Using Appraisals to Improve the Acquisition of Software-Intensive Systems

Presented to
Software Technology Conference 2002

Joe Jarzombek, PMP
Deputy Director for Software-Intensive Systems
Acquisition Resources and Analysis Directorate
Office of the Under Secretary of Defense (AT&L)

29 April 2002

Software Acquisition Management

Reducing project risks with:

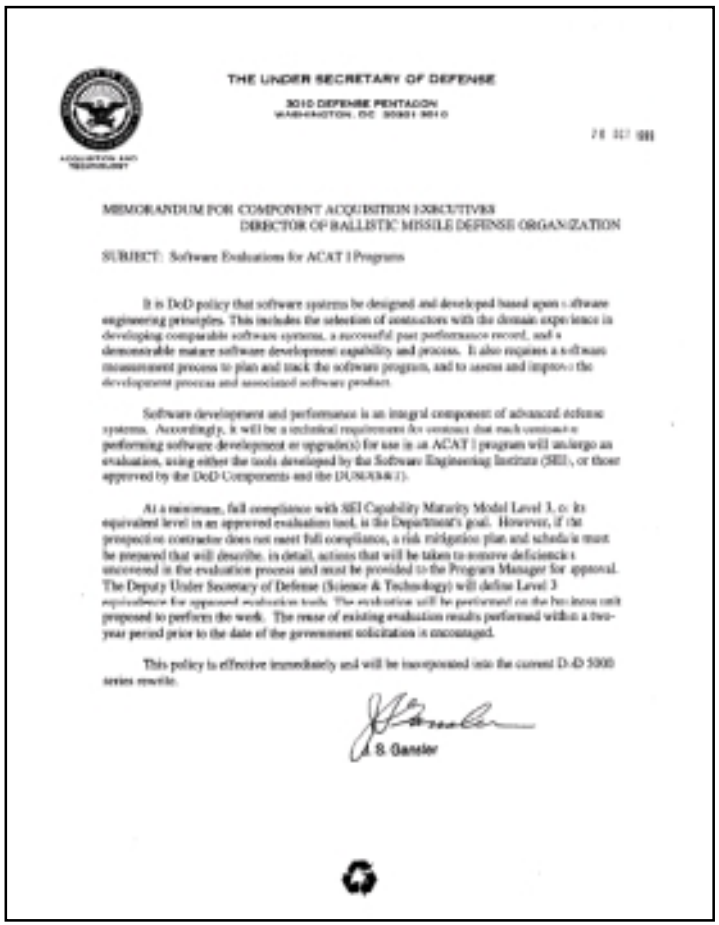
- CMM-based appraisals
- Independent Expert Program Reviews

OSD Support for CMM-based Process Improvement & Appraisal

- Key sponsor of CMMI
  - Participates through three members on the CMMI Steering Group
  - Provides guidance; sponsors and funds the SEI, the CMMI Steward
  - Provides advocacy in various communities of practice
  - Coordinates with the Services to provide implementation guidance
- Directed assessment & evaluation methods be integrated
  - SCAMPI Ver. 1.1 is an integrated Appraisal Method
  - Encourages reuse of appraisal findings
- Surveyed ACAT 1 program offices about CMM Level 3 policy
  - Policy being implemented, but some clarifications needed
  - Industry has embraced process improvement and capability maturity
  - Systems engineering is considered as important as software eng.

Current DoD 5000.2-R Policy on CMM

Initiated 26 Oct 99



THE UNDER SECRETARY OF DEFENSE

3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

MEMORANDUM FOR COMPONENT ACQUISITION EXECUTIVES
DIRECTOR OF BALLISTIC MISSILE DEFENSE ORGANIZATION

SUBJECT: Software Evaluations for ACAT I Programs

It is DoD policy that software systems be designed and developed based upon software engineering principles. This includes the selection of contractors with the domain experience in developing comparable software systems, a successful past performance record, and a demonstrable mature software development capability and process. It also requires a software measurement process to plan and track the software program, and to assess and improve the development process and associated software product.

Software development and performance is an integral component of advanced defense systems. Accordingly, it will be a technical requirement for contract that each contractor performing software development or upgrade(s) for use in an ACAT I program will undergo an evaluation, using either the tools developed by the Software Engineering Institute (SEI), or those approved by the DoD Components and the DUSD(S&T).

At a minimum, full compliance with SEI Capability Maturity Model Level 3, or its equivalent level in an approved evaluation tool, is the Department's goal. However, if the prospective contractor does not meet full compliance, a risk mitigation plan and schedule must be prepared that will describe, in detail, actions that will be taken to remove deficiencies uncovered in the evaluation process and must be provided to the Program Manager for approval. The Deputy Under Secretary of Defense (Science & Technology) will define Level 3 equivalence for approved evaluation tools. The evaluation will be performed on the business unit proposed to perform the work. The reuse of existing evaluation results performed within a two-year period prior to the date of the government solicitation is encouraged.

This policy is effective immediately and will be incorporated into the current D-D 5000 series rewrite.

J. S. Gansler

- Contractor selection
  - Domain experience
  - Past performance
  - Mature software process
  - Measurement program in place
- Evaluation
  - SEI SW-CMM Level 3 compliance, or equivalent (SDCE)
  - Risk mitigation plan for deficiencies
  - Equivalent tools approved by DUSD(S&T)
  - Must be performed on business unit proposed to do the work
  - Reuse of evaluation results within a two-year period encouraged

Why CMM Level 3 Criteria is Used for Evaluating Capabilities

- At start-up, projects in level 3 organizations should be expected to tailor practices from standard organizational process assets to meet the needs.
- Defined, repeatable processes enable more realistic bids and project control (data from multiple companies*)
  - "less than level 3" projects normally overrun cost and schedule while cost and schedule are brought more in line for "level 3 & higher" organizations
  - Lower maturity level projects have more defects causing more rework

* "A Business Case for Software Process Improvement Revised: Measuring Return on Investment from Software Engineering Management," Data and Analysis Center for Software (DACS) State-of-the-Art Report, Sep 1999 http://www.dacs.dtic.mil/techs/roispi2

CMM-Related DoD Policy

- DoD remains committed to policy of promoting mature development processes for contractors
- Acceptable alternatives to satisfy DoD 5000.2-R policy:
  - Software CMM (SW-CMM) level 3 criteria,
  - Software Development Capability Evaluation (SDCE) Core,
  - CMMI Systems Engineering and Software Engineering (CMMI-SE/SW) Level 3 criteria *(memo clarification in Spring 2002)*
- Draft memo clarifying use of CMMI-SE/SW being staffed:
  - Next through Software-Intensive Systems Steering Group – 10 May
  - Then through Service Acquisition Executives
- Still applicable:
  - Risk mitigation plan is required for deficiencies (when level 3 criteria not achieved);
  - Evaluation must be performed on business unit proposed to do the work; and
  - Reuse of evaluation results within a two-year period is encouraged

Standard CMMI℠ Appraisal Method for Process Improvement (SCAMPI℠) Ver 1.1

- SCAMPI℠ is designed to provide benchmark ratings relative to Capability Maturity Model® Integration (CMMI℠) models.
  - It is applicable to a wide range of appraisal usage modes, including both internal process improvement and external capability determinations.
  - It satisfies all of the Appraisal Requirements for CMMI (ARC) requirements for a Class A appraisal method
  - It supports the conduct of ISO/IEC 15504 assessments.
- SCAMPI Method Definition Document (MDD) describes the requirements, activities, and practices associated with each of the processes that compose the SCAMPI method.
  - It is intended to be one of the elements of the infrastructure within which SCAMPI Lead Appraisers conduct a SCAMPI appraisal.
  - Precise listings of required practices, parameters, and variation limits, as well as optional practices and guidance for enacting the method.
  - Overview of SCAMPI's context, concepts, & architecture.

SCAMPI-Related Documents

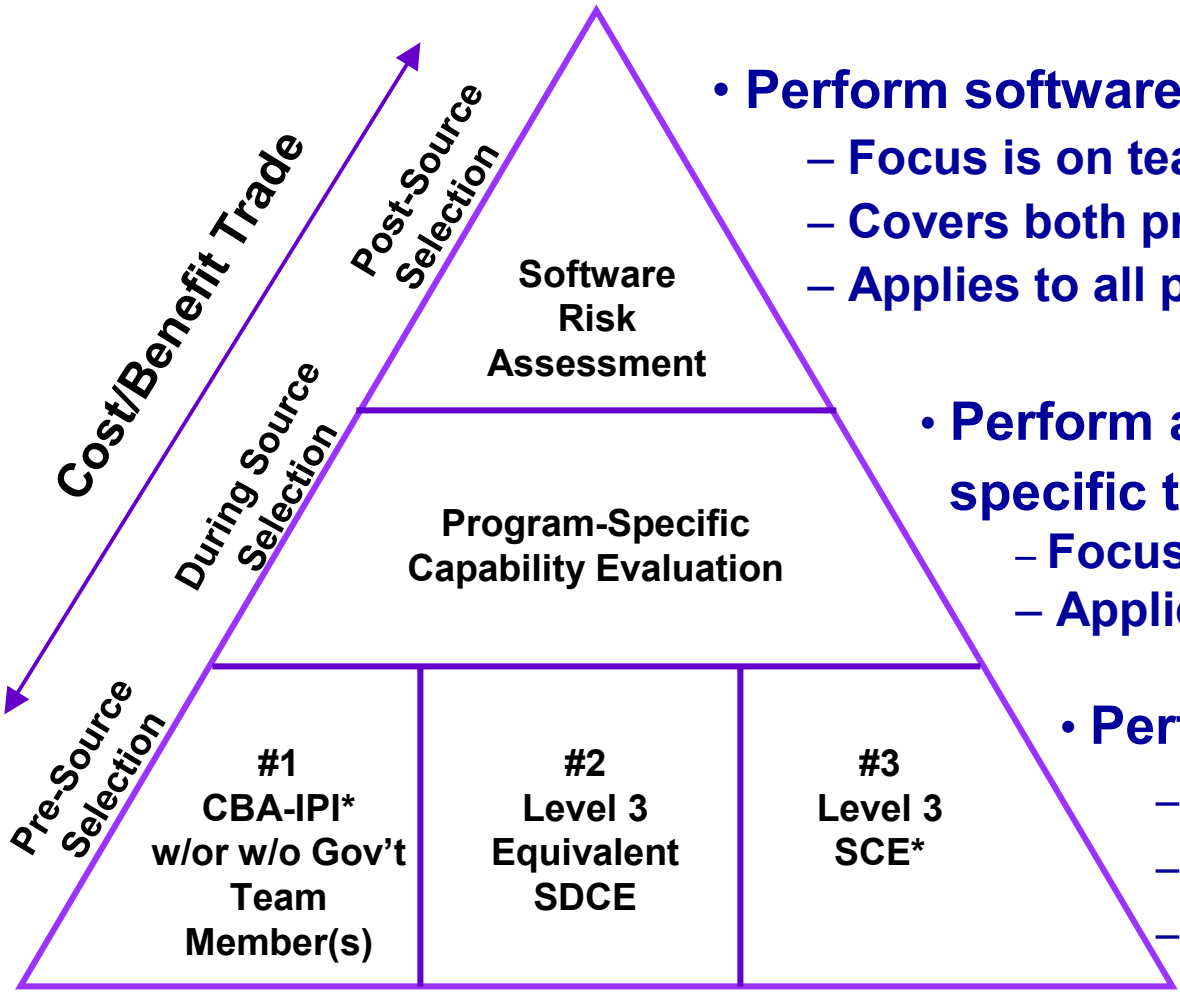
- SCAMPI v1.1 Method Definition Document (MDD) is available via SEI web site
- SEI Technical Note on SCAMPI v1.1 Use in Supplier Selection and Contract Monitoring made available April 2002 for Lead Appraiser training
- SCAMPI Method Implementation Guide (MIG) for Supplier Selection & Contract Monitoring being developed for release in Oct 2002 *

