



Frameworks for Assessing IT Systems Engineering Acquisition Issues and Proposed Approaches in Support of Public Law 111

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Dr. Kenneth E. Nidiffer
Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213
703-908-1117



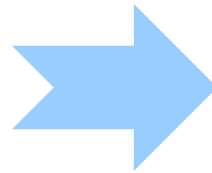
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Overview

- Perspective
- The Problem Space
- The Solution Space (Pre-Decisional)
- What Success Looks Like



Focus: Acquisition of
DoD IT Systems



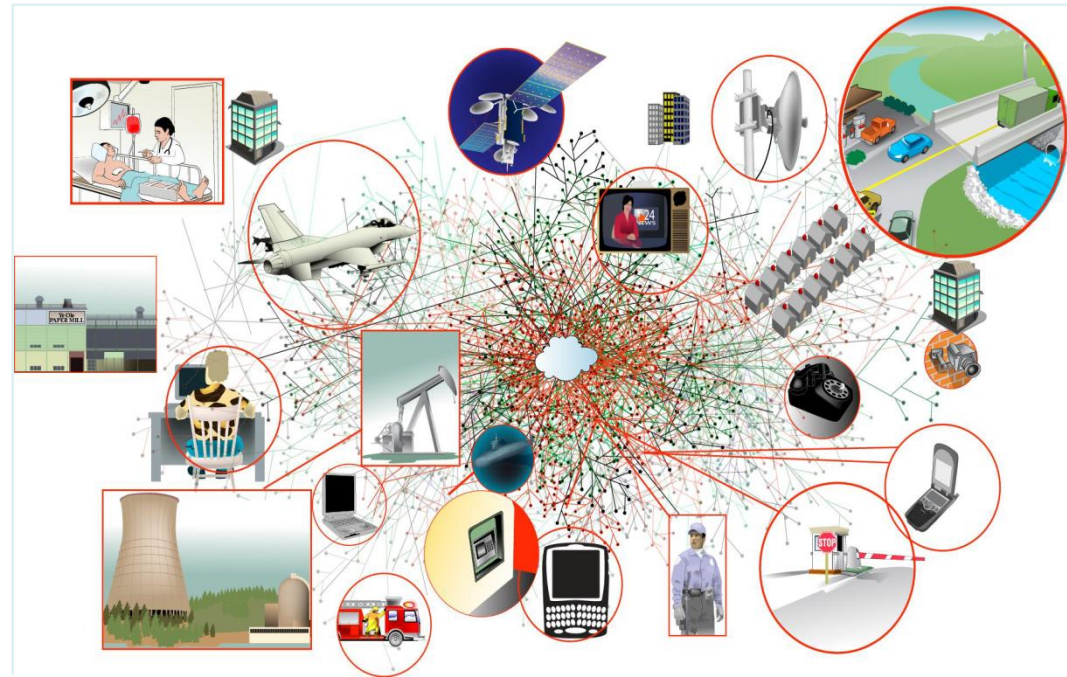
Source: SEI



Perspective: Cyber Landscape

Includes all:

- System of Systems
- Architecture
- Services
- Networked Hardware/ Platforms
- People who digitally connect to cyberspace



What are the opportunities?

Transportation
Infrastructure



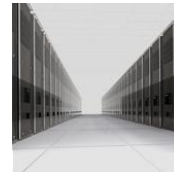
Healthcare
Infrastructure



Banking & Financial
Infrastructure



Energy & Utilities
Infrastructure



Communications
Infrastructure



Source: SEI



Problem Space: Improving Efficiency and Effectiveness in IT/Cyber Acquisitions in DoD



Source: Director, Command and Control, Programs & Policy (OSD) - Pre-Decisional



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Problem Space: Current DoD IT Environment

Current DoD IT Environment



Hundreds of sub-optimal data centers and networks incur **unnecessary costs**



Limited interoperability reduces information sharing and collaboration on mission threats



Increasing demand for **new technology** on **rapidly** evolving devices



IT Programs average **81 Months*** Cannot rapidly and efficiently field new technology to meet warfighter needs



Cybersecurity vulnerabilities threaten to exploit classified information and endanger our national security

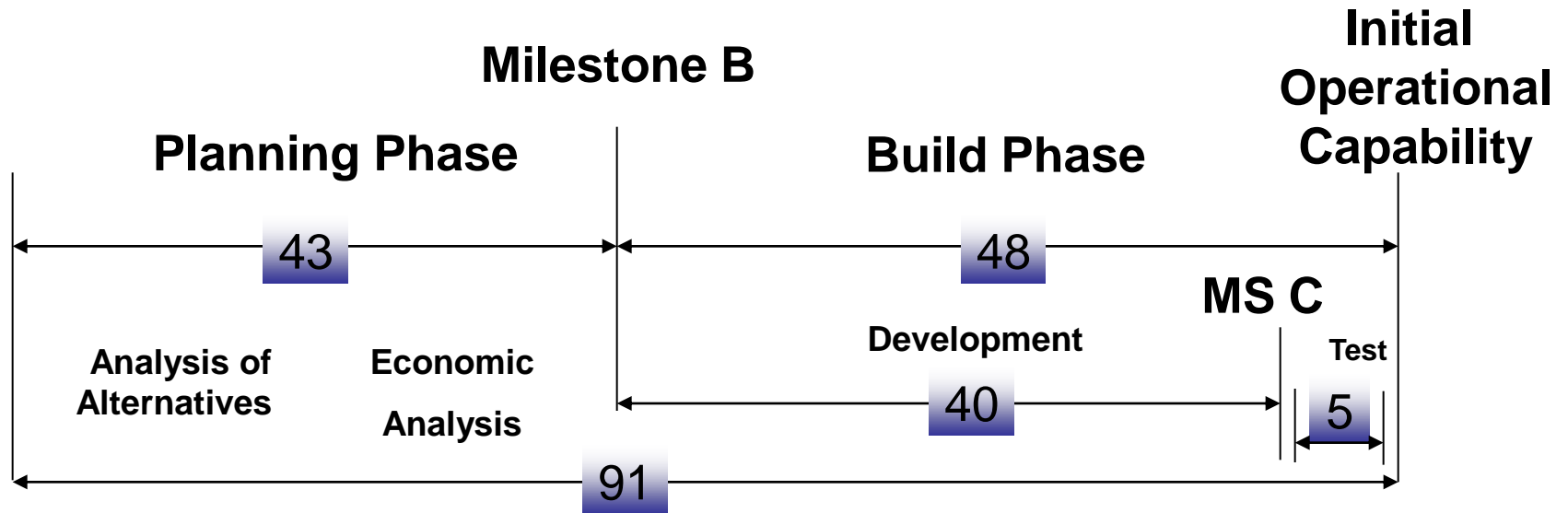


Current IT delivery process hinders our ability to take advantage of **new commercial technology**

