Practical Experiences and Lessons Learned in Implementing CMMI®

Michael T. Kutch, Jr.

Director Engineering Operations Code 09K

Department Head, Code 70
Intelligence & Information Warfare Systems

SPAWAR Systems Center Charleston (SSC-C)

Mike Knox

SEI Authorized CMMI Instructor
SEI Candidate SCAMPI B&C Team Lead

TECHSOFT, Inc.

Engineering Process Office
SPAWAR Systems Center Charleston (SSC-C)

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Presentation Outline

- Introduction to SPAWAR Systems Center Charleston
- Vision and Strategy
- Critical Success Factors
- Practical Experiences
- Success!
- Lessons Learned
- Going Forward
- Summary

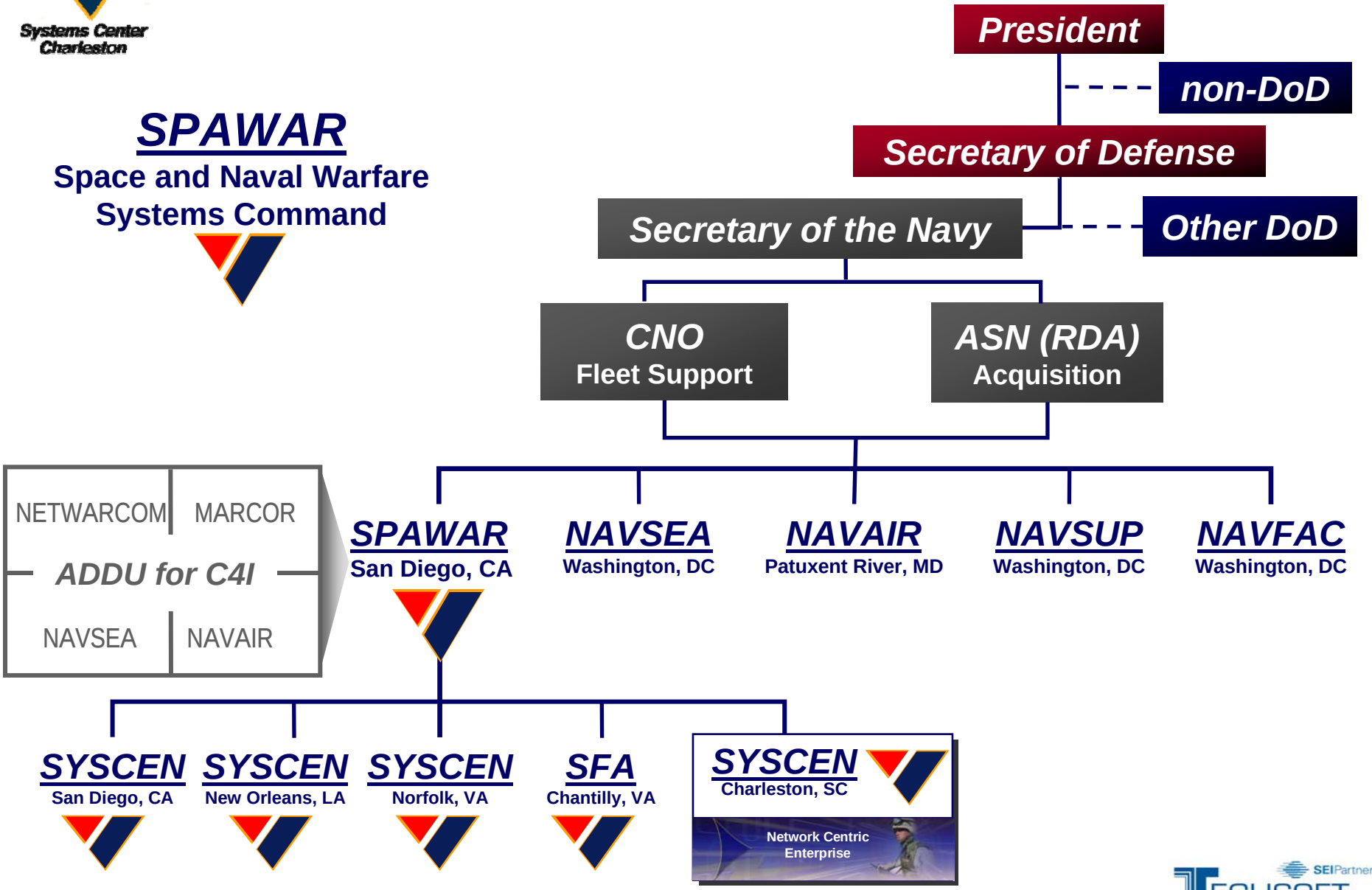
Introduction to SSC-Charleston

- Where we fit
- What we do
- Who we are

Where We Fit

SPAWAR
Systems Center Charleston

SPAWAR
Space and Naval Warfare Systems Command



SEIPartner
TECHSOFT
Technical Software Services, Inc.

What We Do