* Implementation guidance to also be developed to address tailoring for acquisition projects and Section L & M considerations

SCAMPI Capability Evaluation:
Supplier Selection & Contract Monitoring

- SCAMPI typically will be used in two different environments within acquisitions:
  (1) source selection and (2) contract monitoring.
  - Supplier source selection, the application for which SCE was originally developed, and which SCAMPI will replace, has been in use since 1987
  - Contract monitoring
    - current trends have seen a consistent application of SCE in the post-contract award environment;
    - commercial sector of the software community has been applying SCE in the selection of subcontractors and teaming partners.
  - It is expected that these applications will continue with the use of SCAMPI.

Selection of Evaluations Commensurate with Program Risk



- **Perform software risk assessment(s)**
  - Focus is on team's contract performance
  - Covers both product and process risk
  - Applies to all programs
- **Perform a capability evaluation specific to program under bid**
  - Focus is on team processes & I/Fs
  - Applies to all programs
- **Perform a Level 3 appraisal**
  - Focus is on each organization
  - Potential reuse of eval results
  - Required for ACAT I programs

*Or SCAMPI

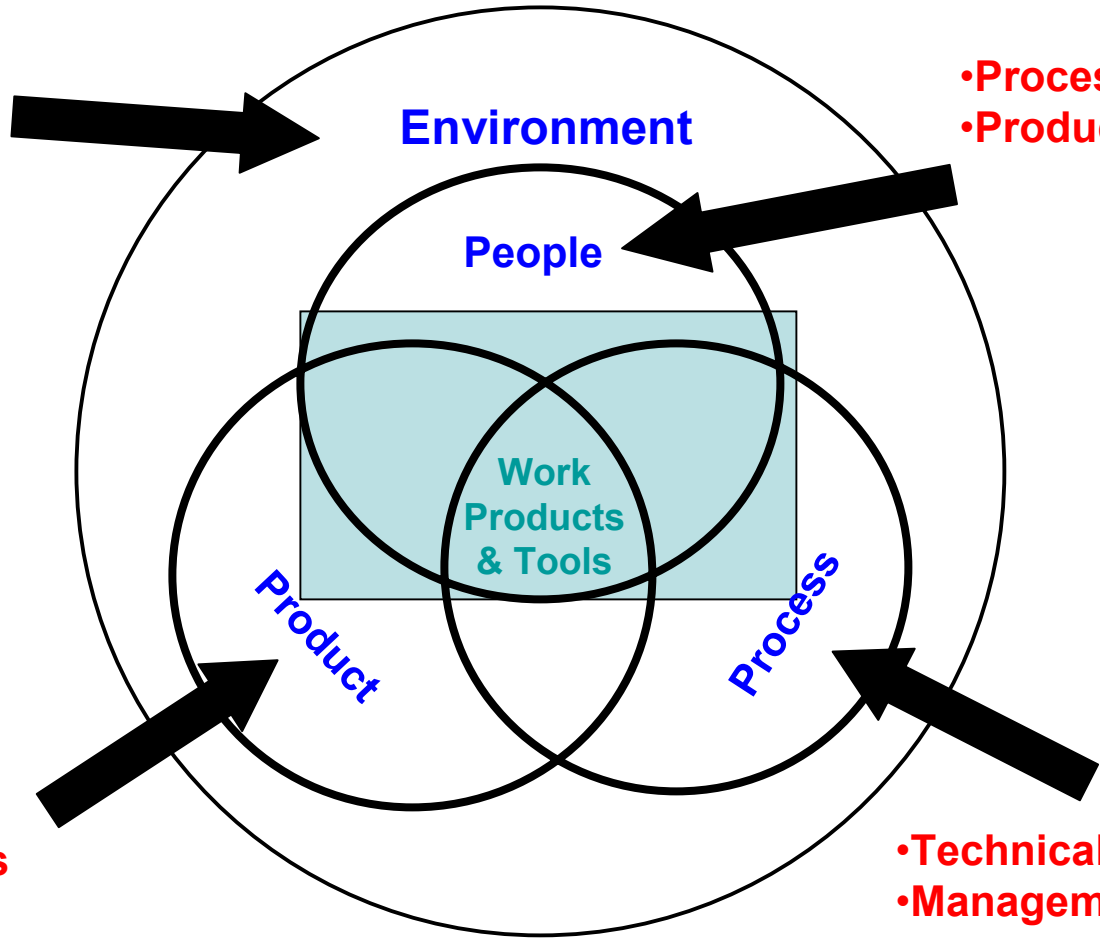
CMM-Related Implementation Guidance

- Further guidance and information related to this policy to be found at http://www.acq.osd.mil/ara/sis after 10 May.
  - Policy Information & Approved Models
  - Implementation Guidance:
    - Acceptable Appraisal Methods -
      - SCE – Software Capability Evaluation
      - SDCE – Software Development Capability Evaluation
      - Independently-led SCAMPI – Standard CMMI Appraisal Method for Process Improvement
    - Independently-led Appraisals
    - Government participation in appraisals
    - Reuse of Appraisals
    - Template/Requirements for Risk Mitigation Plan/Strategy
  - FAQs
  - Areas for discussion and feedback

* Current review of website by SIS SG, CMMI SG, and NDIA SEC

Range of Appraisals: Scope and Focus of SCAMPI vs Others

- Enterprise
- Finance
- Customers
- Project Office(s)

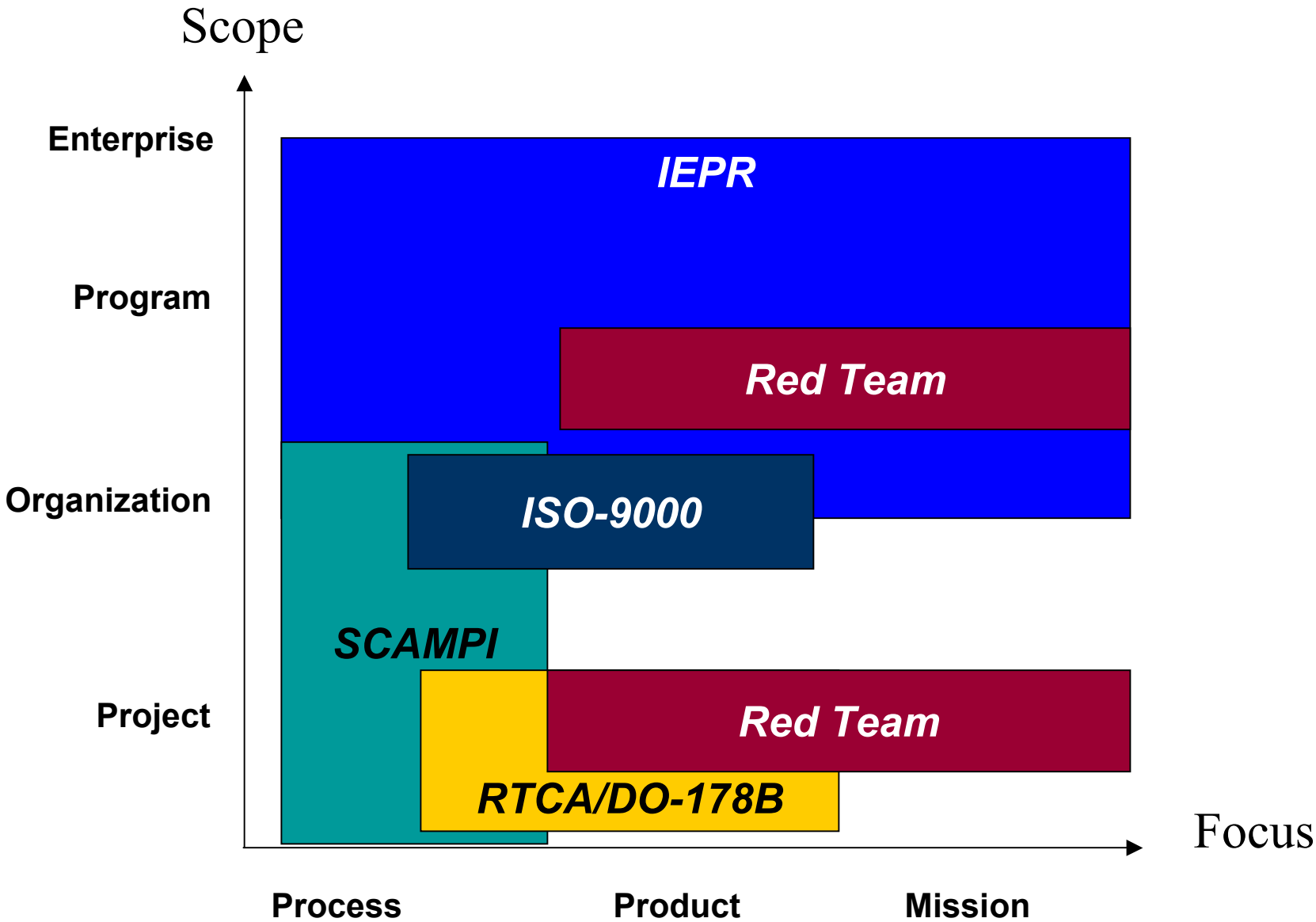


- Process Knowledge
- Product Knowledge

- Deliverables (-ilities)

