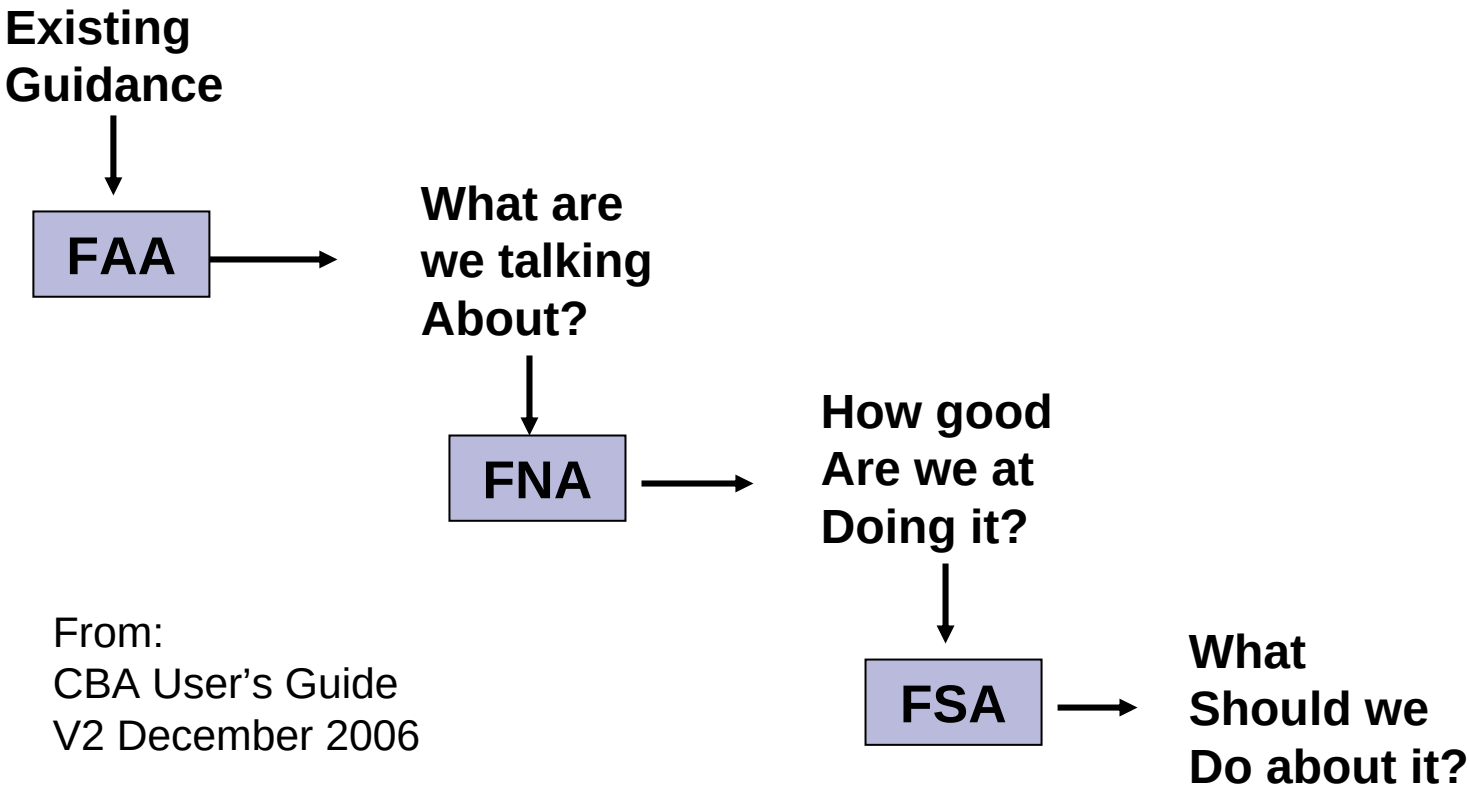
Focus of this Presentation



Draft CJCSI 3170.01G JCIDS Process and Acquisition Decisions

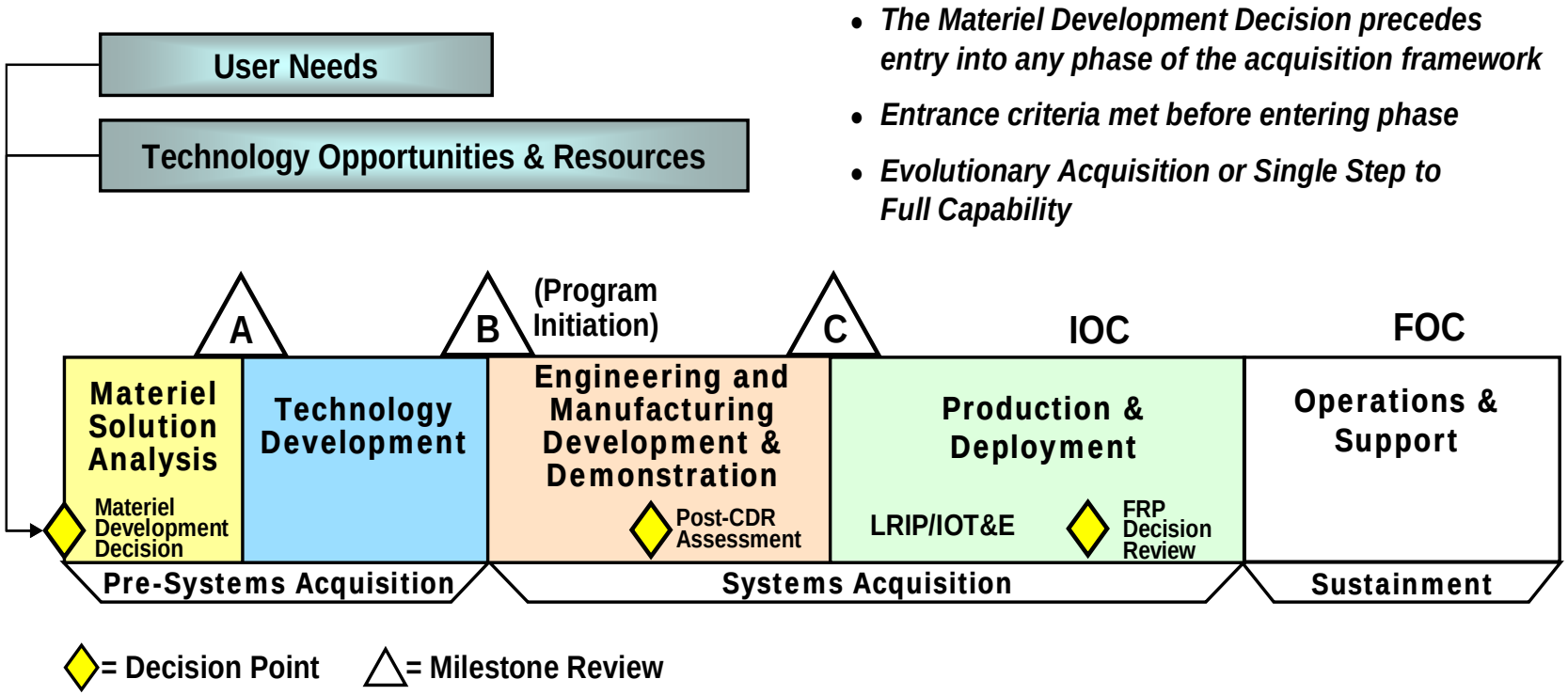