SPAWAR Systems Center Charleston

Connecting the Warfighter

Mission- We enable knowledge superiority to Naval and Joint Warfighters through the development, acquisition, and life-cycle support of effective, integrated C4ISR Information Technology, and Space capabilities.

Vision-
Fully Netted in Three

We are the
Principal C4I Acquisition Engineering & Integration Center on the East Coast & Principal C4ISR ISEA for the Navy

Connecting the Warfighter to the resources needed to win GWOT

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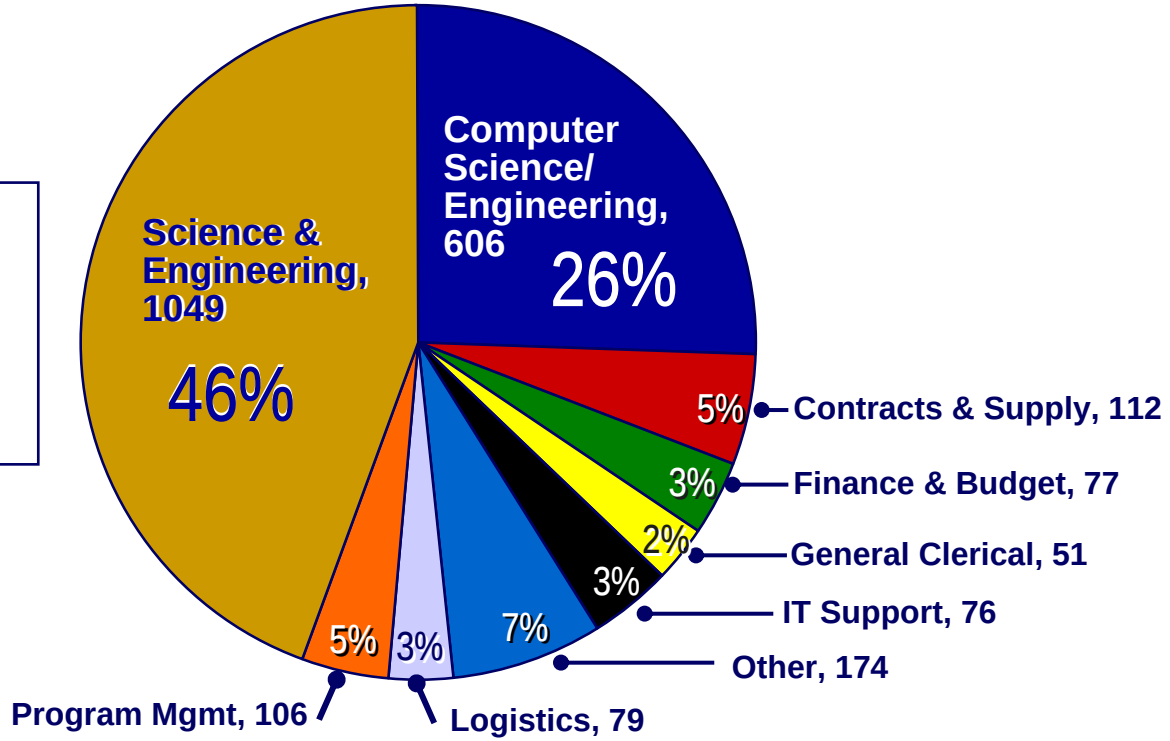
Who We Are

A Large Systems & Software Engineering Organization

Over 70% of workforce is in an engineering or computer-related discipline



- The solutions to the global war on terror developed by SPAWAR result from good systems and software engineering.
- Systems engineering is our core competency.
- Total workforce of ~ 2,300 employees.