- Technical Processes
- Management Processes

Comparing Some Existing Appraisal Methods



Independent Expert Program Review Overview

- An IEPR is an independent assessment of the state of health of a program with a special focus on software
  - Performed for Program Manager - not for oversight
  - Identifies risks and specific recommendations to mitigate risk
- IEPR Policy update: DoD 5000.2-R states
  - ACAT ID/IC programs shall conduct an IEPR after Milestone B and before CDR
  - IEPRs shall be considered for ACAT IA, II, and III programs

Tri-Service Assessment Initiative Issue Structure

- Environment - *Regulatory, Workplace, Political*
- Mission Requirements - *Stability, Dependencies*
- Financial - *Funding, Budget*
- Resources - *Personnel, Facilities, Tools, Products*
- Management - *Acquisition Strategy, Project Planning, Contracting/Subcontracting*
- Technical Process - *Capability, Conformance, Enhancement*
- Technical Product - *Product Line, Quality, Safety*
- Schedule - *Progress, Dependencies*
- User / Customer - *Satisfaction, Training*
- Project / Team Specific - *Project/Team Defined*

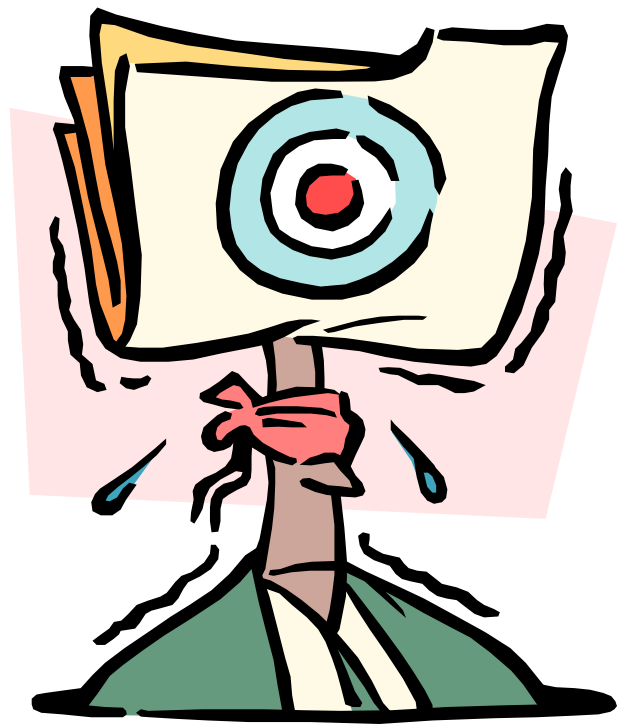
Contact Information

Joe Jarzombek, PMP
Deputy Director for Software Intensive Systems
Acquisition Resources and Analysis Directorate
Office of the Secretary of Defense (AT&L)

Crystal Mall 3, Suite 104
1931 Jefferson Davis Highway
Crystal City, Arlington VA 22202

Business Ph (703) 602-0851, Ext 105
Mobile Cell Ph (703) 627-4644
Fax: (703) 602-3560

Joe.Jarzombek@osd.mil



Back-up Slides

CMM-related Appraisal Considerations

- Multiple models/appraisal methods are currently used:
  - SCAMPI can be used for more that just the CMMI (separate appraisal method from model)
  - Contractors have expressed concern over use of multiple “equivalent” measures to assess compliance with the SW-CMM Level 3 requirement, leading to potential repeated evaluations for each contract bid.

- OUSD(AT&L) Strategy:
  - Sponsor effort and forums to develop SCAMPI implementation guides for Class A, B and C appraisals, as well as for use in source selection and contract monitoring modes
  - Continue to evaluate CMMI as a measure to assess organizational process capabilities.
  - Address CMMI implementation issues:
    - Potential flow-down application to subcontractors
    - Use of capability profiles rather than maturity levels
    - Cost/benefit of alternative appraisal methods

SCAMPI Capability Evaluation:
Supplier Selection & Contract Monitoring

- Factors to consider before deciding to use SCAMPI in an acquisition include the following:
  - Criticality of an acquisition, the systems engineering, or the software component
  - Lack of offeror past performance
  - Lack of systems engineering capability data
  - Lack of software development capability data
  - Total dollar value of the acquisition or software component
  - Management control priority
  - Unprecedented system mission needs
  - Acquisition life cycle phase
  - Length of acquisition time period
  - Prime contractor - subcontractor relationship

SCAMPI Capability Evaluation: Supplier Selection & Contract Monitoring

SCAMPI in Supplier Selection

- The factors affect the implementation of a SCAMPI and become visible in acquisition documentation:
  - Commerce Business Daily announcement
  - Source Selection Plan (SSP)
  - Evaluation Plan (EP)
  - Bidder's Briefing
  - Request For Proposal (RFP)
  - possibly, the Statement of Objectives or Award Fee Plan
  - briefing to successful offeror
  - briefing to unsuccessful offerors

Independently Led Appraisals

- The credibility of appraisal results is closely tied to the objectivity with which the appraisal is conducted.
  - The principle way to assure objectivity is to have the appraisal led by an independent Lead Appraiser -- one who is not from within the organization being appraised and one who did not provide the consulting for guiding the process improvement efforts.
- Using an independent Lead Appraiser has other benefits
  - In responding to requests for proposals, bidders may be requested or allowed to submit the results and findings of previous appraisals.
  - These results may be acceptable as long as the organizations have assured the "independence" of the Lead Appraiser. *(This supports reuse of appraisals)*
  - Winning organizations should expect to have the government program office independently verify the capabilities of the organizations prior to contract award.

Government participation in appraisals

- To provide additional credibility of findings and results from appraisals, organizations planning to compete for government contracts may include a government participant on the appraisal team.
  - It would be the role of the government participant to verify that “the artifacts of the appraisal support the findings and results of the appraisal.”
  - The government participant providing this verification role would be expected to have been trained in the appraisal methodology and model used for the appraisal.
  - It is also recommended that the government participant have some domain knowledge of the system being acquired and/or the processes being appraised. *(This supports reuse of appraisals)*

Reuse of Appraisals

- In support of source-selection activities, government program managers are encouraged to reuse the results of previous independently-led appraisals that have been conducted:
  - within two years, on organizational units proposing to do the work,
  - using evaluation criteria similar to CMMI or SW-CMM Level 3 goals. Acceptable appraisal methods include:
    - independently-led SCAMPI,
    - Software Capability Evaluation (SCE), and
    - Software Development Capability Evaluation (SDCE).
- Bidding organizations that have had appraisals that did not cover processes critical to the project might be expected to have those processes separately evaluated.
  - For example, an organization that will need to conduct risk management tasks under the proposed contract may have had a SCE done on its software development process.
  - In this situation, the acquiring organization may decide to conduct a separate appraisal of the bidding organization's risk management process.

Software Engineering in CMMs

- Level of support for SW-CMM under consideration:
  - SEI hosting meeting of SW-CMM users to elicit their desires May 7-8 in Pittsburgh
  - OSD supports maintaining sufficient methods for evaluating capabilities for meeting level-3 policy and satisfying program needs
  - Development of CMMI for software engineering only may be a necessary condition for any sunset associated with SW-CMM v1.1

Value of CMMI℠

CMMI adds:

- new emphasis on product as well as process
- coverage of services as well as systems
- emphasis on process capability & organizational maturity
- early emphasis on measurement and analysis
- better coverage of engineering management

CMMI builds upon SW-CMM® legacy adding coverage of SE from EIA 731:

- expanded model scope
- risk management and verification & validation
- requirements development and traceability

What The CMMI℠ Is Not

- CMMI models are not processes or process descriptions.
- Actual processes depend on:
  - Application domain(s)
  - Organization structure
  - Organization size
  - Organization culture
  - Customer requirements or constraints

CMMI As A Process Framework Model

- Contains the essential elements of effective processes for one or more disciplines
- Contains a framework that provides the ability to generate multiple models and associated training and assessment materials. These models may represent:
  - software and systems engineering
  - integrated product and process development
  - new disciplines
  - combinations of disciplines
- Provides guidance to use when developing processes

Expected CMMI℠ Business Benefits

- Expect to extend and increase benefits found from the SW-CMM and EIA 731 across larger portions of organizations and enterprises, because:
  - common practices for Systems Eng & Software Eng
  - linkage to ISO & IEEE standards
  - the improved cost and schedule predictability
  - more efficient and effective assessments and training, leveraging improvement efforts across multiple disciplines
  - expandable CMMI Product Suite
  - vision for improvement is more integrated
  - reduced system development costs and cycle times

Industry* Interests in CMM-related policy

- Minimal set of evaluation tools
  - Conserve costly investment in supporting multiple tools
  - Leverage existing tools and methods
  - Too many tools increases cost and risks, losing repeatability
- Reuse of evaluation results
  - Reduce repetitive evaluations
  - Reuse results across evaluation tools
- Consistent application of evaluation tools
  - Evaluation team qualifications and method guidance
  - Cost effectiveness
  - Reliable and repeatable results
- Maintain program scope for evaluations
  - ACAT 1 programs
  - Implications for smaller programs?