Source: Director, Command and Control, Programs & Policy (OSD) – Pre-Decisional



Problem Space: DoD IT Acquisition Cycle-Time - 32 MAIS

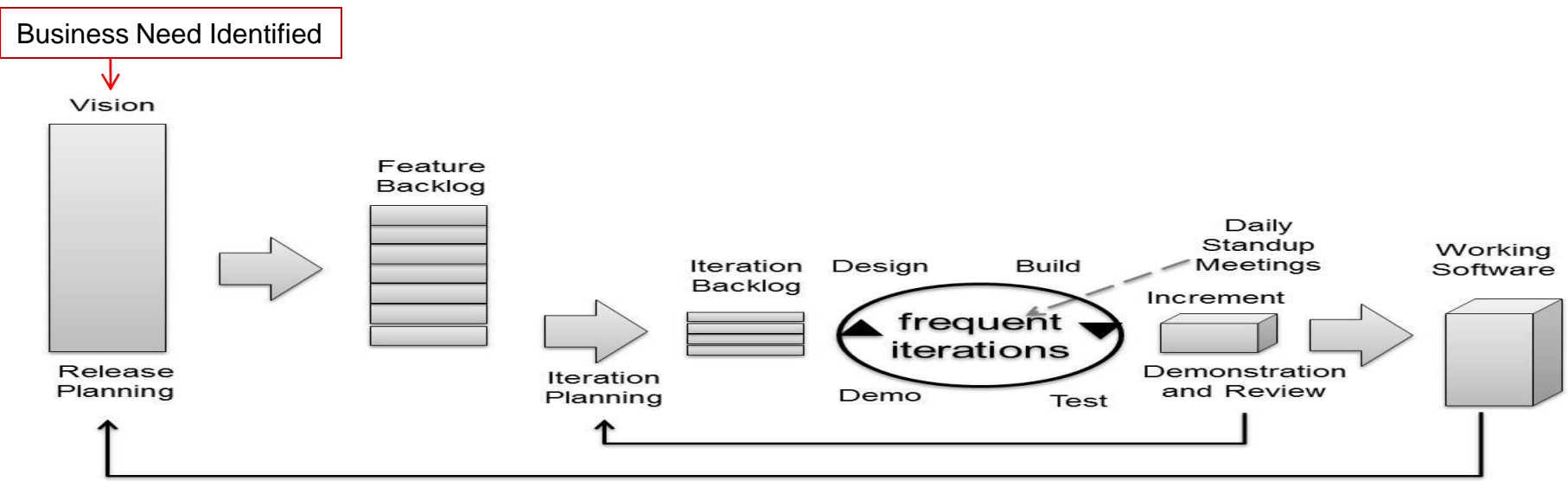
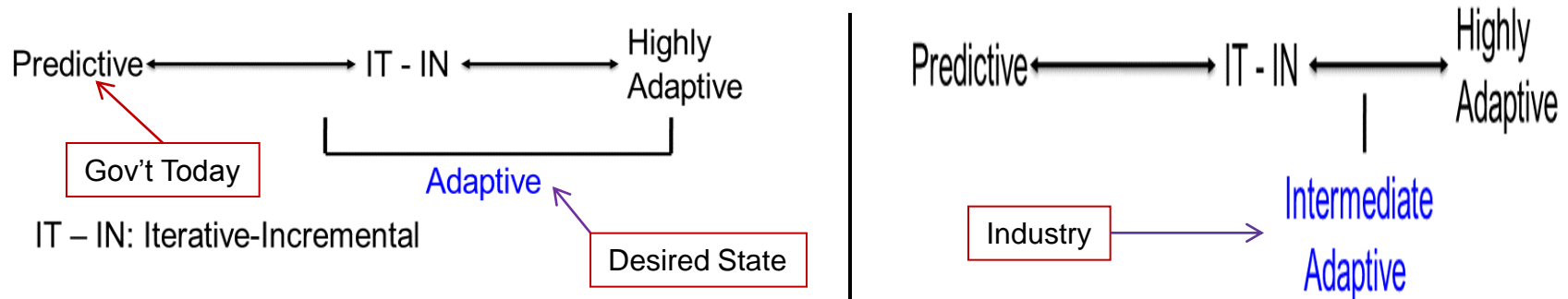


Cycle-Time Driven by Processes Developed to Counter a Cold War Adversary In Industrial Age Society

Source: Defense Science Board Report, March 2009



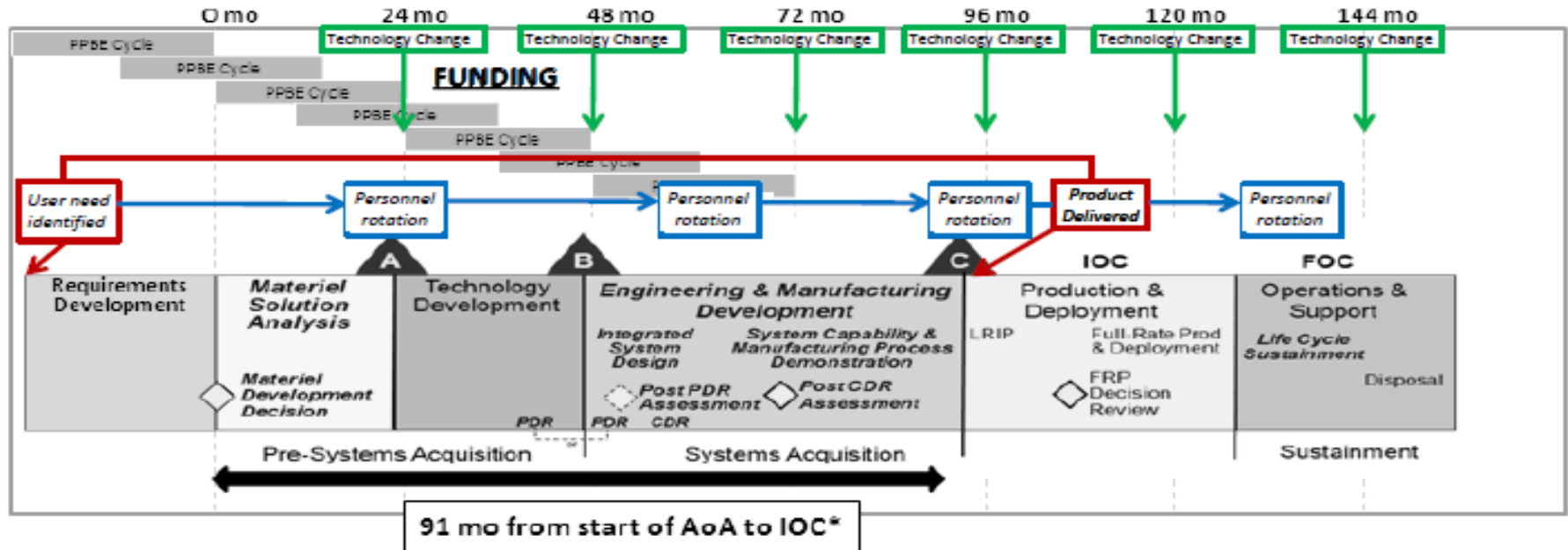
Problem Space: IT Software Life Cycle Continuum



Intermediate Adaptive Life Cycle (Example)