SPAWAR Systems Center Charleston

Vision

- **Vision**
  - Develop and Maintain a World Class Systems Engineering Organization
- **Strategy for Implementing CMMI®**
  - Research Best Methods (Case Studies)
  - Investigate Techniques and Models
  - Build Plan of Action
  - Implement Plan of Action

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Research and Investigate

- **Extensive research included industry and government organizations that have successfully used the SEI CMM® and CMMI® to implement process improvement***
- **Identified commonality among implementation approaches and lessons learned**
- **Investigated how model-based improvement works and the benefits of CMMI®**

*** Case Studies Included: Boeing-Integrated Defense Systems (IDS); U. S. Army Armaments Research, Development and Engineering (RDE) Centers; Lockheed Martin Corporation; Electronic Data Systems (EDS); Raytheon; Northrop Grumman – Mission Systems; Motorola – Global Software Group; General Dynamic Advanced Information Systems; SPAWAR Systems Center San Diego; Thales Training and Simulation; Jet Propulsion Laboratory; Bosch Automotive; Jacobs Sverdrup**

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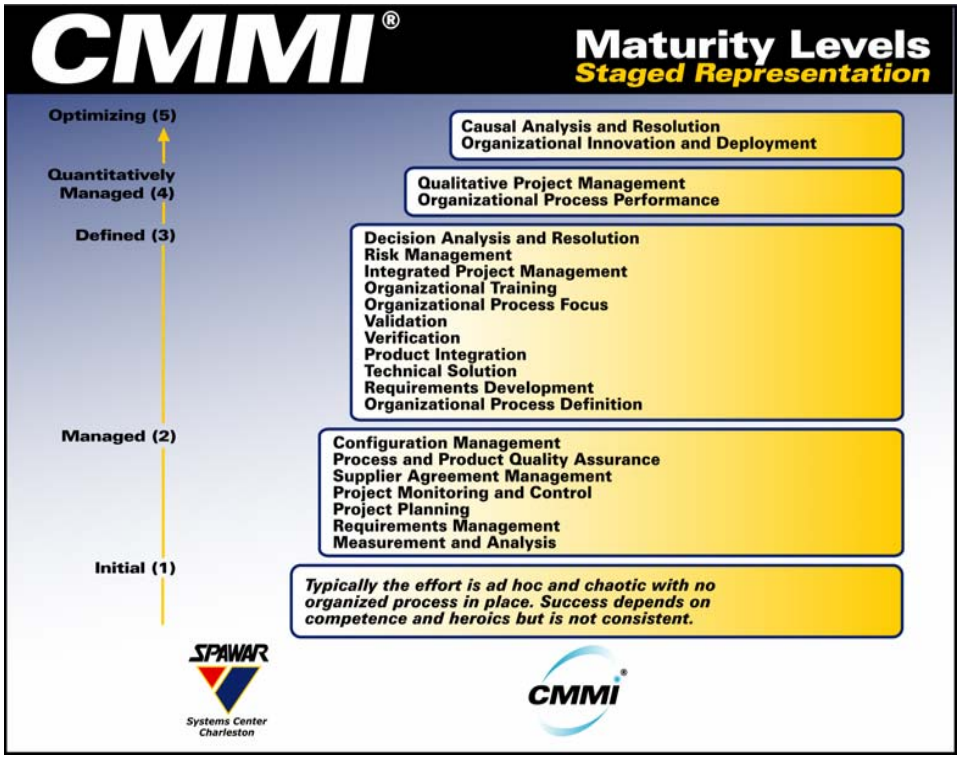
CMMI®

SSC-Charleston chose to implement CMMI® because it provides a structured model for process improvement and is used to measure and improve an organization's ability to successfully manage complex systems engineering and software projects.

The model recognizes excellence in business practices, as measured against a set of demanding criteria.



SEI has reported quantitative evidence showing how CMMI®-based process improvement can result in improvements in cost, schedule, quality, customer satisfaction and return on investment.