*Industry input provided by NDIA, AIA, & GEIA – seeking more input

CMMI℠ Evolution

- CMMI℠ will continue to evolve to better address needs of those delivering software-intensive systems
  - Address the total scope of functional disciplines that must be brought together in 'delivery' capabilities in an integrated team
  - Ensure greater participation from acquisition-related organizations to improve DoD project managers' ability to work with contractors with high maturing capabilities
  - Include input of safety & security communities of practice

- Sponsor CMMI℠ transition enablers
  - Mapping to standards
  - Guidebooks for specific domains
  - Implementation and training aids

Understanding ROI & Impact on Industry

- Data collection needs to continue
  - Empirical data on use of CMMI to support claims of improvement
  - Data on integrity of CMM-based ratings
  - Behavior of 'rated' organizational units
    - Performance on subsequent contract awards
    - 'Shelf-life' for re-validation of ratings or findings/results
- Broader industry* view (commercial sector) on potential impacts of CMMI
  - Perceived benefits and potential burden for moving to CMMI
  - ROI for commercial sector relative to CMMI
- Substantiated value to DoD?
- Implementation of guidance to tailor use for projects

*Industry input provided by NDIA, AIA & GEIA – seeking more input

CMMI Summary

- CMMI is Important:
  - Integration of systems and software engineering is significant
  - Integrated Product and Process Development and Supplier Sourcing involves acquirers (both as buyers and integrators)
  - Integrated appraisal methods for internal process assessments and external capability evaluations are important to the adoption of CMMI
- DoD Will Continue to Support CMMI
  - Through advocacy in various communities of practice
  - Through sponsorship and guidance to the CMMI Steward (SEI)
  - Through implementation guidance
- Policy clarification allowing the use of CMMI to comply with existing SW-CMM policy enables continued evaluation of the full utility of CMMI
- Used in conjunction with ISO &IEEE standards, CMMI provides a framework for integrated process improvement with supporting guidance for implementing best practices

Tri-Service Assessment Initiative

- IEPR Policy update
  - Requires ACAT ID/IC programs to conduct IEPRs after Milestone B and before CDR
  - IEPR Implementation Plan provides guidance for implementing policy
- Assessments require PM buy-in and participation
  - PM retains the assessment results
- Independent Assessment Teams consisting of DoD field experts/practitioners
- Consistent, tailorable, issues-driven Assessment Process, tailored for each assessment
- Assess a wide scope of programmatic issues with special focus on software
- Fee-for-service Assessments; cost covers team travel and labor
- Average duration: 2-3 months

Carnegie Mellon
Software Engineering Institute
Pittsburgh, PA 15213-3890

SEI Acquisition Support

Jack Ferguson, jrf@sei.cmu.edu

Carnegie Mellon
Software Engineering Institute

Outline

Background

SEI Integrated Acquisition Support (IAS)

Outline

Background

SEI Integrated Acquisition Support (IAS)

What is the Problem?

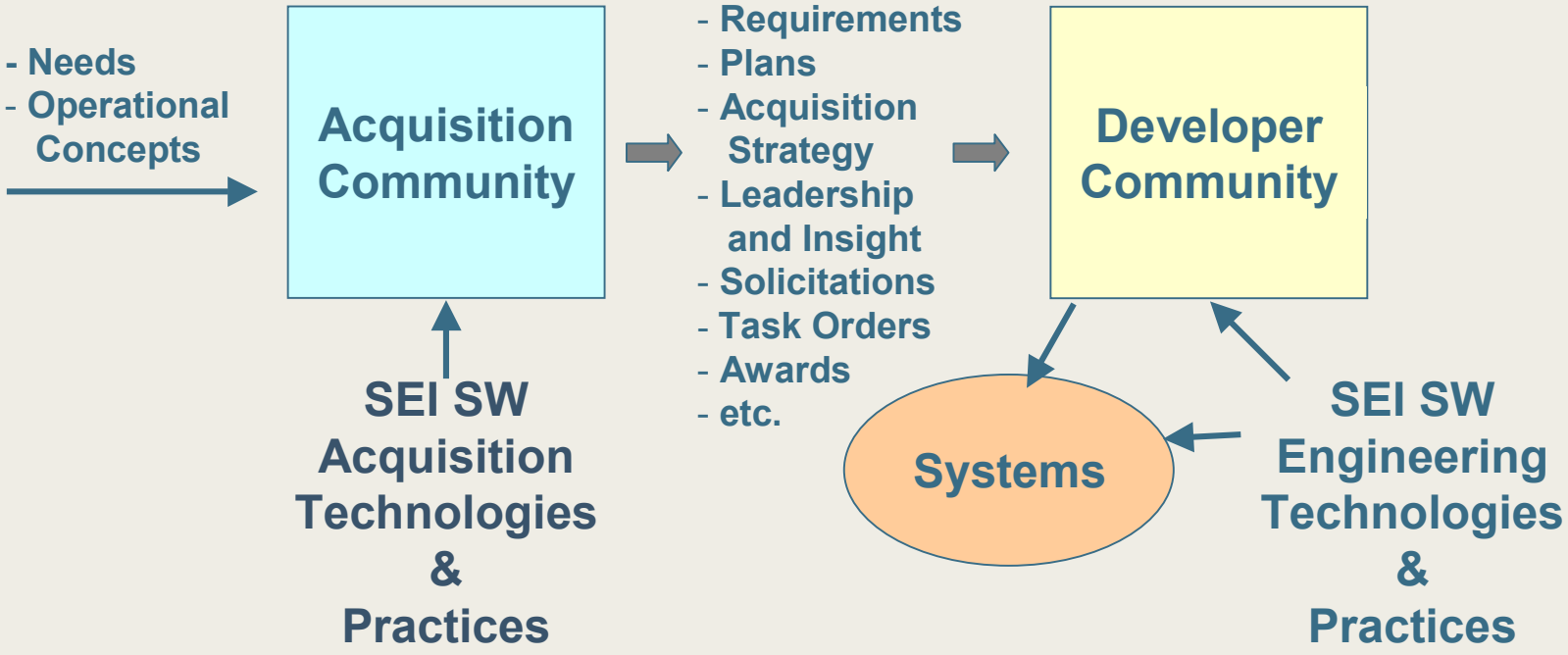
Developing, acquiring and sustaining software-intensive systems is still high risk:

- 49% of new projects were *late and over budget*
- 28% were on time
- 23% were *cancelled before completion*

Source: 2000 Standish Group Chaos Report

Knowing what could cause you to fail, and acting before it happens, increases the odds of successfully acquiring a system

Better Buyer, Better Builder



Drivers for SEI Acquisition Focus

Reduce the DoD risks in acquiring and sustaining software-intensive systems

Bring SEI's unique combination of software engineering knowledge, practices, and capabilities to acquisition and sustainment of software-intensive systems at direction of DoD

Promote collaborations to amplify the combined experience and knowledge of the collaborator network

Enable better buyers of SW-intensive systems

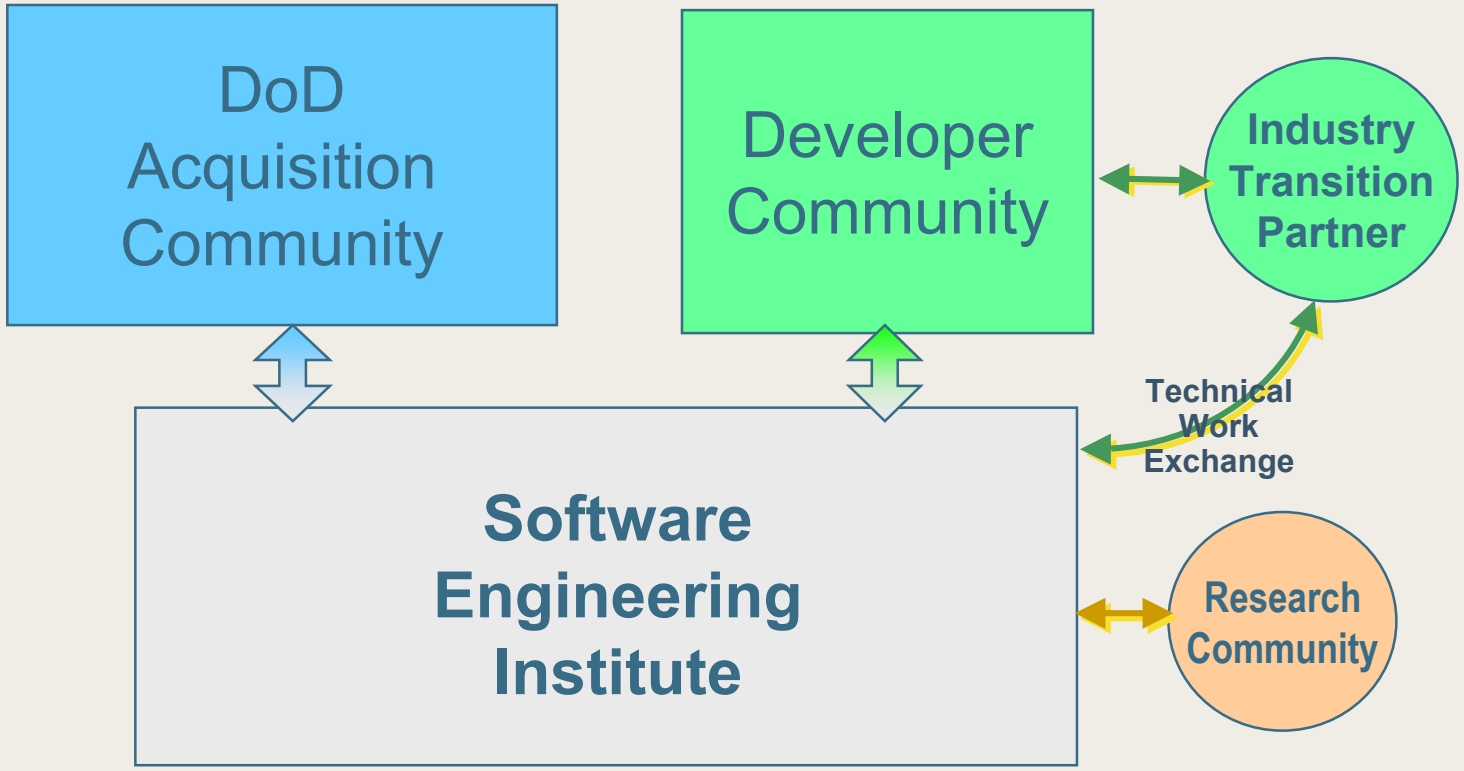
Carnegie Mellon
Software Engineering Institute