Problem Space: Generic Acquisition Process



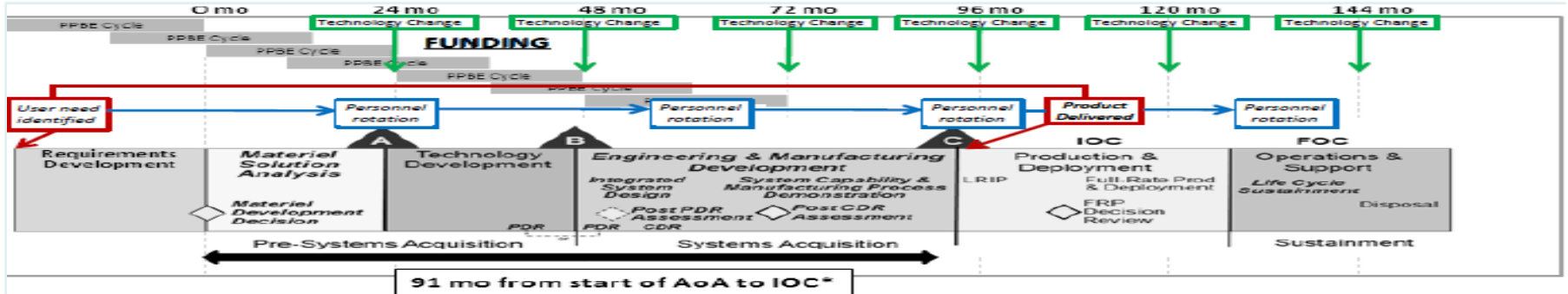
- Program-based
- Personnel Rotation – about every 3 years
- Technology Changes about every 2 years

**Not Efficient or Effective
For Acquisition of
Information Technology
in DoD**

Source: Defense Science Board Report, March 2009



Problem Space: No Milestone “D” – No Way to Re- Invest Replacement Savings

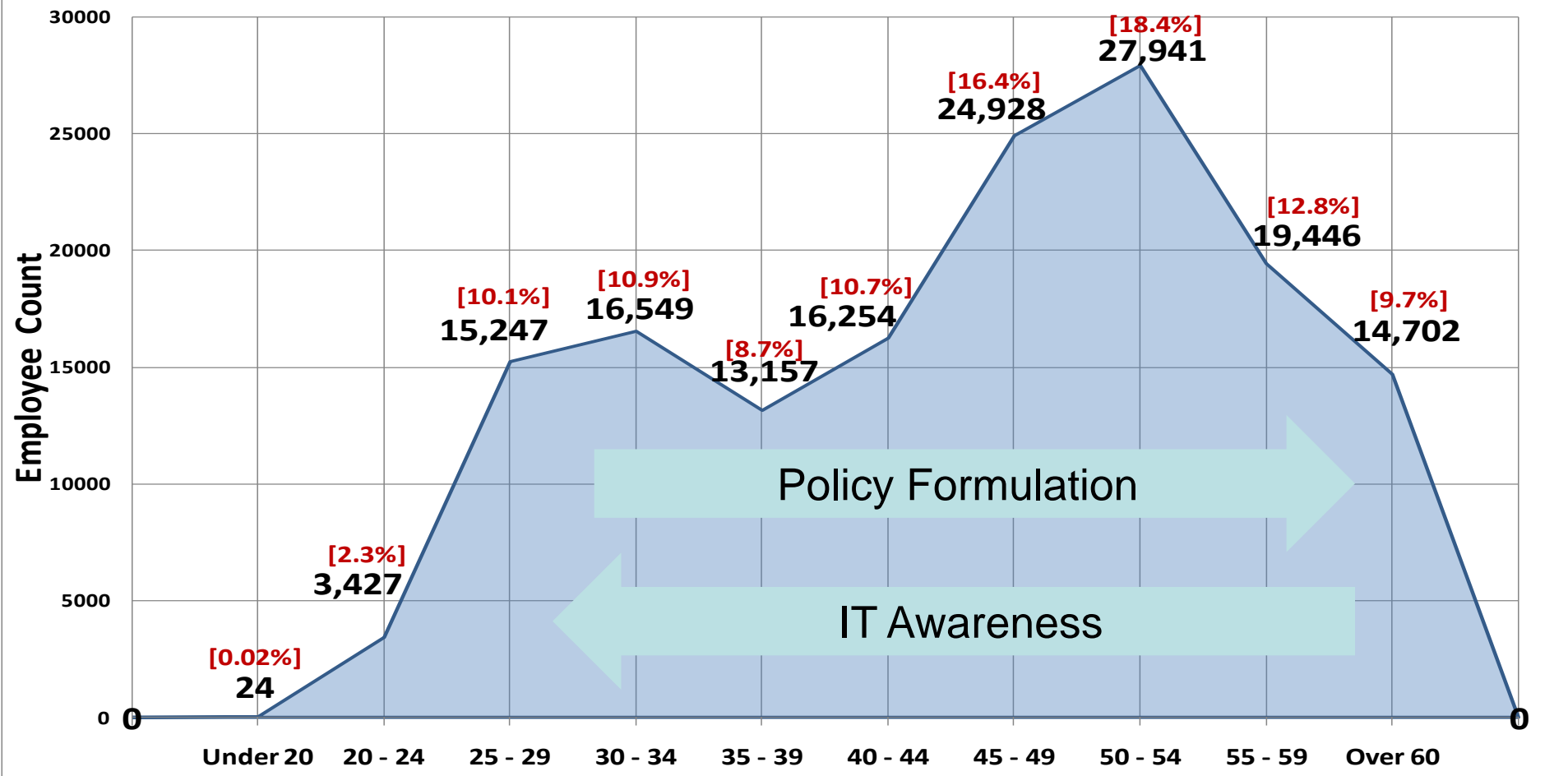


Year	Proportion of software maintenance costs	Definition	Reference
2000	>90%	Software cost devoted to system maintenance & evolution / total software costs	Erlikh (2000)
1993	75%	Software maintenance / information system budget (in Fortune 1000 companies)	Eastwood (1993)
1990	>90%	Software cost devoted to system maintenance & evolution / total software costs	Moad (1990)
1990	60-70%	Software maintenance / total management information systems (MIS) operating budgets	Huff (1990)
1988	60-70%	Software maintenance / total management information systems (MIS) operating budgets	Port (1988)
1984	65-75%	Effort spent on software maintenance / total available software engineering effort.	McKee (1984)
1981	>50%	Staff time spent on maintenance / total time (in 487 organizations)	Lientz & Swanson (1981)
1979	67%	Maintenance costs / total software costs	Zelkowitz <i>et al.</i> (1979)



