CMMI® for Acquisition Works in the Real World

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Agenda

- Organizational Overview
- Starting Process Improvement
- Requirements PAT
  - Benefits Realized Migrating from CMMI-DEV to CMMI-ACQ
- Project Management PAT
  - Benefits Realized Applying CMMI-ACQ

Background

- This presentation describes the process improvement efforts performed by a US Government organization. This presentation refers to them as "**the Organization**"
- The Organization started a process improvement effort in early 2007 using the only capability maturity model available at the time, CMMI-DEV
- The MITRE Corporation is supporting their process improvement activities
- When CMMI-ACQ was released in late 2007, it was quickly adopted as a better mechanism to achieve process improvement
- This presentation describes a "work in progress", showing why there was a transition from CMMI-DEV to CMMI-ACQ, and how CMMI-ACQ is being leveraged to the Organization's advantage

Organizational Overview

- Type of IT Work:
  - Mostly Acquisition (OTS Hardware and Software, GOTS).
  - The Organization installs/integrates acquired components into operational environment
  - Contractors primarily used for staff augmentation
  - Minor web development for infrastructure support

The Organization's Challenges

- Manage a large number of small to large projects
  - All project managers are members of the Organization or contractors (providing staff augmentation)
  - Each project is focused on acquiring and integrating capabilities needed to support the Organization's mission
  - Constraints:
    - Limited Staff, Budget and Schedule
    - Single Project Manager typically oversees 5 – 7 projects
- Manage technology changes
  - Keep current with technology advances
  - Be prepared to acquire and integrate new technologies as they mature
  - Maintain the current mature Enterprise Architecture
- Be aggressive in ensuring that Organization is able to meet its mission with little or no "down-time"

The Organization's Process Improvement Business Objectives

- Process improvement objectives are outlined in the Organization's Process Improvement Plan
  - Improve product quality by reducing defects
  - Reduce delivery time by increasing productivity
  - Improve customer satisfaction
  - Enhance project manager training
  - Develop best practices, knowledge, and experience in the Organization's work force

MITRE's Role in the Organization's Process Improvement

- Help the Organization identify and work to achieve process improvement goals
- Facilitate ProAct [*] Meetings
- Draft process improvement plans and schedules
- Advise the ProAct lead and sponsor
- Support PAT activities:
  - Draft straw man Standard Operating Procedures (SOPs)
  - Draft relevant templates
  - Facilitate PAT and Pilot meetings

[*] **The Process Action Group (ProAct) has similar roles and responsibilities typically performed by an Engineering Process Group (EPG)**

2Q 2007: Two Appraisals (SCAMPI-C)

- Basis: CMMI-DEV
  - This was the only model available at the time
- Selected process areas most relevant to the Organization's mission:
  - Configuration Management (CM)
  - Decision Analysis and Resolution (DAR)
  - Measurement and Analysis (MA)
  - Process and Product Quality Assurance (PPQA)
  - Project Planning (PP)
  - Project Monitoring and Control (PMC)
  - Requirements Development (RD)
  - Requirements Management (REQM)
  - Risk Management (RSKM)
  - Supplier Agreement Management (SAM)
- Weaknesses / Areas for Improvement were noted with each SCAMPI-C