Capabilities-Based Assessment (CBA)



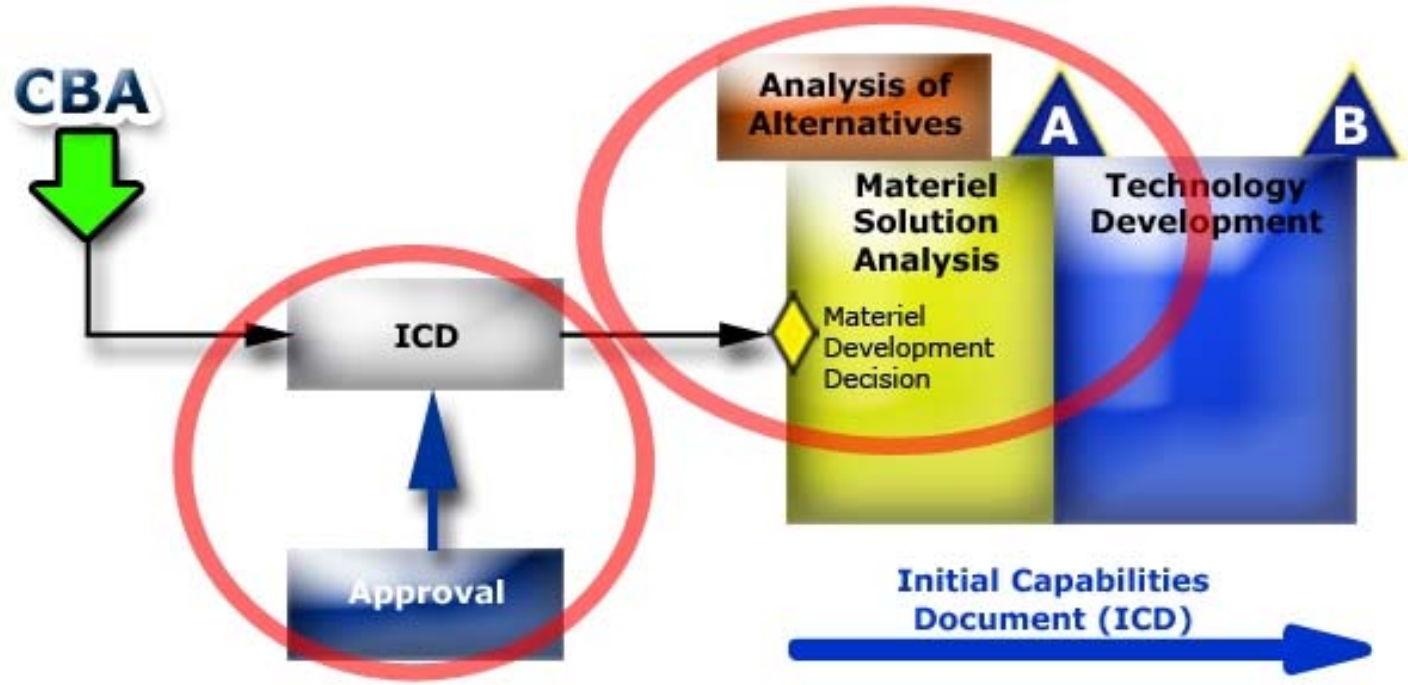
From:
CBA User's Guide
V2 December 2006

Draft 5000.02 The Defense Acquisition Management Framework.