Problem Space: 2011 DAW Age Analysis

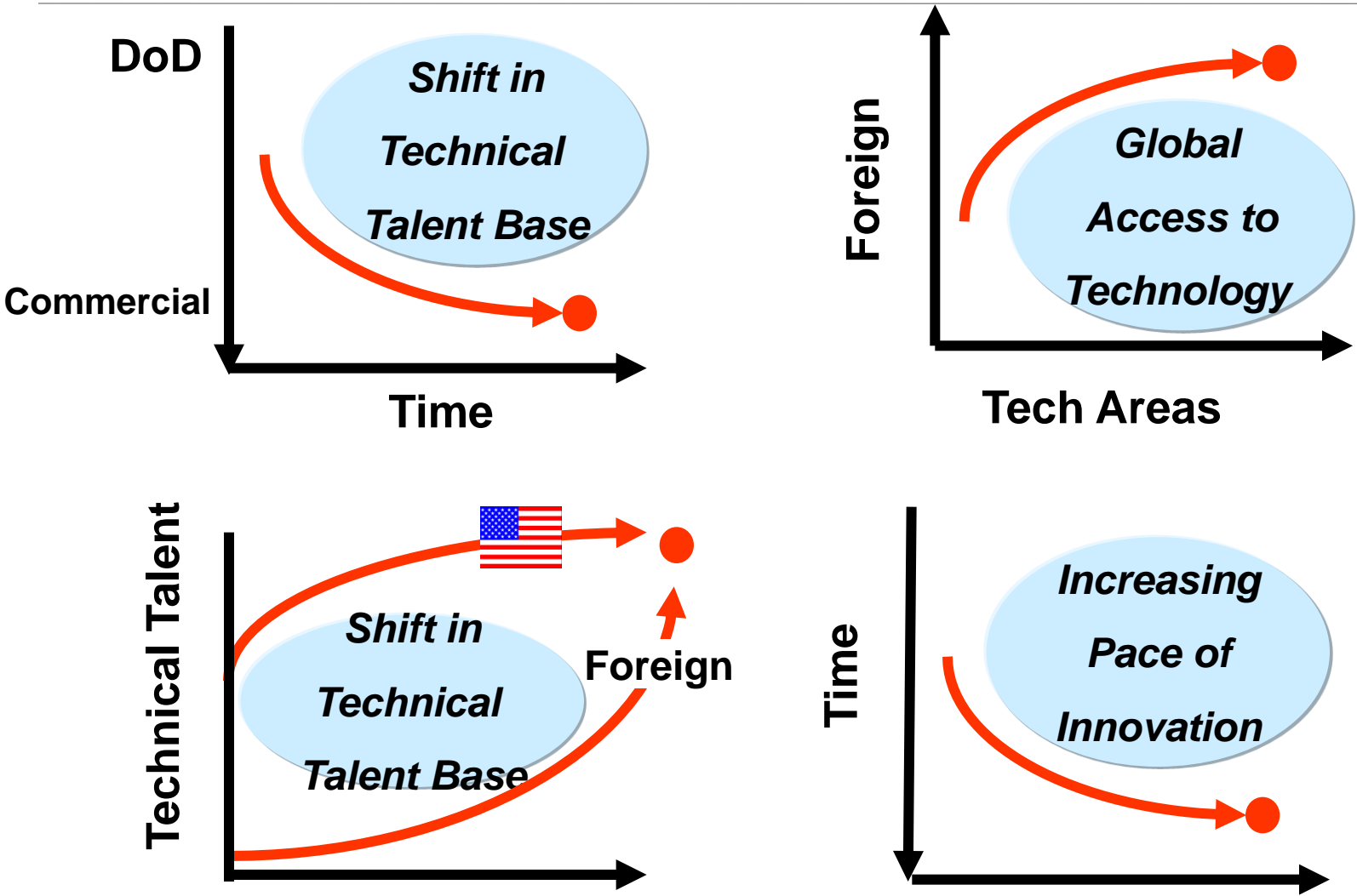
Def Acq Workforce - Overall Age Distribution - FY11 Q3



Data Source: OSD (AT&L Data Mart)



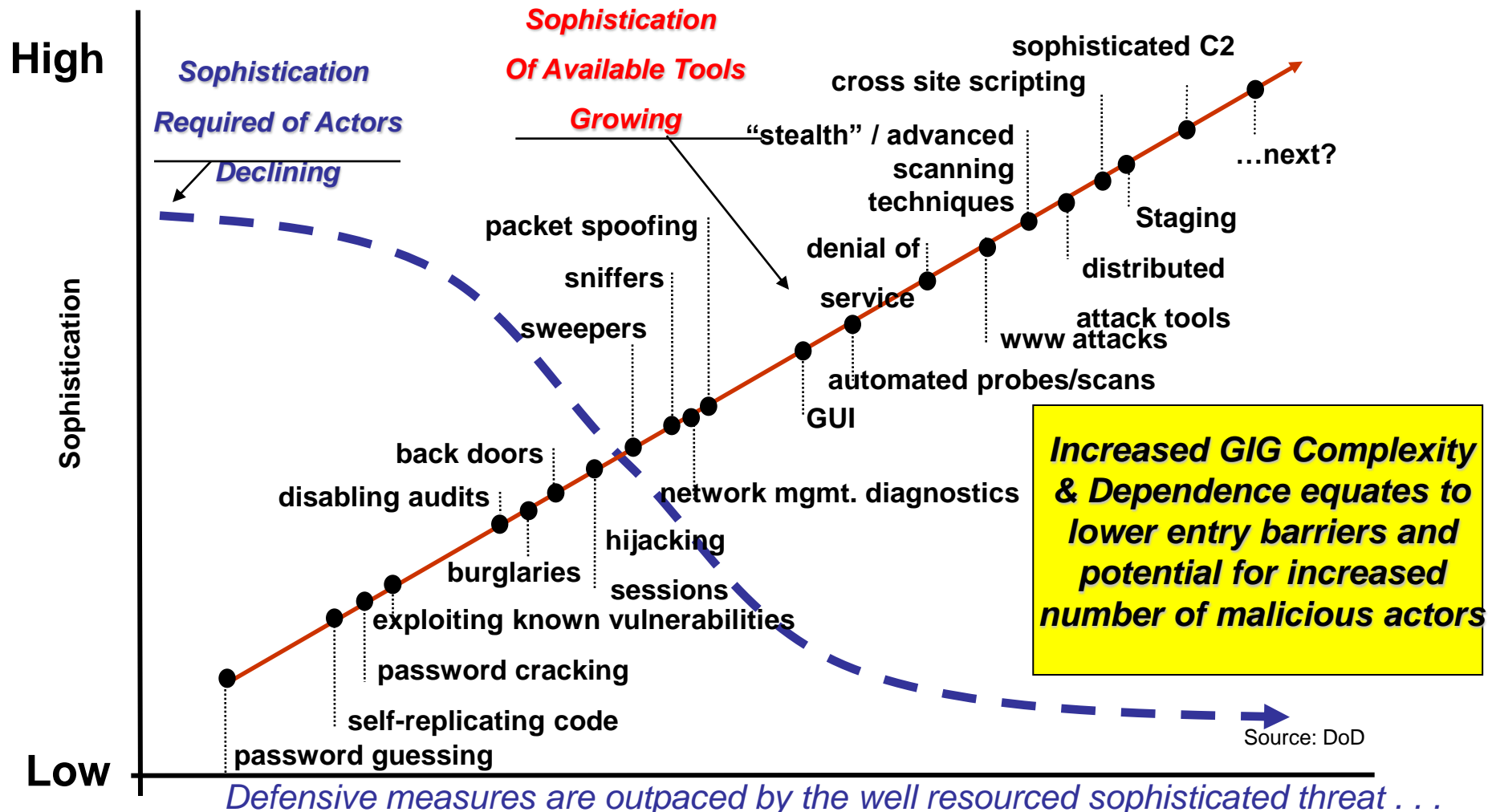
Problem Space: Four Key Challenges to our Technical Base