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Critical Success Factors

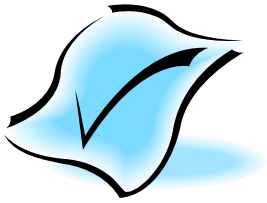
CRITICAL SUCCESS FACTORS FOR IMPLEMENTING CMMI®	
Command-wide Policy (Create vision that is urgent)	Assign Responsibilities (Strong Change Agents are essential)
Strategy and Plan (Include knowledge of why change is necessary and benefits)	Provide Training
Senior Management Support	Build Central Repository
Provide Resources and Funding (New Organizational Structure Usually Needed)	Measure and Communicate Progress

Practical Experiences

Applied the Critical Success Factors:

1. Ensure Policy Published at Highest Level
2. Obtain Approval for Process Improvement (PI) Plan
3. Obtain Resources (Funding) and Assign Responsibility for PI Initiative
4. Build Support for the PI Initiative
5. Plan and Provide Training
6. Build and Maintain Central Repository
7. Measure and Communicate Progress

1. Policy Published at Highest Level



Command-wide policy signed by our Executive Director, approved by the Board of Directors, and published December 2003.

- The policy directs the use of the best practices represented in the CMMI®-SE/SW model for all SSC-C systems and software engineering projects and tasks.
- The policy also directs the use of industry standards (ISO/IEC 15288 for Systems Engineering and ISO/IEC 12207 for Software Engineering).

2. Get Plan Approved

Process Improvement Plan and Schedule Approved February 2004.

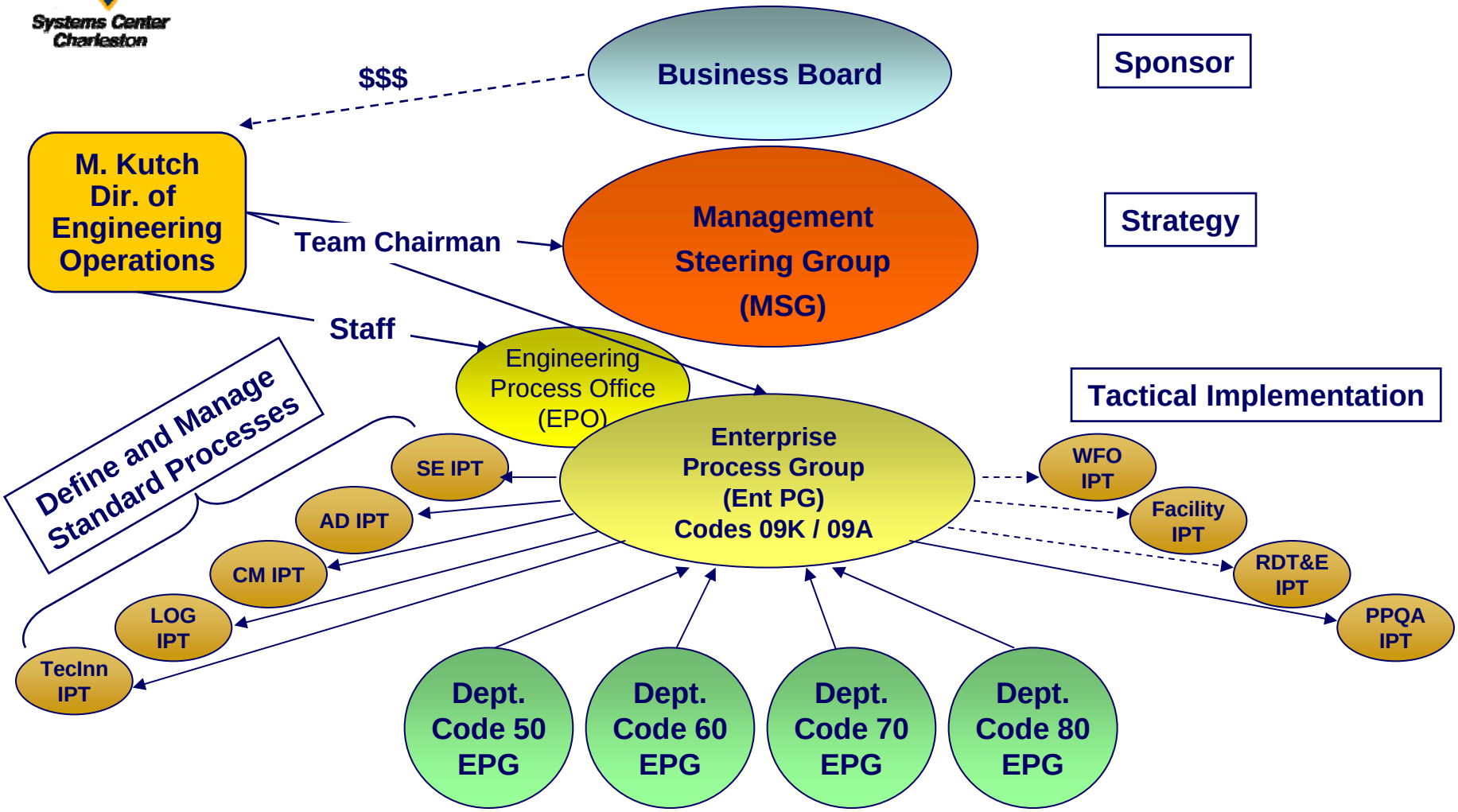
- Plan included why changes were necessary
- Schedule included achievement of CMMI® Maturity Level 2 for Command in April 2005
- Schedule includes achievement of CMMI® Maturity Level 3 for Command in April 2007