- *The Materiel Development Decision precedes entry into any phase of the acquisition framework*
- *Entrance criteria met before entering phase*
- *Evolutionary Acquisition or Single Step to Full Capability*

Problem / Solution Space Interface



Business Analyst | **Requirements / Systems Engineer**

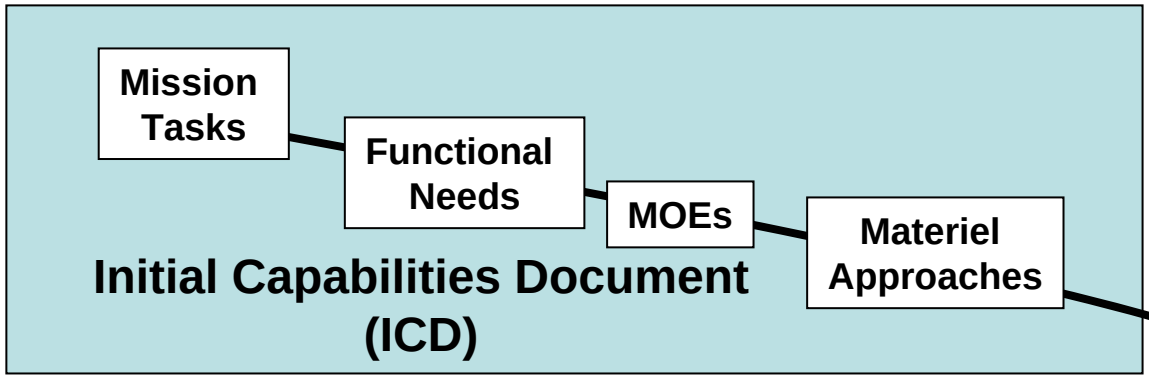
Information Transfer at the Interface

If your goal in software development is to "make the business case come true" (and by 'business case' I mean the initial justification for spending time, money, and effort on the development in the first place), then the most important thing to understand is: why are we building this? That is, what are the needs of the customers (or business)? **If you don't know, or clearly understand, the customer needs, then you cannot know if you are building the right system** - which then makes the technical correctness of the functional spec (what we intend to build) or the design spec (how we think it should work) a moot point.

Richard Zultner

30 Sep 2008 Requirements-Engineering Group

AoA and Effectiveness Analysis Process



Analysis Guidance Planning & Methodology

Determine Alternative Solutions

Select Models And Data

Perform Analysis

Study Operational Effectiveness Analysis

	Task 1			Task 2			Task 3		
	MOE 1-1	MOE 1-2	MOE 1-3	MOE 2-1	MOE 2-2	MOE 2-3	MOE 3-1	MOE 3-2	MOE 3-3
Alternative 1									
Alternative 2									
Alternative 3									

Definitions and Attributes of MOEs

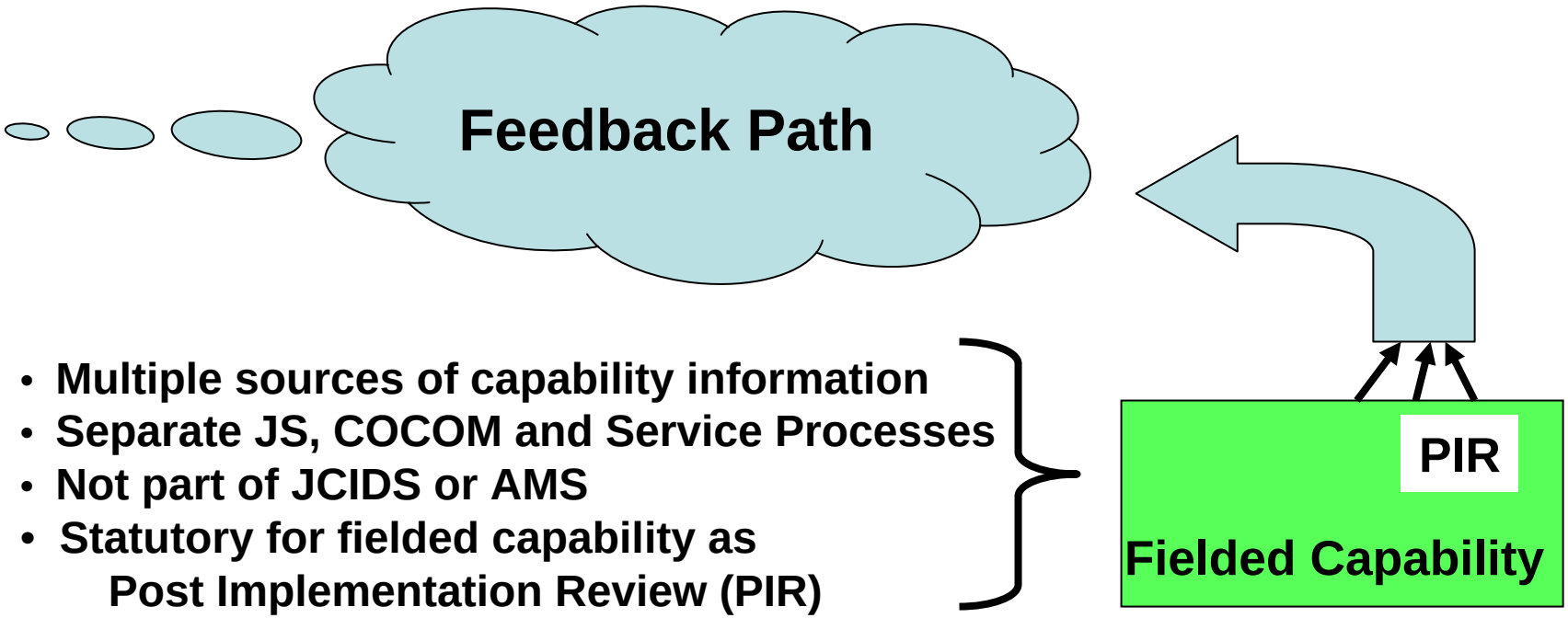
- MOEs are standards against which the capability of a solution to meet the needs of a problem may be judged. The standards are specific properties that any potential solution must exhibit to some extent.