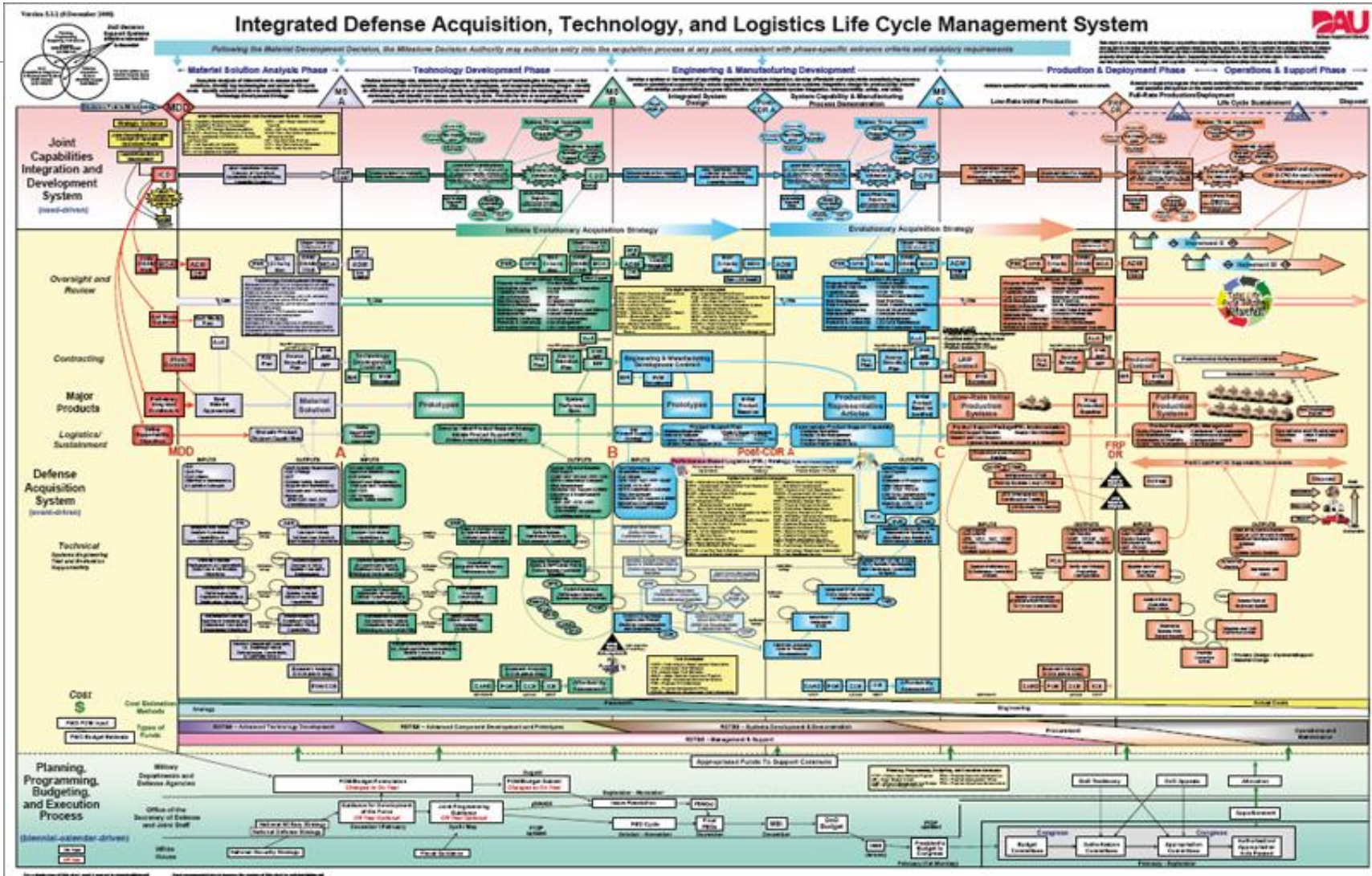
Source: DDR&E



Problem Space: Technological Rate of Adoption - the Cyber Domain is Hotly Contested



Problem Space: An Effective Process for Major Defense Systems – But Not Very Agile for IT Systems



Source: Defense Acquisition University



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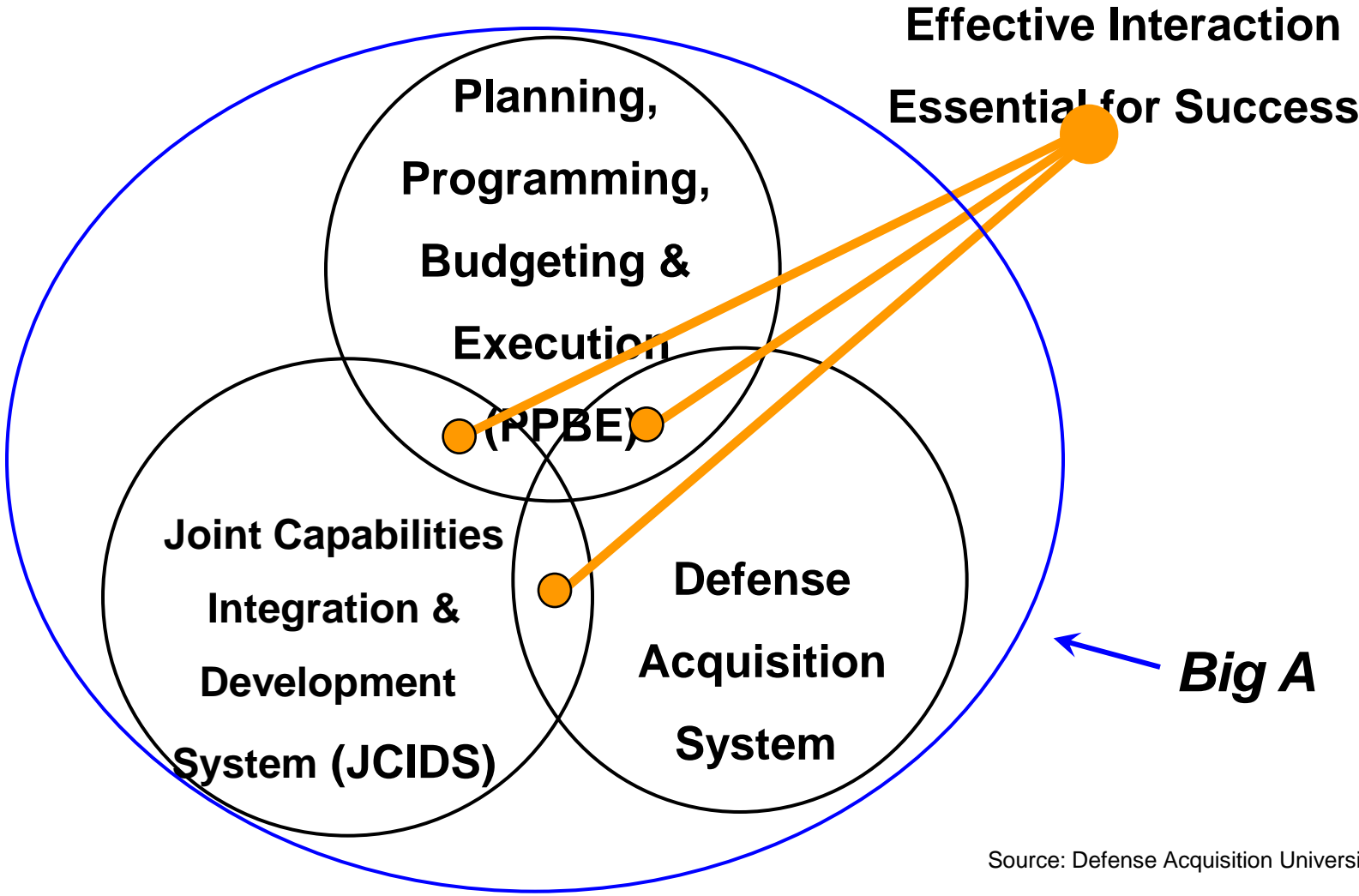
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Problem Space: Alignment of Three Major DoD Decision Support Systems