Initial State of the Organization's Process Improvement

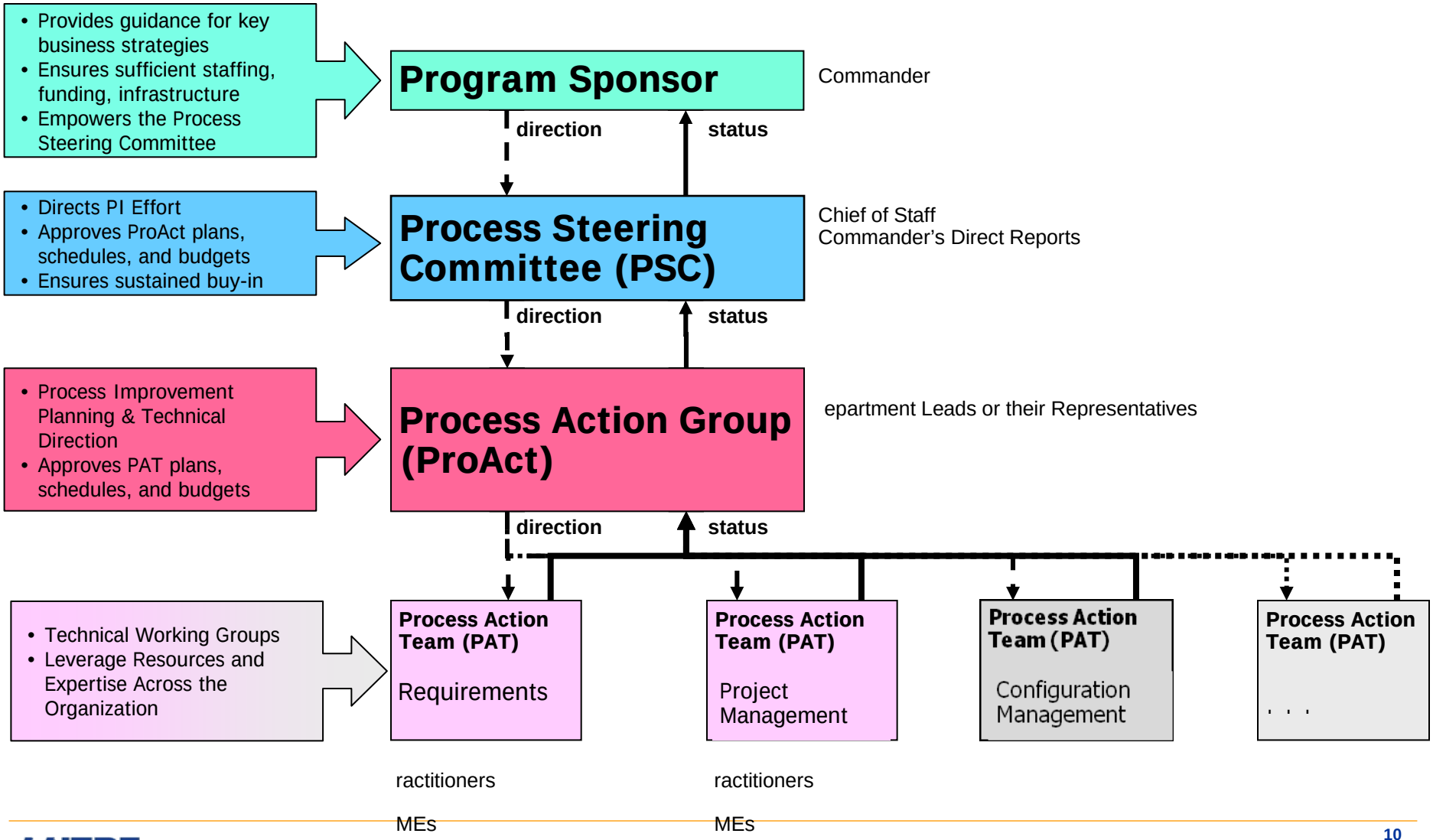
- For several process areas:
  - No documented organizational procedures
  - Few standard organizational templates with which to produce key artifact
  - Each individual performs their work their own way based on their knowledge and experience

- Each directorate interprets its response to the Organization's strategic plan differently and not always in concert with other directorates

The Organization's Process Improvement Plan

- Plan was established following both 2007 SCAMPI-Cs
- Initial accomplishments:
  - Process improvement organizational infrastructure established
  - ProAct was chartered and established
  - Identified and prioritized initial processes areas for improvement:
    - Requirements Development and Management
    - Project Planning and Monitoring & Control
    - Configuration Management
  - Process Action Teams [PATs] were chartered to develop organizational-level processes and templates
    - PAT stakeholders are representatives from each Organization's directorate, either as participants or as reviewers

The Organization's Process Improvement Organization



Requirements PAT: Starting using CMMI-DEV

- PAT was formed in September 2007 to develop SOPs for
  - Requirements Development
  - Requirements Management
- CMMI-DEV selected because
  - SCAMPI-Cs used CMMI-DEV
  - No other constellation existed at the time
- Results of applying CMMI-DEV:
  - Requirements Management: No significant differences applying CMMI-DEV versus CMMI-ACQ
  - Requirements Development: Several CMMI-DEV practices did not map to the Organization's way of doing business as an acquisition organization