Outline

Background

SEI Integrated Acquisition Support (IAS)

SEI Interfaces Before IAS



Examples of Acquisition Support

NRO (SA-CMM, Product Line Practices, Team Risk Management)

Coast Guard (Quality Attribute Workshop (QAW), RFP preparation, review deliverables, SA-CMM, metrics, survivability)

NAVAIR (SA-CMM, Team Software Process, CMMI)

TAPO (architecture evaluation, acquisition strategy, product line scoping)

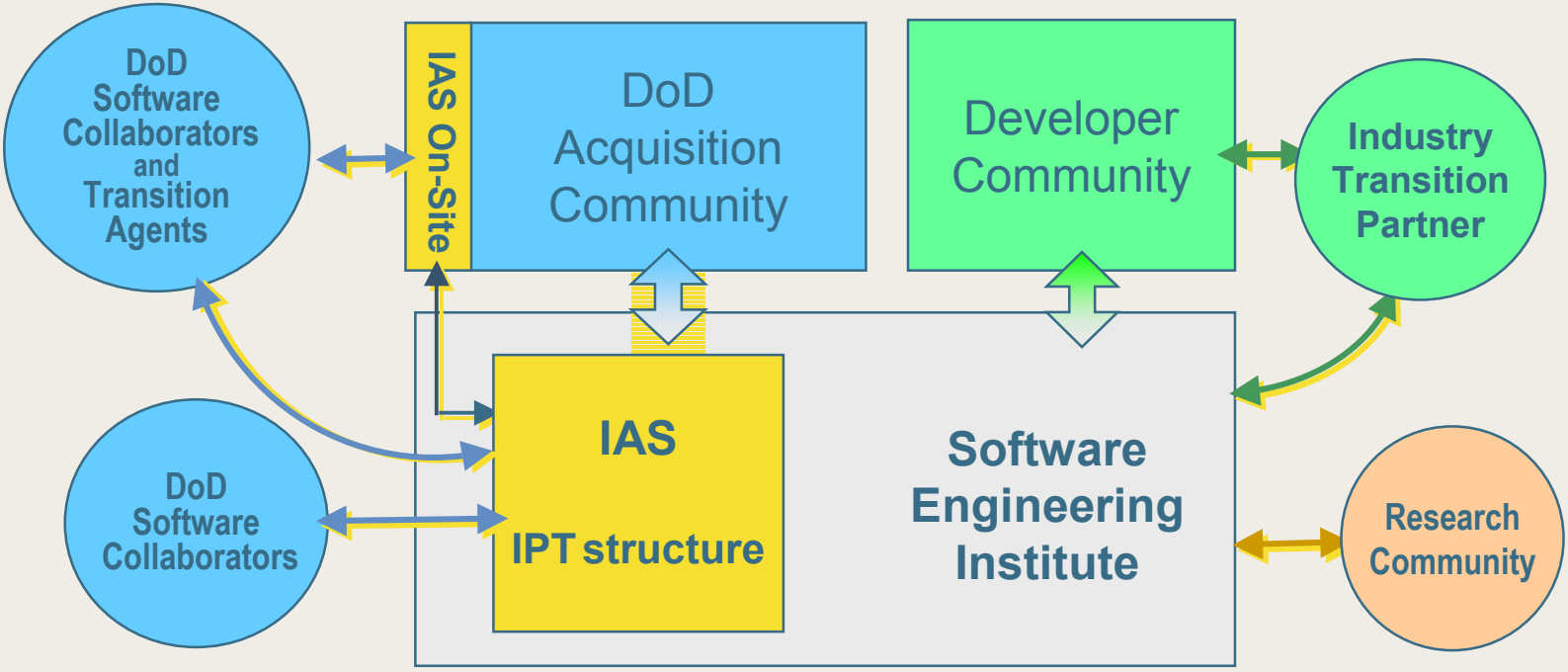
ESC (evolutionary acquisition, COTS risk guidance)

Gunter AFB (Legacy System Migration, QAW, RFP Section L and M evaluation criteria, review deliverables)

Leadership and participation on Independent Technology Assessments, IEPRs

OSD (PEO/SYSCOM Evolutionary Acquisition, COTS)

SEI Interfaces with Integrated Acquisition Support (IAS) Organization



Objective: Assist DoD acquirers in making evolutionary and revolutionary improvements in the acquisition of software intensive systems

Integrated Acquisition Support Activities

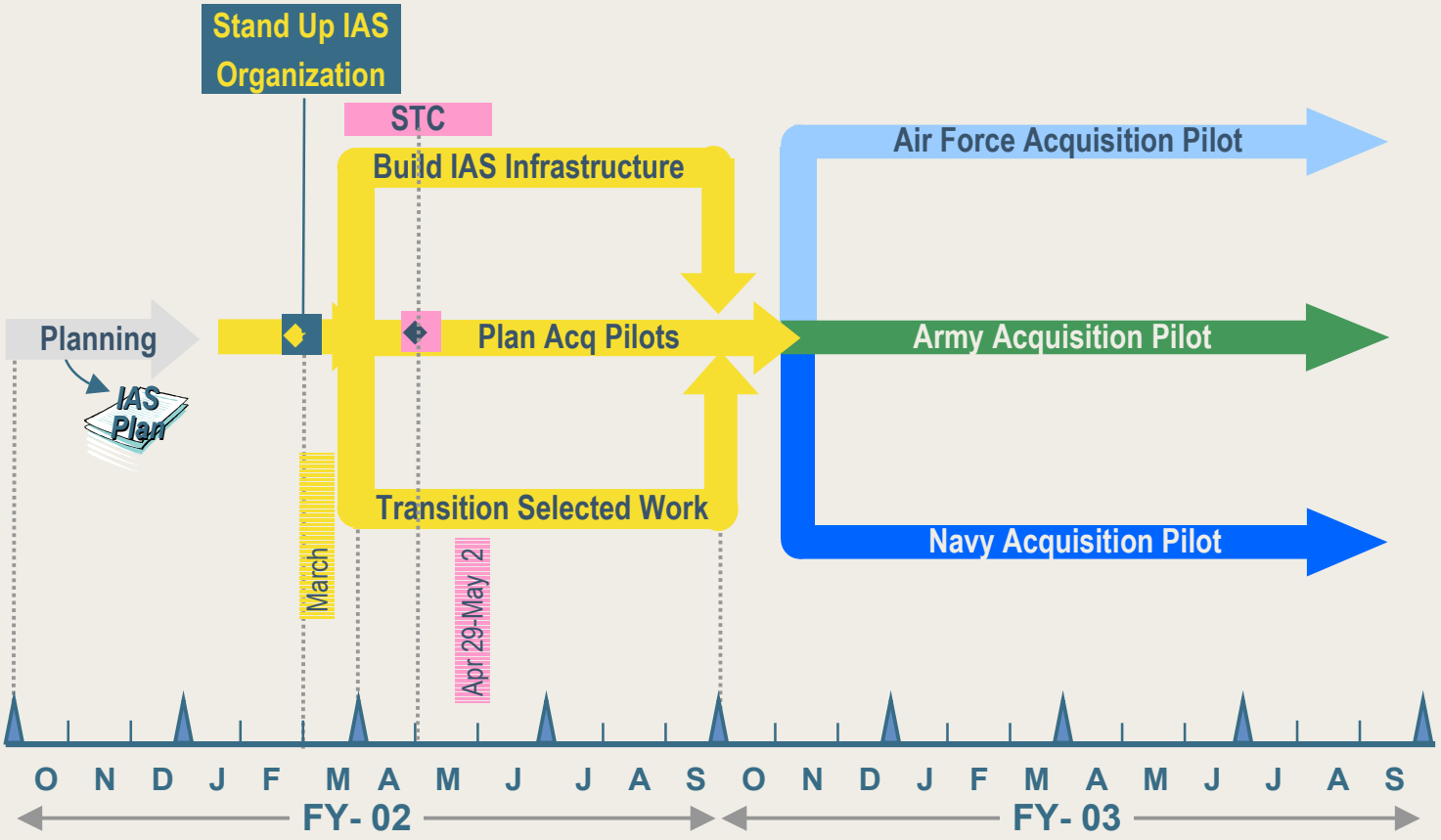
Program Specific Activities

- Transition technologies and practices to improve DoD software-intensive system acquisition and sustainment
- Perform diagnostics such as Independent Technical Assessments and IEPRs
- Assist with RFP preparation
- Assist with technical evaluations of proposals and deliverables

Amplification Activities

- Collaboratively develop acquisition technologies and practices
- Transition technologies and practices to the DoD acquisition community collaborators
- Review and advise DoD acquisition policy related to SIS

IAS Roadmap for FY02-03



What is an Acquisition Pilot?

Trial use of one or more new SEI products or services, delivered by SEI technical staff, in support of a strategically important acquisition program, to foster widespread use throughout an acquisition organization (work includes use in support of an acquisition organization, metrics-based analysis, and lessons learned capture and dissemination).