Problem Space: Software-Reliant Acquisitions Can Be Difficult to Manage

According to Fred Brooks* software projects are difficult because of accidental and essential difficulties

- Accidental difficulties are caused by the current state of our understanding
 - of methods, tools, and techniques
 - of the underlying technology base
- Essential difficulties are caused by the inherent nature of software
 - invisibility - lack of physical properties
 - conformity
 - changeability
 - complexity



Dr. Fred Brooks

* Source: *The Mythical Man-Month* by Fred Brooks, Addison Wesley, 1995



Solution Space: Issues Are Well Known and Are Being Addressed

	House Armed Services Committee	National Research Council	Defense Science Board	Business Executives for National Security
→ Defense acquisition process structured for weapon systems; ill-suited for information technology	✓	✓	✓	✓
→ Systems take too long to deliver; inconsistent with technology cycle	✓	✓	✓	
→ Too document intensive, time consuming, and process bound to respond effectively to end-user needs	✓	✓	✓	✓
Oversight process not aligned with rapid acquisitions (favors large programs, high-level oversight)		✓		✓
Lack of accountability by personnel in the oversight process		✓		✓
Complexity inherent in aligning three major Departmental processes - Requirements, Resourcing and Acquisition	✓			✓
Funding process inconsistent with pace of evolving mission requirements	✓	✓		
Current metrics (financial, acquisition process) don't work well in measuring IT success	✓	✓		
Lack of meaningful trades between performance, cost, and date-to-field	✓	✓	✓	✓
→ Overly detailed requirements that are inconsistent with pace of technology change and need for rapid delivery	✓	✓		✓
Inability to prioritize requirements effectively	✓	✓		✓
Testing is integrated too late and serially	✓	✓		
Cyber-security is inadequately managed during the acquisition process			✓	
Lack sufficient numbers of individuals with proven records of acquisition success	✓	✓	✓	✓
→ Significant cultural impediments to change	✓			✓

Source: Director, Command and Control, Programs & Policy (OSD) – Pre-Decisional



Solution Space: Legislative Landscape – 2009 and 2011 National Authorization Acts

Sec 804: NEW IT ACQUISITION PROCESS REQUIRED

“The Secretary of Defense shall develop and implement a new acquisition process for information technology systems

- Be based on the recommendations in Chapter 6 of the March 2009 report of the DSB Task Force on DoD and Procedures for the Acquisition of Information Technology
- Be designed to include—
 - (A) early and continual involvement of the user;
 - (B) multiple, rapidly executed increments or releases of capability;
 - (C) early, successive prototyping to support an evolutionary approach;
 - (D) a modular, open-systems approach

Sec 933: STRATEGY FOR ACQUISITION/OVERSIGHT OF DoD CYBER WARFARE CAPABILITIES

“The Secretary of Defense, in consultation with the Secretaries of the military departments, shall develop a strategy to provide for the rapid acquisition of tools, applications, and other capabilities for cyber warfare for the United States Cyber Command and the cyber operations components of the military departments”

- (1) An orderly process for determining and approving operational requirements
- (2) A well-defined, repeatable, transparent, and disciplined process for developing capabilities to meet such requirements, in accordance with the information technology acquisition process developed pursuant to section 804 of the 2010 NDAA”

Source: Director, Command and Control, Programs & Policy (OSD) – Pre-Decisional



Solution Space: Section 804 - IT Acquisition Reform Goals

Objectives

- Guiding Principles in Report to Congress
 - Deliver Early and Often – Be responsive to the users needs
 - Incremental and Iterative Development and Testing
 - Rationalized Requirements – Balance user needs with constraints
 - Flexible/Tailored Processes – Customize to IT category
 - Knowledgeable and Experience IT Workforce
 - Understands IT uniqueness
- Provide a simplified, tailorable approach for delivering IT capability that:
 - Favors mature technology (OTS), emphasizes the Enterprise and eliminates redundancy

Reform Tenets

- An actively managed portfolio-based construct used to plan, resource, and manage capability delivery and execution
- Tailored acquisition process with an emphasis on short duration projects that deliver incremental capability
- Capability-based requirements process that reflect user needs with “rationalized” constraints
- Greater funding flexibility for portfolio-aligned information capabilities
- Portfolio-based oversight and management of the IT Enterprise using well-defined Enterprise Architectures