- Therefore, MOEs are independent of any solution.

- A meaningful MOE must be quantifiable and a measure to what degree the real objective is achieved.

The MOE is part of both the AoA and the CBP feedback process

Feedback Process



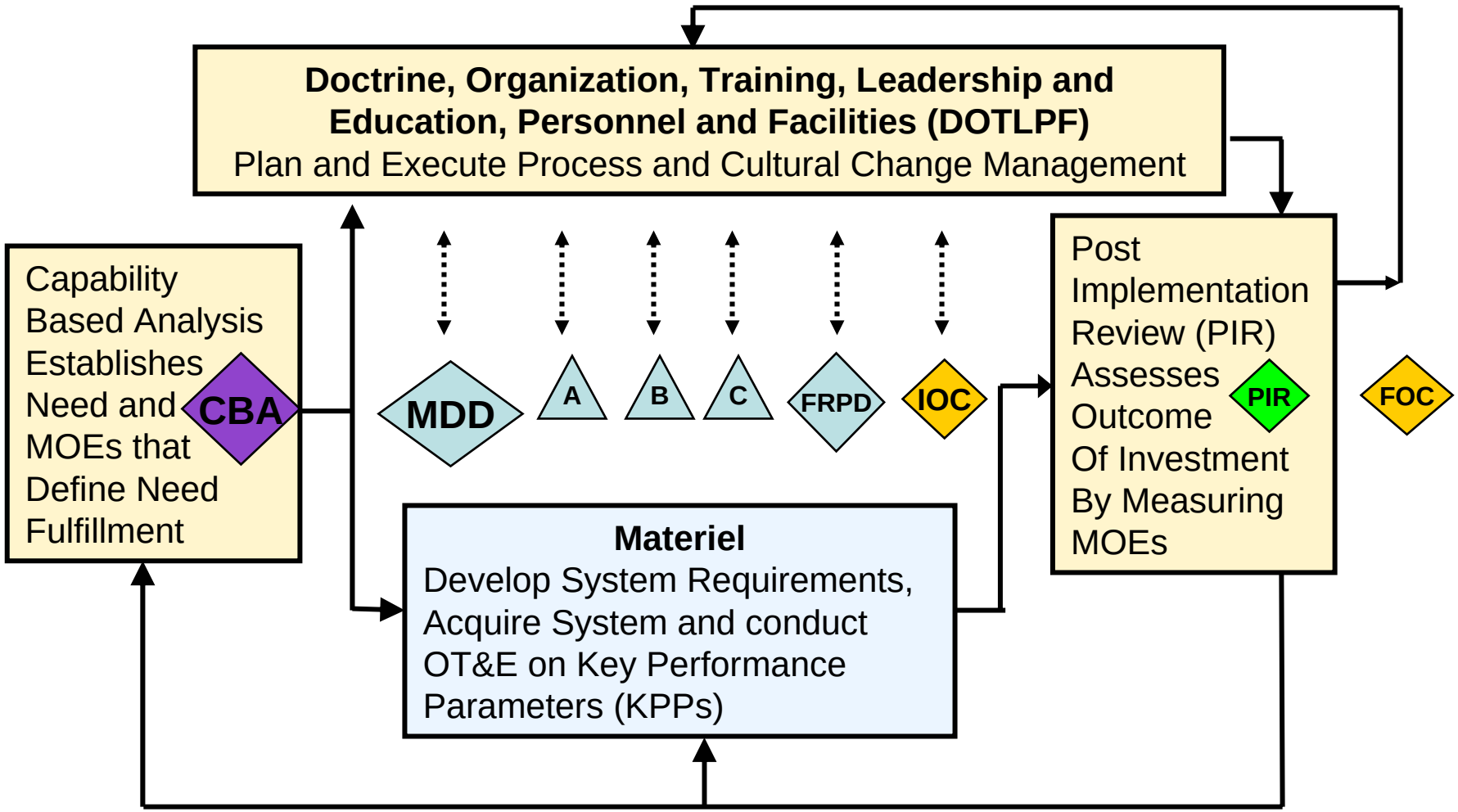
- **Multiple sources of capability information**
- **Separate JS, COCOM and Service Processes**
- **Not part of JCIDS or AMS**
- **Statutory for fielded capability as Post Implementation Review (PIR)**