3. Resources and Responsibility

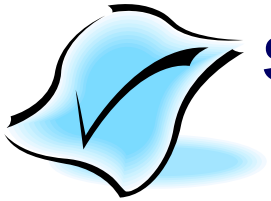
New Organizational Structure Established and Funded at the Command Level.

- Director of Engineering Operations (Code 09K)
- Engineering Process Office (EPO)
- Command and Departmental Engineering Process Groups (EPGs)
- Various Integrated Process Teams (IPTs)

New Organization for Implementation



4. Build Support for PI Initiative



Spread the word!

- Shared Early Successes in *The Chronicle*, SSC-C's site publication
- Built Senior Management Support
- Created a Newsletter Focusing on Systems & Software Engineering Process Improvement
  - Available in printed and electronic format
  - Published every 2-3 months
- Provided Extensive Mentoring and Coaching

Spread the Word!

Systems and Software Engineering Newsletter

s²eNEWS
Systems and Software Engineering Newsletter

SPAWAR Systems Center Charleston

Volume 2, Issue 1 — February 2006

The Benefits of CMMI®

SSC Charleston's Project Managers have pushed their teams to practice CMMI® and are reaping great benefits as a result. The Engineering Process Office sat down with them to discuss what they learned during their pursuit of Maturity Level 2. Article on Page 2.

KUTCH'S KORNER: CMMI® Makes SSC-C Work Smarter

In the past year, we've taken great steps toward making SPAWAR Systems Center Charleston a world-class engineering organization. We had six teams go to CMMI® Maturity Level 2, and their experience is the focus of this issue of the *s²eNEWS*. Granted, this effort required significant work, but SSC-C is seeing numerous benefits as a result of implementing CMMI. By jumping ahead, these teams have provided a roadmap we all can follow, allowing us to work smarter to achieve the same success.

The tangible, quantifiable benefits we've reaped by implementing CMMI have boosted SSC Charleston's reputation – both in the Command and the civilian world – as a quality engineering institution, and that's something we can all be proud of. In their interviews for the article you're about to read, SSC-C's projects were very

IN THIS ISSUE...

5. Plan and Provide Training

Intro to Process Improvement

- Over 950 people trained
- Provided via WBT
- Now Required for all employees

CMMI®

- SEI Intro to CMMI®
  - Over 300 attendees to date
- SSC-C Level 2 Processes overview

Project Management/Project Monitoring & Control

- 730 people trained

Process-specific Workshops (CM, QA, REQ, M&A)

- 375 people trained

**** This accounts for many employees attending more than one course***

Systems Engineering Training

3-day on-site, classroom course

- Based on SMU SE Masters course
- Customized to incorporate SSC-C SE process
- Over 300 SSC-C engineers trained