Criteria for Acquisition Pilots

Important to Service Acquisition Executive

Commitment of sponsor and PM for change

Commitment to leverage funds

Early enough to help program

Target for SEI technologies

Long-term focus vs. day-to-day problem solving

Opportunity to capture and disseminate lessons learned

Involvement of other Software Collaborators

Summary

SEI has a new focus on helping the acquisition community

- New Integrated Acquisition Support Organization
- On-site presence
- Direct involvement with acquisition process

Are looking for opportunities

- To help Program Offices thru Acquisition Pilots
- To work with Software Collaborators to develop and transition technology

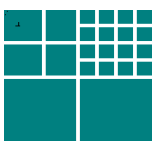
Successful Software Acquisition without a Hogwart's Degree

Experience Factory Applied to Acquisition

Vic Basili, UMD/FC-MD/CeBASE

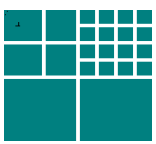
STC Meeting

April 29, 2002



Motivation for an Empirical Approach

- Software acquisition teams need to understand the right models and techniques to support their activities. For example:
  - What level of information do I need from a contractor to keep track of and understand the progress towards my goals?
  - How should you select and tailor an acquisition lifecycle model for the particular environment?
  - How do you judge the credibility of the cost estimates provided by the bidder?
- Too often, such decisions are based on opinion and personal experience, made without a reasonable basis for judgement
- How do other disciplines build knowledge about
  - the elements of their discipline, e.g., their products and processes
  - the relationships between those elements



One Motivation for the CeBASE Approach

CeBASE

Experiences with the Software Engineering Laboratory (SEL)

Consortium of NASA/GSFC, CSC, UM, established in 1976

Goal to improve the process and product quality

- using observation, experimentation, learning, and model building

Learned a great deal (e.g., what worked and didn't work)

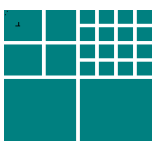
Observation played a key role

Feedback loops provided an environment for learning

Generated lessons learned and packaged into the process, product and organizational structure

Made measurable improvements in the processes and products

The Software Engineering Laboratory was awarded the first IEEE Computer Society Award for Software Process Achievement in 1994 for demonstrable, sustained, measured, significant process improvement



The SEL Empirical Approach
Baselines: 1987, 1991, 1995

CeBASE

Continuous Improvement in the SEL

Decreased **Development Defect rates** by
75% (87 - 91) **37%** (91 - 95)
Reduced **Cost** by
55% (87 - 91) **42%** (91 - 95)
Improved **Reuse** by
300% (87 - 91) **8%** (91 - 95)
Increased **Functionality** five-fold (76 - 92)

CSC

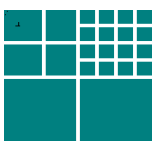
officially assessed as CMM level 5 and ISO certified (1998), starting with SEL organizational elements and activities

Fraunhofer Center

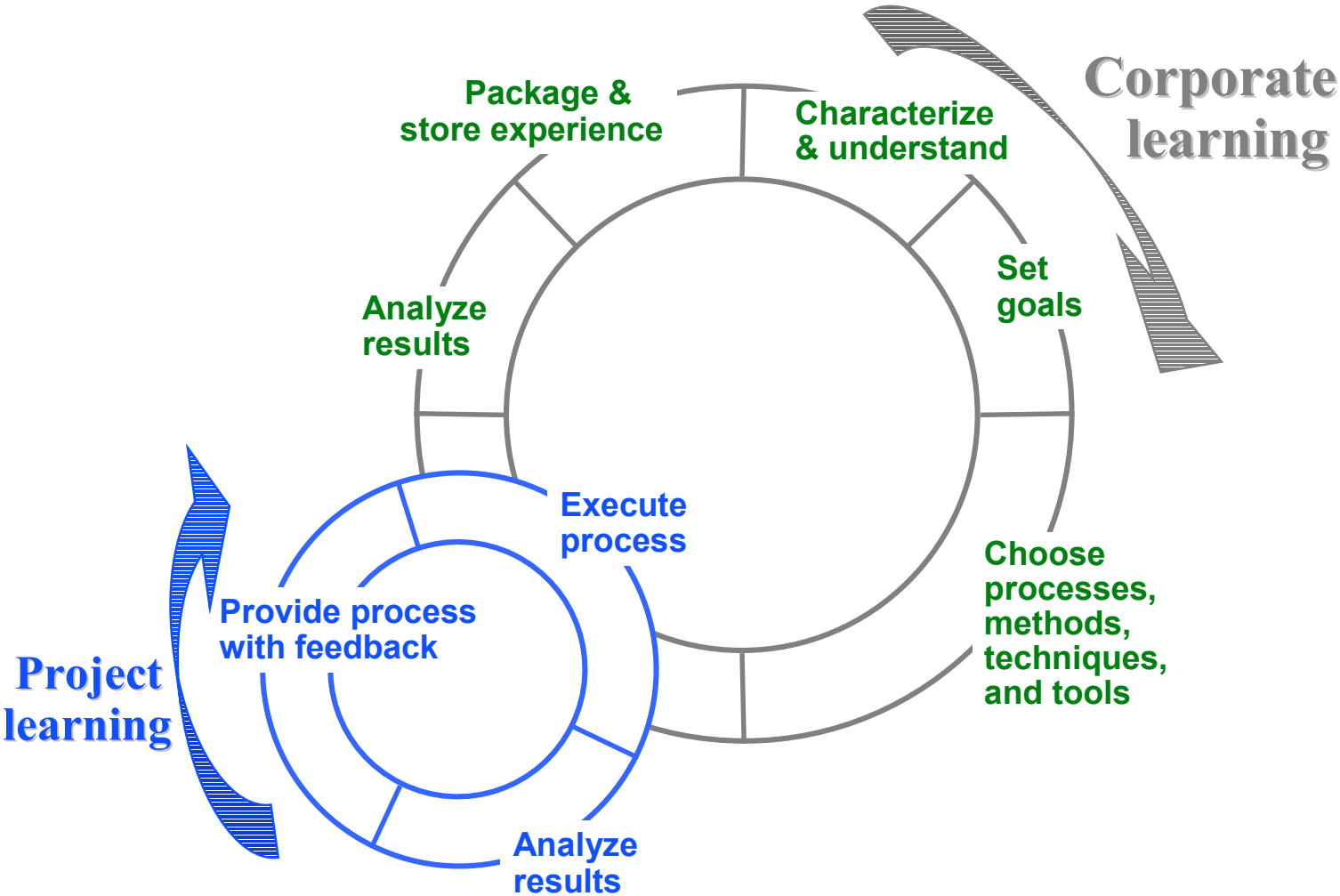
for Experimental Software Engineering - Maryland created 1998

CeBASE

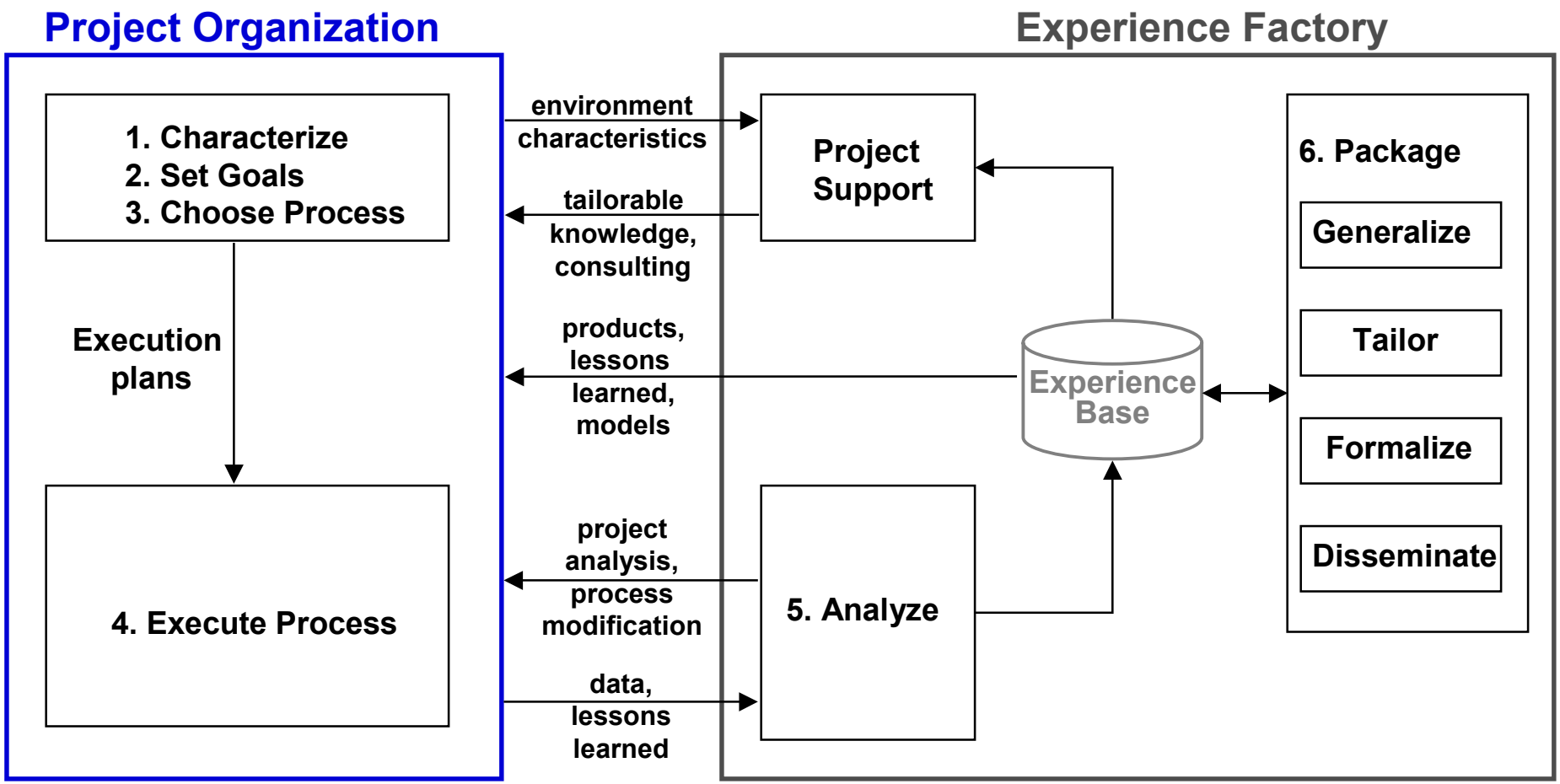
Center for Empirically-Based Software Engineering created 2000



Quality Improvement Paradigm



The Experience Factory Organization



Software Acquisition Models and Measures

Uses

Characterize

Describe and differentiate acquisition processes

Build descriptive models and baselines

Understand

Explain associations/dependencies between processes and effects

Discover causal relationships

Analyze models

Evaluate

Assess the achievement of quality goals

Assess the impact of various acquisition processes

Compare models

Predict

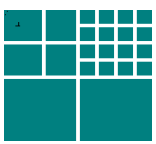
Estimate expected product quality and process resource consumption

Build predictive models

Motivate

Describe what we need to do to manage the contractor

Build prescriptive models



Software Acquisition Models and Measures

CeBASE

Resource Models and Baselines,

e.g., cost models, resource allocation models

Change and Defect Baselines and Models,

e.g., defect/quality prediction models

Product Models and Baselines,

e.g., progress measurement, technical performance measures

Process Definitions and Models,

e.g., acquisition lifecycle models for large and small acquisitions, COTS evaluation models

Method and Technique Evaluations,

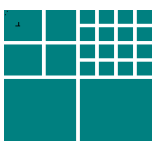
e.g., acquisition risk management methods, contract management methods

Quality Models,

e.g., reliability models, ease of change maintenance, availability models

Lessons Learned,

e.g., risks associated with a performance-based acquisition



Minimizing Acquisition Process Steps

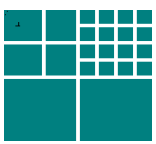
When can I get away with a minimal level of process in my acquisition processes, i.e., only the absolutely necessary activities?