Post Implementation Review (PIR) Defined

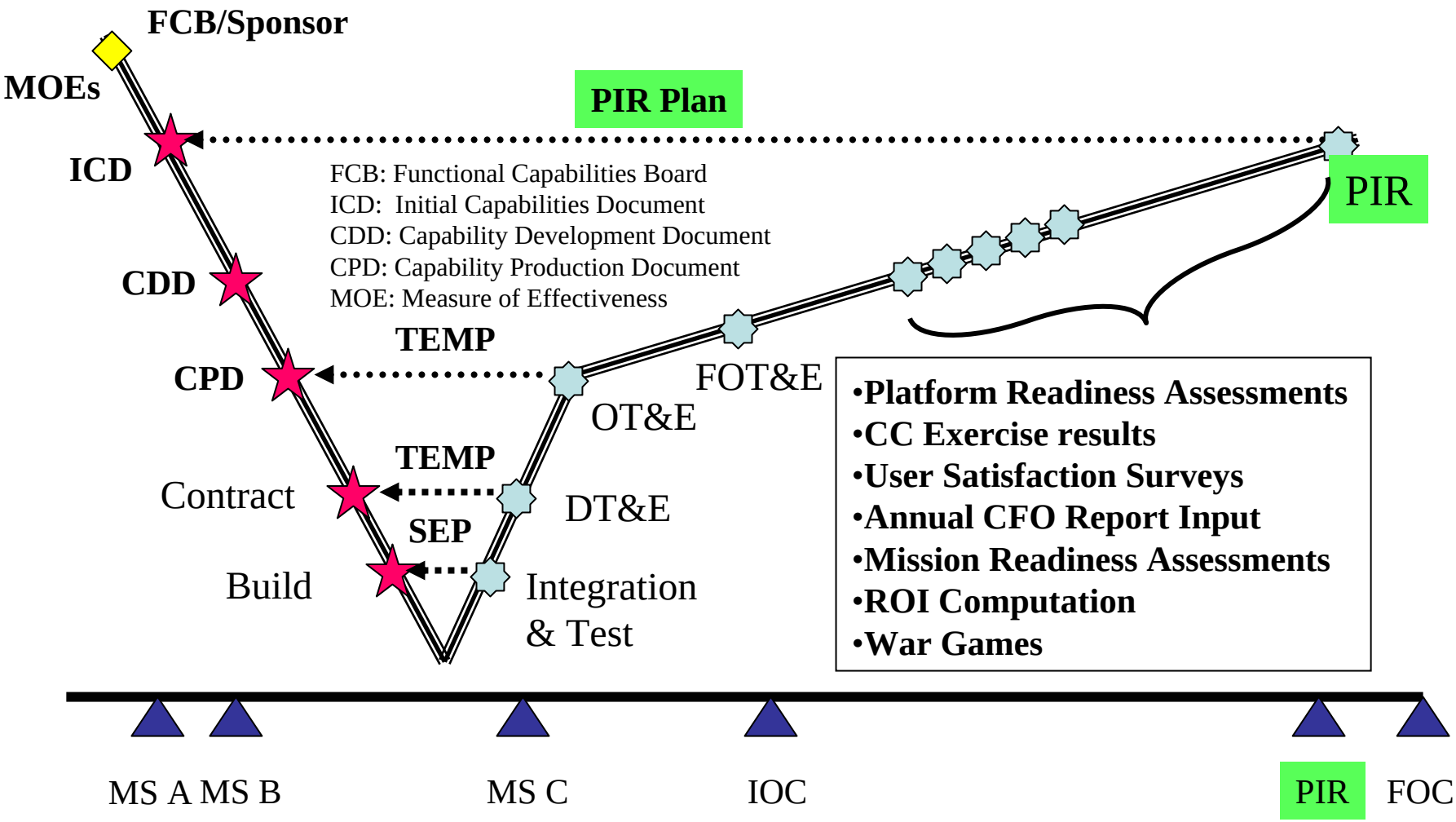
An analysis of an investment or acquired system that is part of a capability portfolio, operating in its intended environment, using data collected from various sources to answer the question:

Did we get what we needed, and if not what to do about it?