Requirements PAT: Problems Encountered using CMMI-DEV

Practice	Expected Work Products	Applicable to the Organization?
Elicit Needs & Develop Customer Rqmts	Prioritized list of customer requirements	Yes
Establish Product & Product Component Requirements	Product and product component requirements	No
Allocate Product Component Requirements	Product requirements allocated to high-level architectural components	No
Identify Interface Requirements	Interface requirements	No
Establish Operational Concepts & Scenarios	CONOPS (Concept of Operations)	Yes
Establish Definition of Required Functionality	Functional Architecture	No
Analyze Requirements & Achieve Balance	Identification of Key Requirements	Yes
Validate Requirements	Requirements Baseline	Yes

Requirements PAT: Practitioner Feedback

- When we developed an initial Requirements Development process based on CMMI-DEV we got immediate “push back”. Some complaints (October 2007):
  - We do not develop products
  - We document the customer requirements and let the supplier allocate requirements to components
  - Functional Architectures, if needed, are developed by the supplier
  - The documented process is too development-oriented

Requirements PAT:
All ARD Practices Support Organization's Needs

Practice	Expected Work Products	Applicable to the Organization?
Elicit and Collect Stakeholder Needs	Prioritized list of customer needs	Yes
Develop / Prioritize Customer Requirements	Statement of Requirements [SOR]	Yes
Establish Contractual Requirements	Supplier Requirements	Yes
Allocate Contractual Requirements	Mapping SOR to Supplier Deliverables	Yes
Establish Operational Concepts & Scenarios	Concept of Operations [CONOPS] (part of SOR)	Yes
Analyze Requirements & Achieve Balance	Feasibility Analysis	Yes
Validate Requirements	Project Requirements defined	Yes

Requirements PAT: Before CMMI-ACQ and After

Key Artifact	Before Improvement (with no CMMI influence)	After Improvement (using CMMI-ACQ)
Standard Operating Procedures [SOP]	• Did not exist as a formal artifact • Requirements development was inconsistent	• SOP was being adopted by Organization even before the pilot completed and new SOP was formally rolled out • Relevant organizations have established infrastructure to support their roles in the acquisition requirements process
Statement of Requirements [SOR] template	• Existed but was not consistently used • Requirements not defined the same way • Inconsistent SOR content • No Concept of Operations (ConOps) was created	• Acquisition-based SOR template included an embedded ConOps • Being adopted by the organization even as the pilot is winding down • Being migrated into DOORS for better management • Organizational infrastructure put into place to manage SORs

Feasibility Analysis template	• Did not exist	• Feasibility Analysis template verifies requirements & validates appropriateness to enterprise
		• Is being used
		  • to achieve requirements balance
		  • as a planning tool to determine whether to include requirements in acquisition plans

Project Planning, Monitoring and Control PAT Approach

- Process considerations in addition to CMMI-ACQ:
  - DoD 5000 (Defense Acquisition Guidebook [DAG])
  - FAR (Federal Acquisition Regulations)
  - PMBOK (Project Management Body of Knowledge)
- Apply a full PM lifecycle to Organization's PP/PMC processes:
  - Project Initiation
  - Project Planning
  - Project Execution and Control
  - Project Closure

Why CMMI-ACQ is more appropriate than CMMI-DEV

- CMMI-ACQ is more appropriate than CMMI-DEV for PP and PMC:
  - Project Planning in CMMI-ACQ is based on Acquisition Strategy (rather than Product Requirement)
  - Under CMMI-ACQ, re-planning takes into account changes to the Supplier Agreement which can impact estimates, budget, schedule, risks, resources and task commitments
- CMMI-DEV focuses on plans for development only vs. plans for all acquisition processes. Notable CMMI-ACQ additions include
  - Acquirer-supplier interaction
  - Transition activities

Specific Acquisition-Focused Practices added to PP and PMC in the CMMI-ACQ

Process Area	Specific Goal	Specific Practice
Project Planning	SG 1 Establish Estimates	SP 1.1 Establish the Acquisition Strategy
Project Planning	SG 2 Develop a Project Plan	SP 2.7 Plan Transition to Operations and Support
Project Monitoring and Control	SG 1 Monitor the Project Against the Plan	SP 1.8 Monitor Transition to Operations and Support

The Benefits of Using CMMI-ACQ To Execute Project Planning (1)