Source: Director, Command and Control, Programs & Policy (OSD) – Pre-Decisional



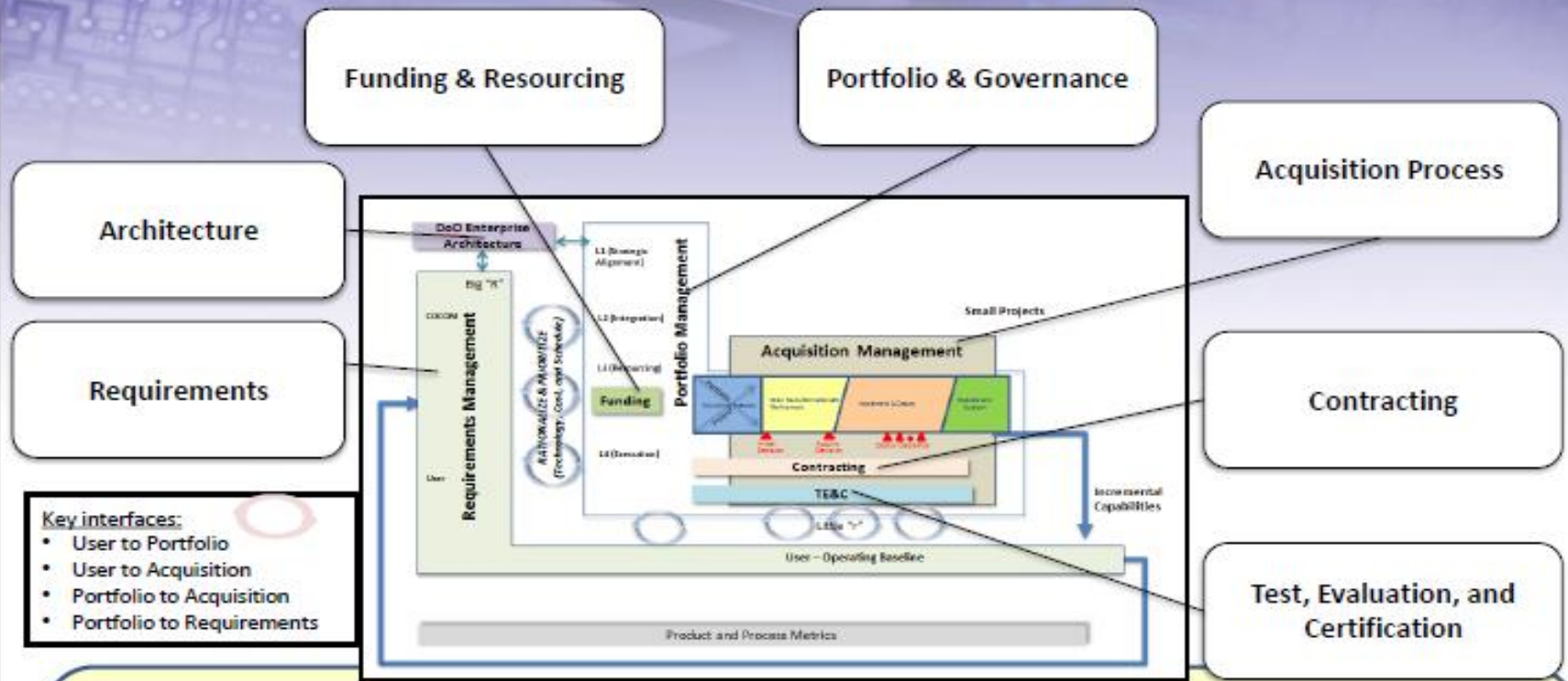
Solution Space: IT Reforms in Progress



Source: Director, Command and Control, Programs & Policy (OSD) – Pre-Decisional



Solution Space: Section 804 Improvement Acquisition Concepts



Overarching Principles

- Deliver Early and Often
- Rationalized Requirements
- Flexible and Tailored Processes
- Incremental and Iterative Development and Testing
- Knowledgeable / Experienced IT Workforce

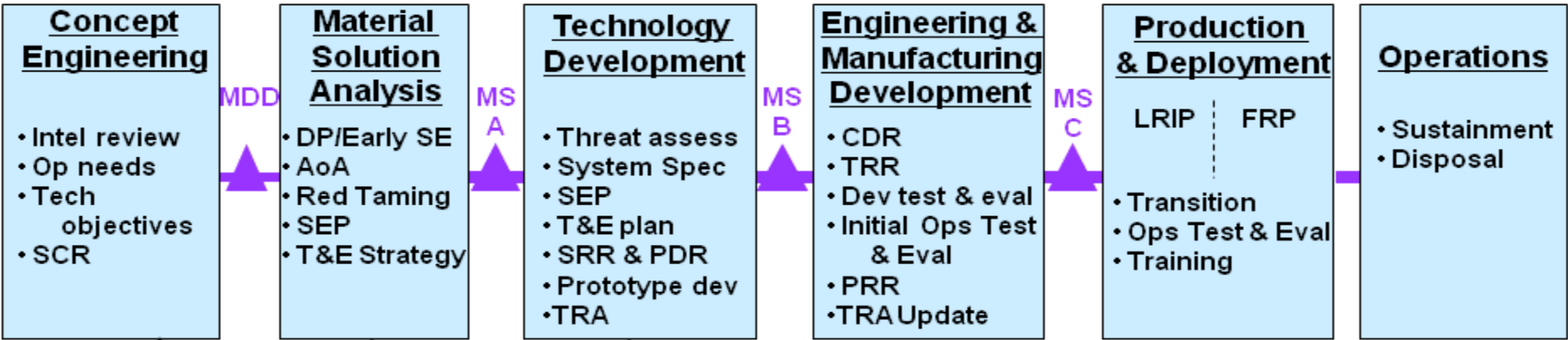
Provide a simplified, tailorable approach for delivering IT capability that favors mature technology, emphasizes the Enterprise, and eliminates redundancy

Source: Director, Command and Control, Programs & Policy (OSD) – Pre-Decisional



Solution Space: Systems Engineering - Key Upfront Discipline

5 to 15 Years



Concept Engineering

- Intel review
- Op needs
- Tech objectives
- SCR

Material Solution Analysis

- DP/Early SE
- AoA
- Red Taming
- SEP
- T&E Strategy

Technology Development

- Threat assess
- System Spec
- SEP
- T&E plan
- SRR & PDR
- Prototype dev
- TRA

Engineering & Manufacturing Development

- CDR
- TRR
- Dev test & eval
- Initial Ops Test & Eval
- PRR
- TRA Update

Production & Deployment

LRIP | FRP

- Transition
- Ops Test & Eval
- Training

Operations

- Sustainment
- Disposal

Technology and Risk Reduction

- Technology "push" investment
- Technology maturation
- Phenomenology measurements

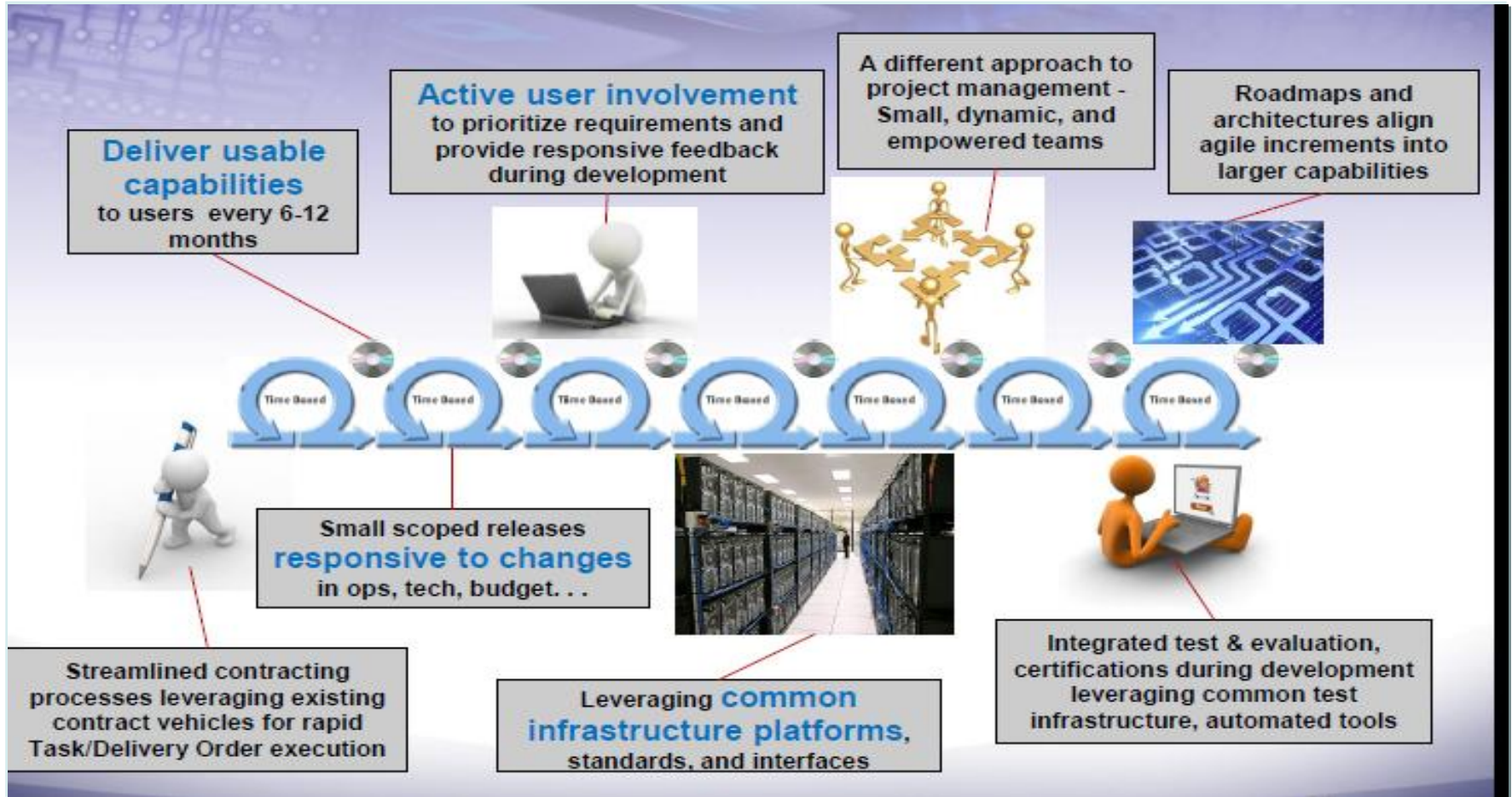
AoA – Assessment of Alternatives
 DP – Developmental Planning
 MDD – Material Development Decision
 SCR – System Concept Review
 SRR – System Requirements Review
 SEP – System Engineering Plan
 PDR – Preliminary Design Review
 CDR – Critical Design Review
 TRR – Test Readiness Review
 PRR – Production Readiness Review
 LRIP – Low-Rate Initial Production
 FRP – Full Rate Production