PIR Information Path in Feedback Process

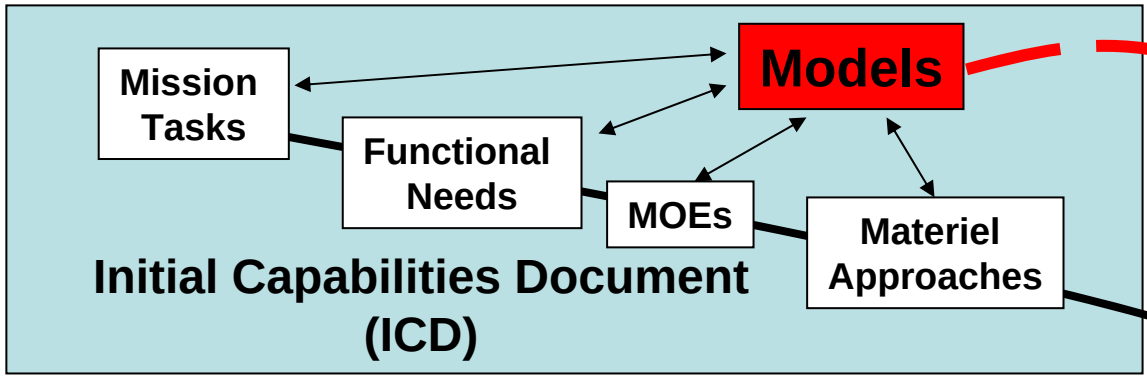


PIR in the Feedback Process



Opportunities, Challenges and Trends

Model Compatibility & Sharing Opportunity at the Problem-Solution Interface



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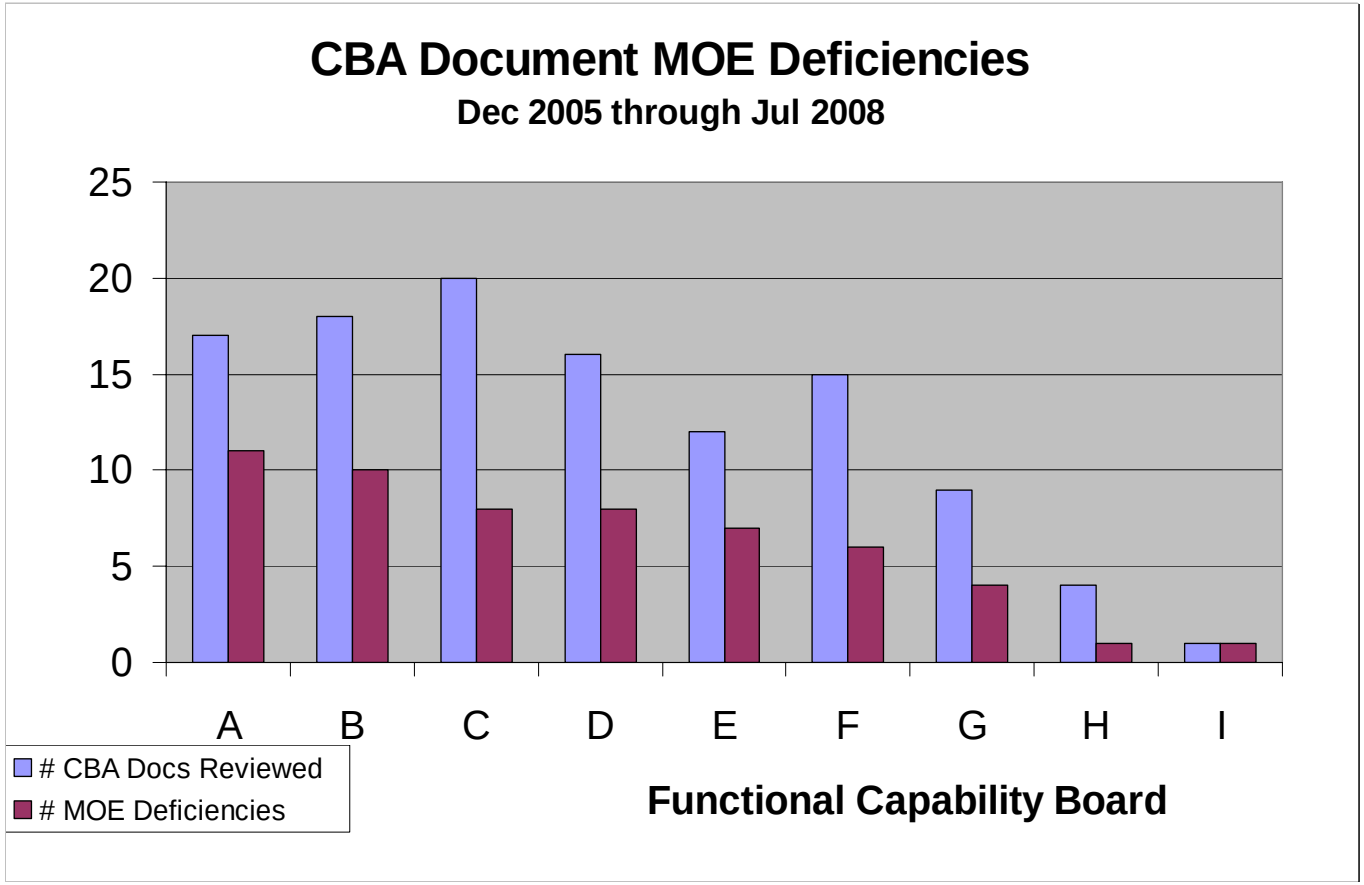
MOE Deficiencies in CBA