1-day SE for Managers course added

Intro to Software Engineering added

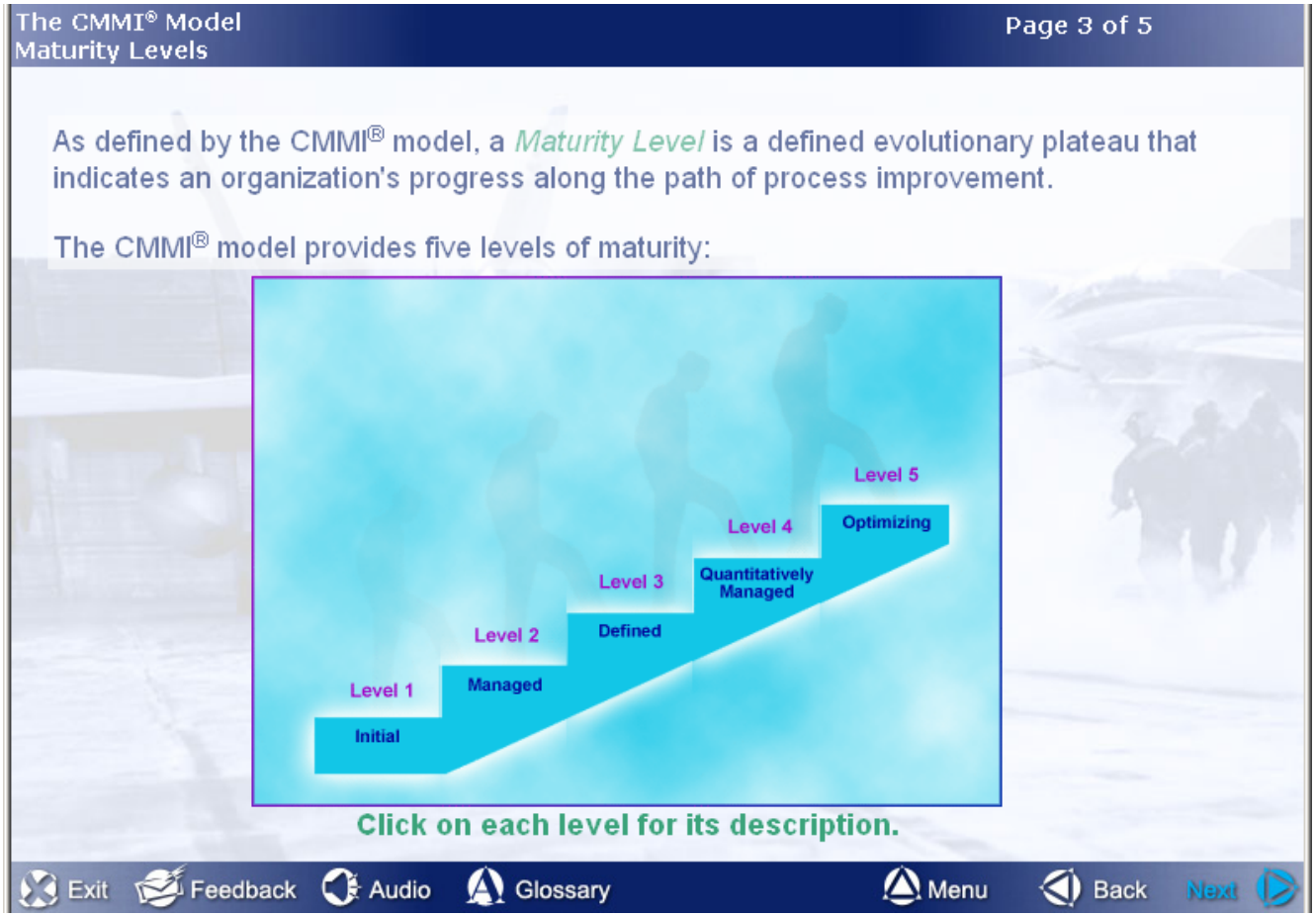
"Thought provoking, motivating, and challenging. Learning basic SE caused me to brainstorm many different applications of organized system processes. It motivated me to want to begin organizing its application. It also challenged me to apply GOOD SE practices in order to successfully be more efficient in the process.."

"It was extremely beneficial to have a professor with extensive knowledge of the subject matter and one who could apply it to the SPAWAR methods."