- Added Specific Practice 1.1, “Establish the Acquisition Strategy”
  - The Organization’s programs are usually classified as “Joint Requirements Oversight Council (JROC) Programs of Interest” so they must follow DoD 5000
  - Acquisition strategy included in the Project Plan due to the nature of the Organization’s projects being small and not having time to create separate plans
  - All subpractices for SP 1.1 were included in the Acquisition Strategy section of the Project Plan Template and in the SOP
  - Added additional guidance in our Standard Operating Procedure (SOP) and Project Plan Template to reference the DAG and the FAR
  - Planning is based on the Acquisition Strategy

The Benefits of Using CMMI-ACQ To Execute Project Planning (2)

- Informative material drove Budget and Schedule to include the Supplier's activities in addition to those of the Acquirer
  - SP 1.2 "Estimate the Scope of the Project"
    - Created WBS and Cost Estimating Templates to incorporate the Supplier's activities in addition to the Organization's activities
      - This was a stumbling block because the Organization wasn't accustomed to tracking their efforts and costs just those of the suppliers
  - SP 1.3 "Establish Estimates of Work Product and Task Attributes"
    - Estimation methods should be used for both the supplier and acquirer such as historical data and estimating models (included in the Organization's WBS and Cost Estimating Templates)
  - SP 1.5 "Estimate Effort and Cost"
    - Estimates address all processes and activities for both supplier and acquirer
  - SP 2.1 "Establish the Budget and Schedule"
    - Actives for supplier, acquirer and stakeholders are established, tracked and maintained

The Benefits of Using CMMI-ACQ To Execute Project Planning (3)

- "Project Data" includes both Acquirer and Supplier Data
  - SP 2.3 Plan Data Management
    - Sections included in the Project Plan Template as well as the Standard Operating Procedures (SOP) to address this SP
- Added Specific Practice 2.7 "Plan Transition to Operations and Support"
  - Addition of this SP made sense because the Organization follows the DoD 5000, therefore guidance in CMMI-ACQ useful
  - Sections included in the Project Plan Template as well as the Standard Operating Procedures (SOP) to address this SP

The Benefits of Using CMMI-ACQ To Execute Project Monitoring and Control

- Informative material drove Acquirer's Monitor and Control activities to extend to the Suppliers and their activities
  - Sections included in the Standard Operating Procedures (SOP) to address several SPs
  - SP 1.2 "Monitor Commitments"
    - Both Acquirer and Supplier Commitments
  - SP 1.3 "Monitor Project Risks"
    - Both Acquirer and Supplier Risks
- Added Specific Practice 1.8 "Monitor Transition to Operations and Support"
  - Sections included in the Project Plan Template as well as the Standard Operating Procedures (SOP) to address this SP
  - Added an activity to in the SOP to Close the project
    - includes activities to ensure final product is baselined under CM and product is turned over to appropriate groups

PP and PMC: Noted Improvements

- **The Organization's projects are looking to use the new PP/PMC processes even prior to piloting**

Key Artifact	Before Improvement	After Improvement
Project Plan Template	• Inconsistent Project Plan content	• The organization plans to adopt upon completion of the pilot • Merged several separate plans into one
Work Breakdown Structure Template	• Did not exist as a formal artifact	• Will be used to achieve planning and monitoring and control balance
Estimating and Cost Template	• Did not exist as a formal artifact	• Will be used to achieve planning and monitoring and control balance
Standard Operating Procedures	• Did not exist as a formal artifact	• Relevant organizations have established infrastructure to support their roles in the Project Planning, Monitoring and Control process
Project Closeout Checklist	• Did not exist as a formal artifact	• Will be used to achieve balance in Project Closure activities

Next Steps

- **Requirements:**
  - **Migrate from paper Statement of Requirements entry to direct input into DOORS**
- **Project Management:**
  - **Pilot the PP/PMC SOP and templates**
  - **Implement formal measurements program**
  - **Integrate Requirements Management, PP, and PMC change management activities with forthcoming Configuration Management PAT**

Questions?

Author Biographies

Mr. Richard Raphael is a Lead Software Systems Engineer with the MITRE Corporation. He has over 35 years of experience in program and systems engineering management and over 18 years of experience in process improvement using the Software CMM and CMMI. He has participated in a number of formal CMMI appraisals (including two Maturity Level 5 appraisals) and has led a number of internal CMMI-based gap analysis appraisals. He is currently working with several Government organizations, helping them achieve process improvement using the CMMI-ACQ. Additionally, he is a member of the CMMI-SVC model development team. Mr. Raphael holds an MS in Technology Management from the American University in Washington, D.C.

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