There is evidence that

- a minimal process is possible for projects that are less than 10 months, under $50K, and less than 10 people, have stable requirements, and use a known technology

Implications for empirically based software acquisition:

- From a cost effectiveness point of view, I can identify the minimum set of processes that have been demonstrated necessary in past projects and concentrate on only those.



Maximizing Acquisition Process Steps

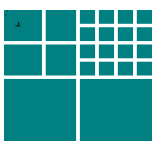
When do I need a robust software acquisition process with a high level of detail, i.e., high degree of formality, full set of steps, … ?

There is evidence that

- a robust process is needed for projects of more than 24 months, more than a million dollars, and more than 30 people, and have volatile requirements using new technology.

Implications for empirically based software acquisition:

- I need to put a full acquisition process in place, including full lifecycle planning, for large systems.



Process Customization

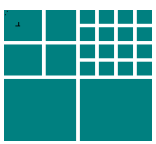
What level of process detail is needed for customizing acquisition processes?

There is evidence that there are at least three levels of detail available in process

- minimal process
- controlled process, needed for projects that are 12 to 36 months, under a million dollars, and less than 30 people
- a robust process

Implications for empirically based software acquisition:

- The better you can articulate your project characteristics, the more effectively you can choose and tailor process.



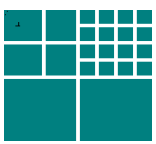
Summary

Improvement of software competence is an essential business need

The software acquisition discipline needs to
- build software core competencies as part of overall acquisition strategy
- create continuous learning organizations to improve acquisition competence
- generate a tangible corporate asset: an experience base of competencies
- build an empirically-based, tailorable software acquisition process

CeBASE Approach represents a Lean Enterprise Management concept that should be compatible with a SA-CMM level 5 organizational structure

Learning process is continuous and evolutionary



CeBASE Framework for Acquisition

Barry Boehm, USC

STC Software Acquisition Panel

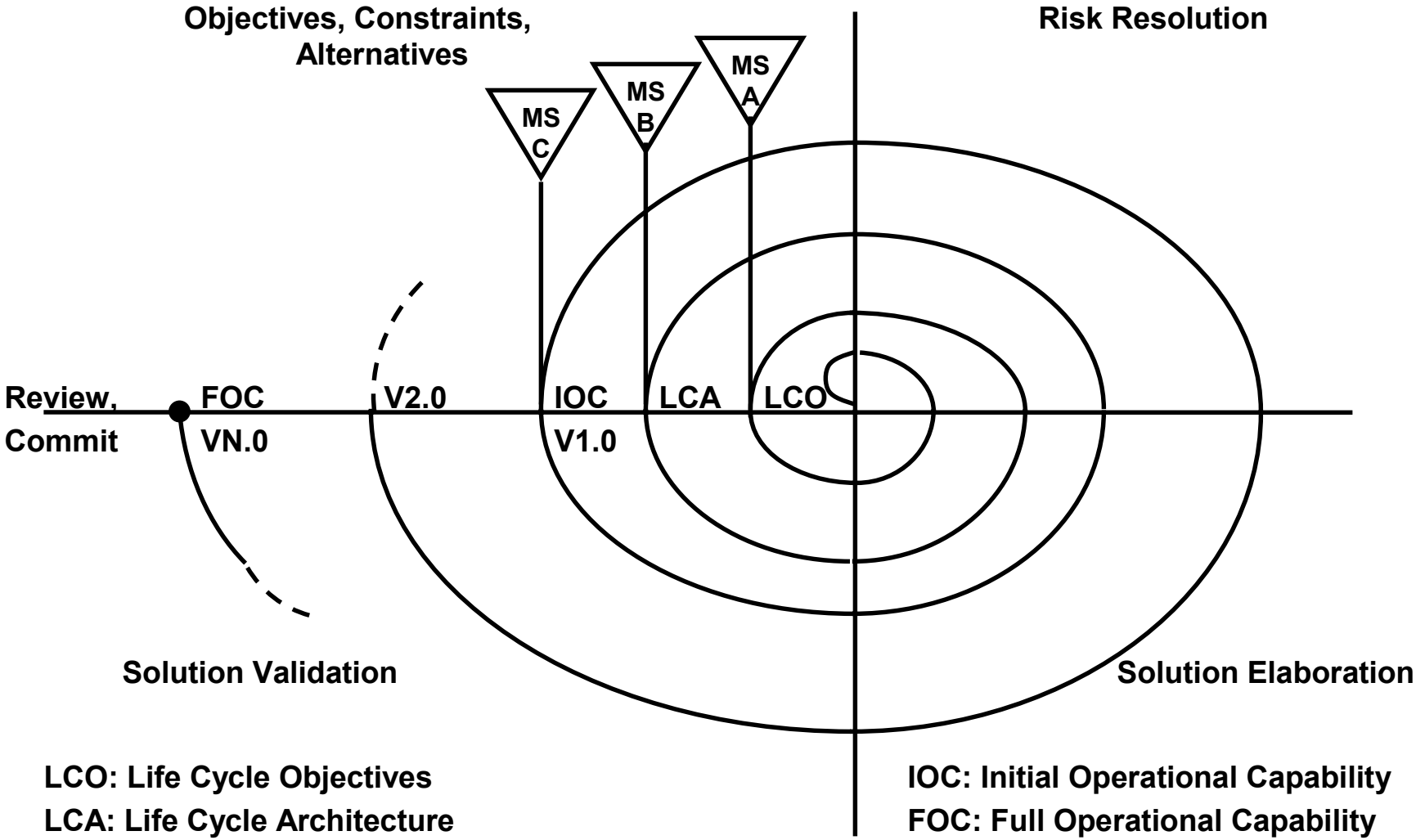
April 29, 2002

Outline

- CeBASE Spiral Fits DoD 5000.2 Acquisition Life-Cycle
- Acquisition Objectives and Evaluation Frameworks
- Competitive Front-End Economics
- Successful Fixed-Schedule or Fixed-Cost Acquisitions
  - Schedule As Independent Variable (SAIV) Process
- The CeBASE Method fits the CMMI

The CeBASE Spiral and DoD 5000.2

– Cross Talk, May 2001



LCO: Life Cycle Objectives
LCA: Life Cycle Architecture
IOC: Initial Operational Capability
FOC: Full Operational Capability

LCO (MS A) and LCA (MS B) Pass/Fail Criteria

– Cross Talk, December 2001

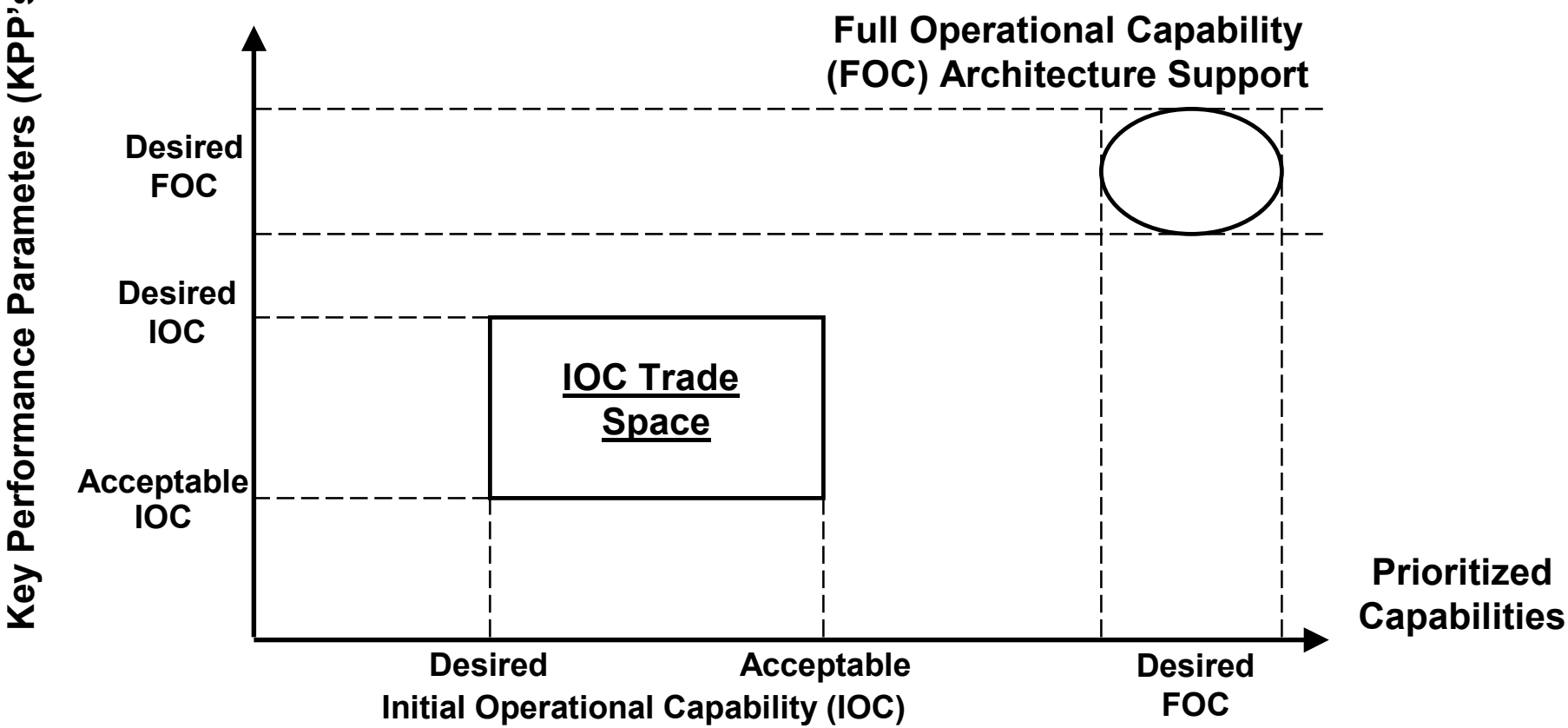
A system built to the given architecture will