Student Feedback

PI Web-Based Tutorial

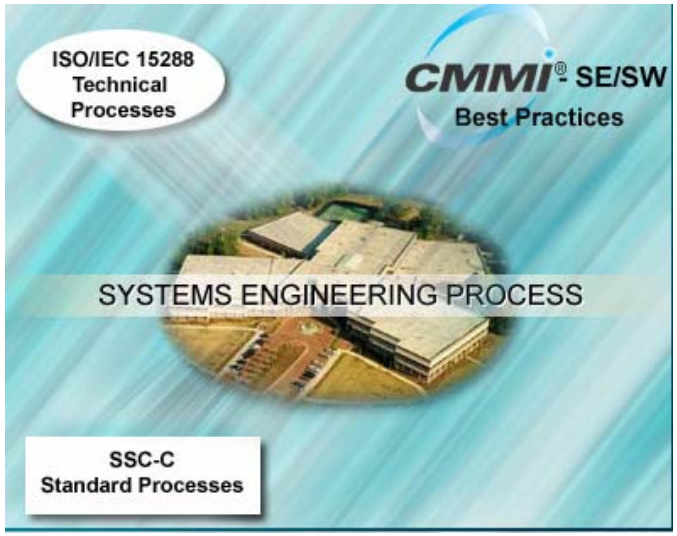
To offer Process Improvement training to more employees, we developed an online web-based tutorial (PI-WBT) that allows students to take the course at their own pace and to receive a certificate and education credit upon course completion.

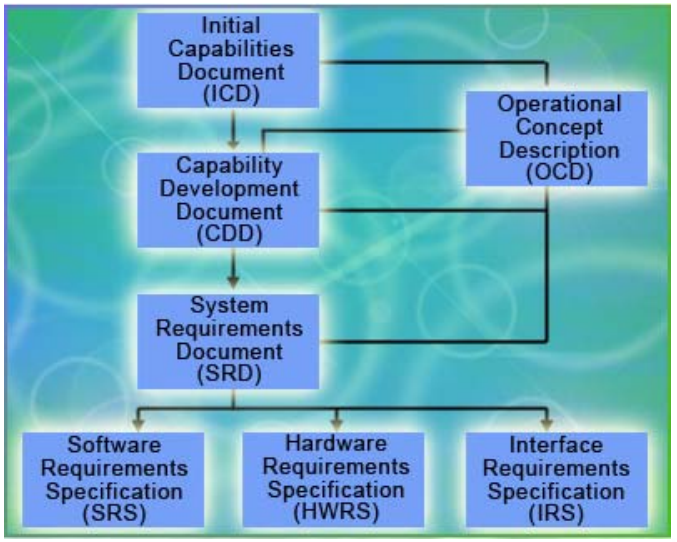


SE 101 Web-Based Training

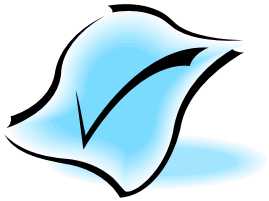
Introduction to Systems Engineering

- 10-module web-based training
- Closely aligned to SSC-C SE Process, SE Fundamentals Course, ISO/IEC 15288 and IEEE standards
- Includes hotlinks to referenced documentation
  - Process manuals, policies, standards





6. Central Repository



Built and Continue to Populate Central Repository (CORPWEB/CMMI® intranet website).

- Policies & Process Manuals
- Standard Operating Procedures (SOPs)
- Sample Documentation and Templates
- Projects' Artifacts
- Artifacts from Teams – IPTs, EPGs
- Link to PI-WBT and SE web-based training
- Link to ePlan Builder (EBP)
- Links to Reference materials and guidebooks

Engineering Process Office Website

Address https://corpweb2.spawar.navy.mil/cmmi/standardprocesses/standardprocesses.aspx Go

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SSC-Charleston Engineering Process Office