Potential Impact of MOE Deficiencies

- Likely Scenario:
  - 43% ICDs submitted to the JS for review during past 30 month period contained no MOEs
- Assumptions (conservatively stated)
  - Requirements volatility accounts for 10% of Program of Record cost overruns.
  - Lack of MOEs accounts for 10% of requirements volatility
  - The 2008 DoD Major Program cumulative expenditure is $800B + $800B less than major = $1,600B
  - Cost overrun is 5% or $80B
- Cost of not providing MOEs to the SE process:
  - .1 x .1 x .43 x $80B = $344M

Recent Trends

- Publication of CBA Guide v2 by JS-J8 in Dec 2006
  - Describes CBA process
  - Guidance for study plan and planning
  - Discusses analytic approaches
    - Development of MOEs
- Implementation of requirements manager training and certification
  - USD(AT&L) Memoranda of 2 September 2008, Requirements Management Certification Training Program Policy, John Young
  - Includes training and certification of requirements authors, reviewers and validators
- Joint Staff considering shortening the CBA cycle to a month or two instead of a year or two.
  - Impact on development of MOEs not clear
  - May be signal that Problem-Solution interface boundary is shifting

?

Some Remaining MOE Issues

- How could MOEs be allocated?

$MOE_{DesiredCapability} = MOE_{Existing\ Capability} + MOE_{Gap\ Capability}$

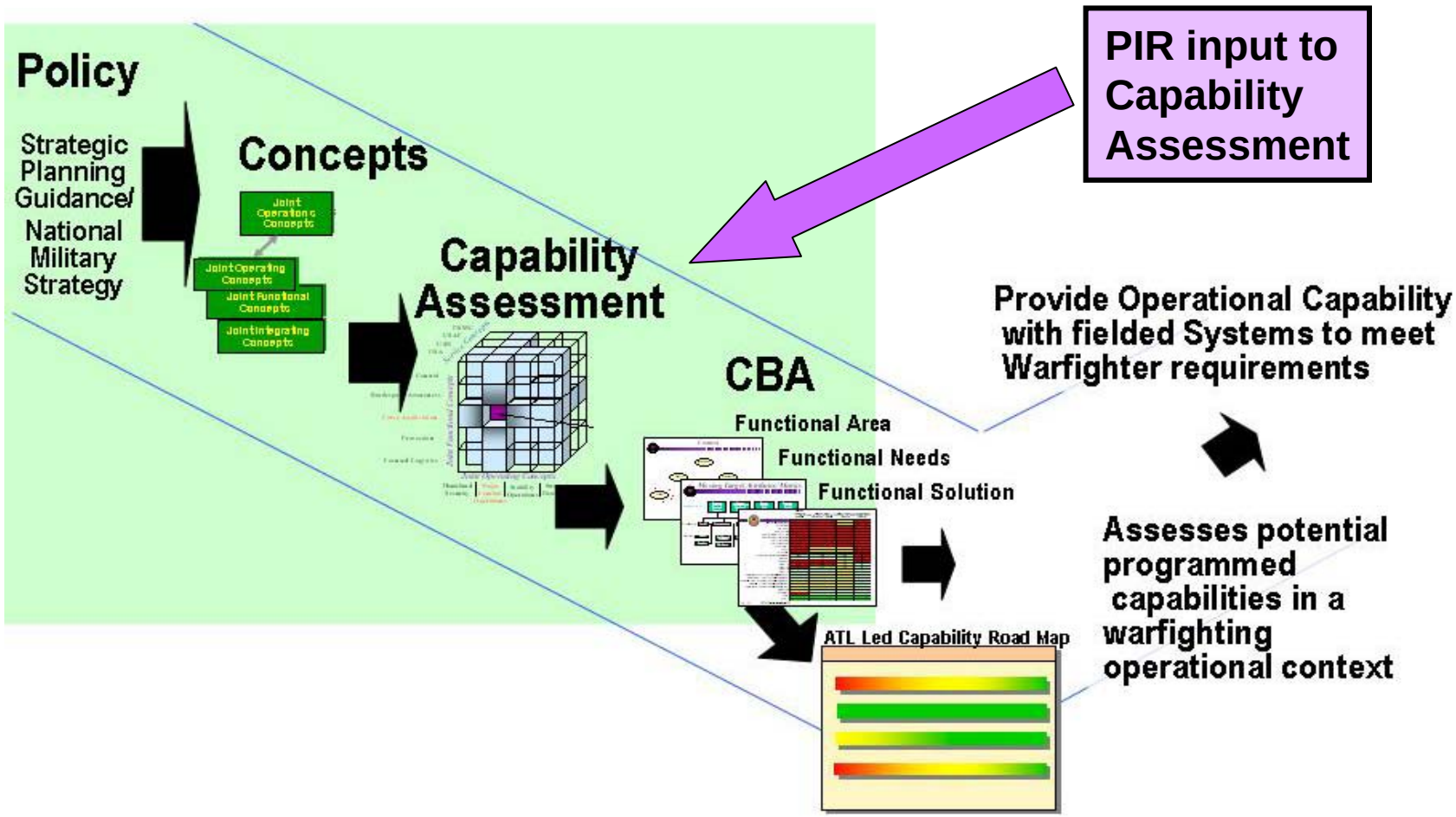
$MOE_{Gap\ Capability} = MOE_{DOTLPF} + \sum MOE_{ICDs}$

where DOTLPF = f(Existing processes + changes needed to maximize benefit of materiel investment)