70-75% of Cost Decisions Made Prior to Milestone A
Impact 72% of Total Life Cycle Costs

Source: DDR&E



What Success Looks Like: Enabled Agile Capability Delivery



Source: Director, Command and Control, Programs & Policy (OSD) – Pre-Decisional



What Success Looks Like: Alignment with DoD's Better Buying Power

Better Buying Power Tenets	Agile Capability Delivery
Target Affordability and Control Cost Growth <ul style="list-style-type: none"> Mandate affordability as requirement Set shorter program timelines and manage to them 	<ul style="list-style-type: none"> Agile Capability Delivery provides timely delivery of effective and efficient capabilities Releases are cost and schedule constrained Emphasis on affordability and short program timelines
Incentivize Productivity and Innovation in Industry <ul style="list-style-type: none"> Increase the use of FPIF contract type Reinvigorate industry's independent research and development and protect the defense technology base 	<ul style="list-style-type: none"> Cost and schedule constrained development cycles permit the frequent use of Fixed Price type contracts Flexible requirements refinement process allows the frequent integration of current technologies
Promote Real Competition <ul style="list-style-type: none"> Present a competitive strategy at each program milestone Require open system architecture Increase dynamic small business role in defense marketplace competition 	<ul style="list-style-type: none"> Smaller increments provides opportunities for frequent competition and greater small business participation Agile Capability Delivery encourages the use of open systems architectures
Improve Tradecraft in Services Acquisition <ul style="list-style-type: none"> Address causes of poor tradecraft in services acquisition 	
Reduce Non-Productive Processes and Bureaucracy <ul style="list-style-type: none"> Reduce the number of OSD-level reviews Eliminate low-value-added statutory processes 	<ul style="list-style-type: none"> Reduces non-productive processes and bureaucracy Streamlines test and certification processes for faster deliveries

Source: Director, Command and Control, Programs & Policy (OSD) – Pre-Decisional



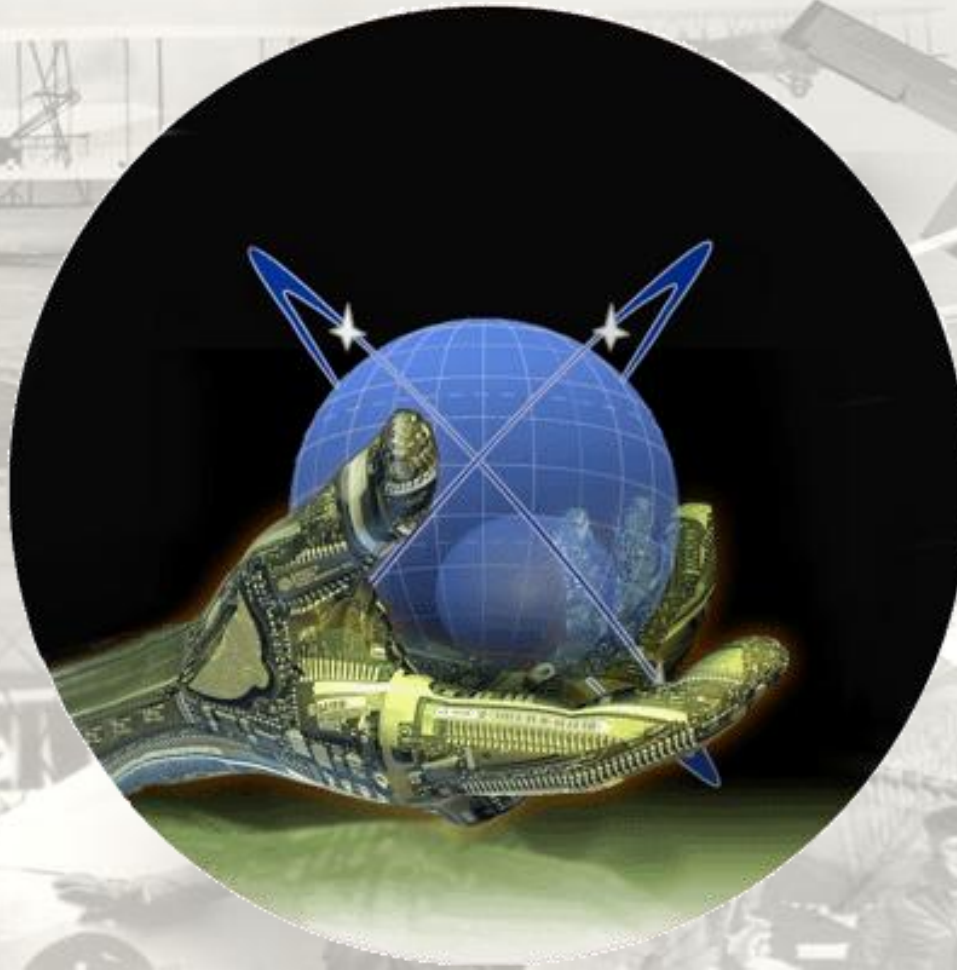
What Success Looks Like



Source: Director, Command and Control, Programs & Policy (OSD) – Pre-Decisional

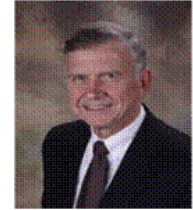


Questions?



Contact Information

Dr. Kenneth E. Nidiffer, Director of Strategic Plans for
Government Programs



Software Engineering Institute, Carnegie Mellon University

Office: + 1 703-908-1117

Fax: + 1 703-908-9317

Email: Nidiffer@sei.cmu.edu



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