- **Support the operational concept**
- **Satisfy the requirements**
- **Be faithful to the prototype(s)**
- **Be buildable within the budgets and schedules in the plan**
- **Show a viable business case**
- **Establish key stakeholders' commitment to proceed**

LCO: True for at least one architecture
LCA: True for the specific life cycle architecture;
All major risks resolved or covered by a risk management plan

Software Acquisitions Should Avoid Point Solutions

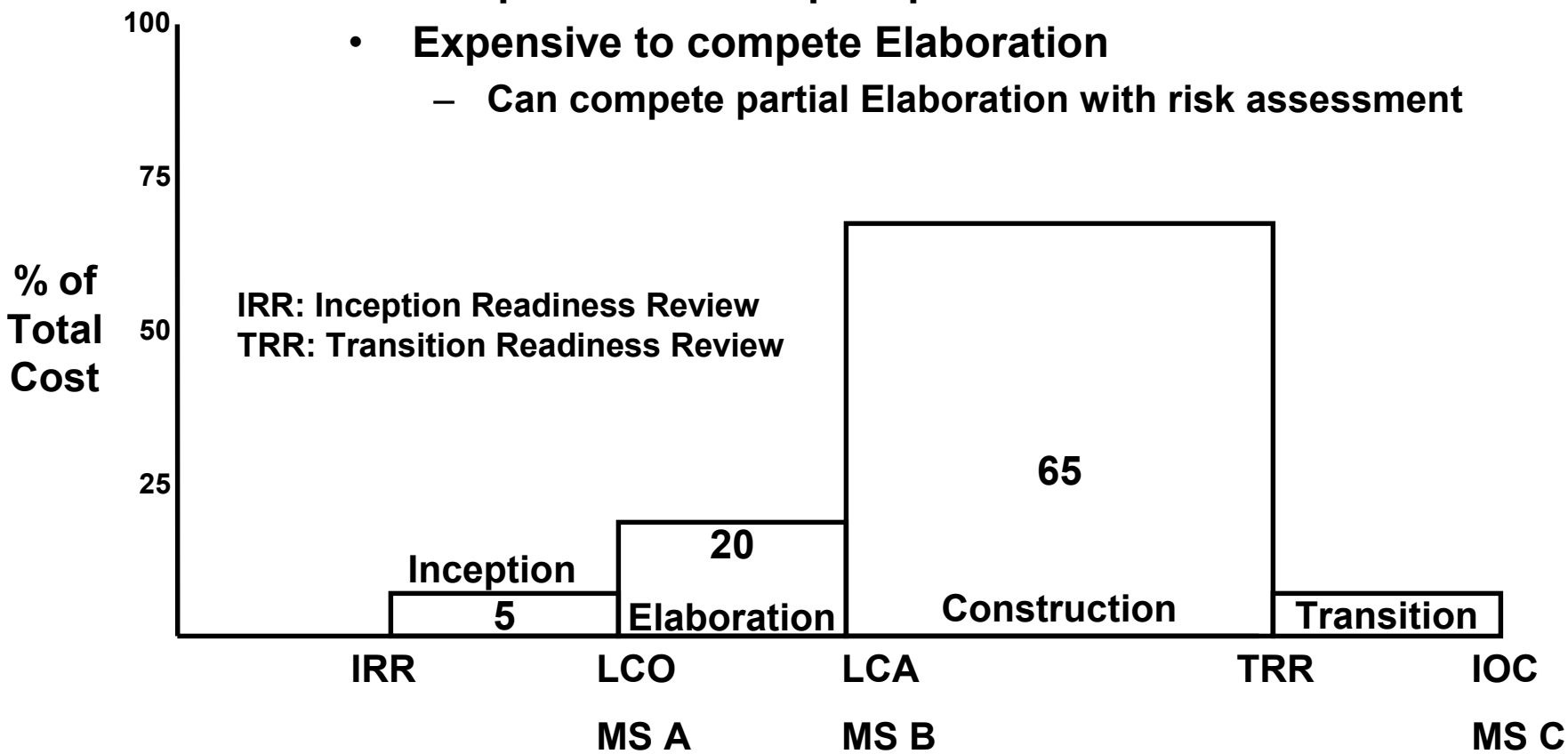
– Software Needed for Adaptability to Change



KPP's:cost, schedule, performance, dependability, interoperability, …

Competitive Front End Economics

- Inexpensive to compete pre-IRR
- Expensive to compete Elaboration
  - Can compete partial Elaboration with risk assessment



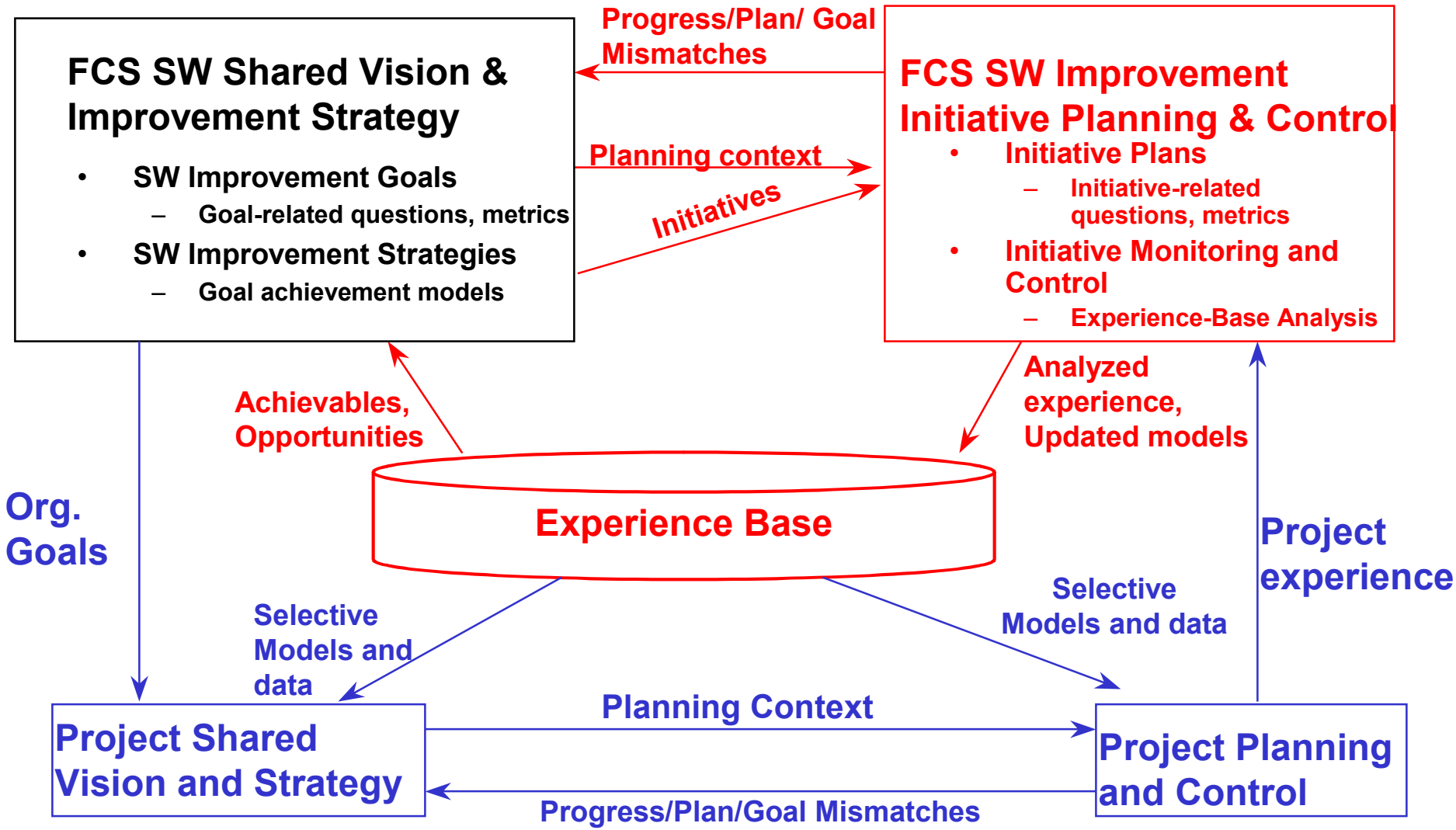
The SAIV* Process Model

– Cross Talk, January 2002

1. Shared vision and expectations management
2. Feature prioritization
3. Schedule range estimation
4. Architecture and core capabilities determination
5. Incremental development
6. Change and progress monitoring and control

*Schedule As Independent Variable; Feature set as dependent variable
– Also works for cost, schedule/cost/quality as independent variable

Integrated Project and Organization Management: The CeBASE Method – Cross Talk, May 2002



The CeBASE Method Fits The Full CMMI

– Cross Talk, May 2002

Assessment / Practice		Project	Organization
Application Focus	Software	Software CMM / Waterfall	Software CMM / Early EF, GQM
	Systems	CMMI / Spiral, MBASE, RUP	CMMI / CeBASE Method