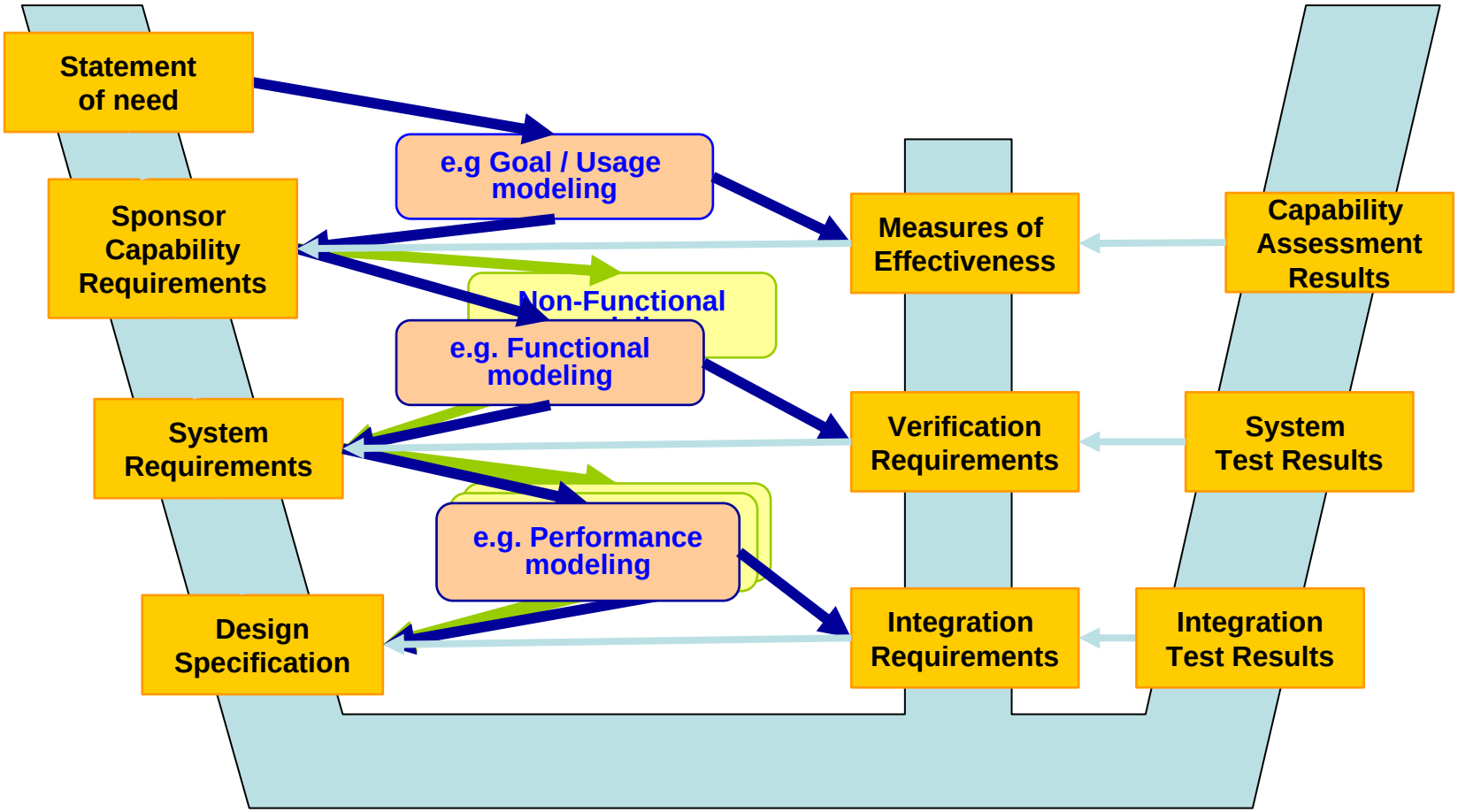
- How could MOEs be traced?

Could MOEs be traced through the DOTLPF and materiel acquisition processes in a manner analogous to requirements tracing by the systems engineers?

PIR Input to JCA Assessment



Models Bridge Layers of Requirements and Provide Verification Criteria
INCOSE Work Shop 08



Typical MOE Situations

- Outcome metrics presented but measures deferred for CDD
- Study team not adequately staffed
- Study team neither tasked nor funded to undertake analytic approach needed to develop MOEs
- Outcome measures stated in narrative but solution performance parameters KPPs presented as MOEs
- CJCSM 3170.01 does not explicitly require MOEs for the ICD, Draft CJCSI 3170.01G has eliminated the term MOE
  - Uses the term desired effects
- Developed MOEs do not address desired outcomes

Cause - Effect Candidates

- Lack of capability analyst training
  - Analyst jumps into solution mode comfort zone
- Capability lexicon confusion
  - Miscommunication amongst analysts and reviewers
- Regulatory MOE requirement inconsistencies
  - Analyst takes path of least work
  - ICD approval available without MOEs
- Inadequate study team guidance
  - Analyst not steered to analytic approaches needed to develop MOEs