EPO Home | ePlan Builder | WBT Courses | eWBS | Contact EPO | CorpWeb

Navigation

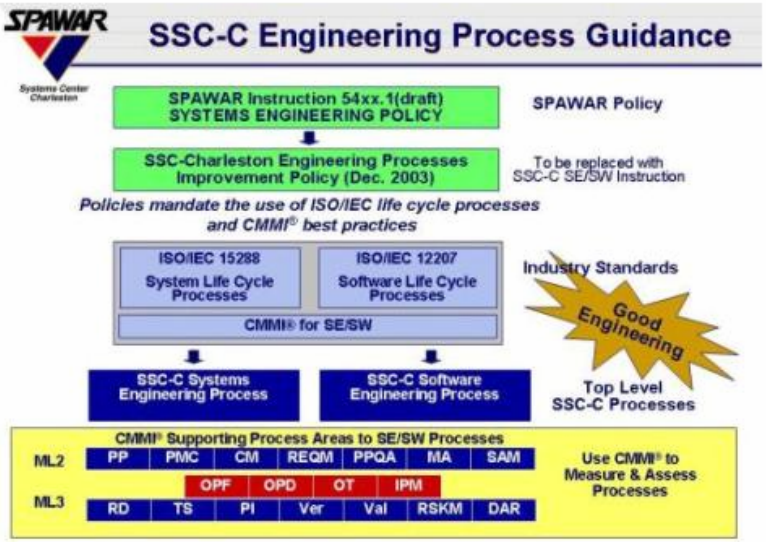
- Calendar
- SSC-C Standard Processes
  - Systems Engineering Process
  - Software Engineering Process
  - Life Cycles
  - Tailoring Criteria
- Process Areas
- Projects
- Process Improvement Teams
- Organizational Measurement Repository
- Training
- Innovation Program

SSC-C Standard Processes

Currently, the SSC-C Standard Processes contain policies, process manuals for CMMI®-SE/SW Level 2 and Level 3 process areas, and select SOPs. The standard processes for Systems Engineering and Software Engineering provide detailed procedures for accomplishing tasks within these respective disciplines. The 3 top-level standard engineering processes are:

- Systems Engineering
- Software Development
- Software Maintenance

These processes were derived from the ISO/IEC industry standards to address the typical engineering work performed by SSC-C. Additional SSC-C standard processes have been developed to further refine these top level engineering processes and to support the process areas of CMMI®. The graphic depicts the derivation of the SSC-C standard processes.



Related Links

- Process Improvement Communication Plan
- SSC-C Artifact Submittal Form

Internet

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Policies and Processes

A unique SSC-Charleston Policy and Process Manual addresses each of these Process Areas:

- Project Planning
- Project Monitoring and Control
- Configuration Management
- Process and Product Quality Assurance
- Measurement & Analysis
- Requirements Management
- Supplier Agreement Management
- Requirements Development
- Technical Solution
- Product Integration
- Verification
- Validation
- Risk Management
- Decision Analysis and Resolution Management
- Integrated Project Management
- Organizational Process Focus
- Organizational Process Definition
- Organizational Training

ePlan Builder Tool

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ePlan Builder tool

- An interactive, web-based application that leads the user through a structured interview process (like TurboTax®) to generate a CMMI®-compliant plan
- Includes standard, consistent text
- Generates an initial project-specific document
  - Project Management Plan (with Work Breakdown Structure)
  - Configuration Management Plan
  - Process and Product Quality Assurance Plan
  - Requirements Management Plan
  - Measurement and Analysis Plan
  - Systems Engineering Plan (DoD SEP Format)

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7. Measure and Communicate Progress[1]

Progress Measured Every 1- 4 Months

- Projects conducted Process Reviews and Document Reviews to measure progress and identify gaps using SSC-C Project Assessment SOP and Data Collection Form (based on best practices of CMMI®)
- EPO performed Class B/C appraisals of selected projects
- SEI performed Standard CMMI® Appraisal Method for Process Improvement (SCAMPI℠) Class A's at the Project-level
- SEI performed Command-wide SCAMPI℠ Class A appraisal in April 2005

7. Measure and Communicate Progress[2]

Recognize and Publicize Early Successes

- 'Project-level' SCAMPIs provided early successes due to conducting the appraisal using the "continuous representation" of the model
  - Scope of appraisal looked at all 7 ML2 PAs and if the PAs were satisfied, i.e., achieved CL2, then the project achieved ML2 [equivalent staging]
  - Projects received CL2 for various PAs (e.g., CM, SAM, REQM, PP, PMC)
- Led to BIG success! - SSC-C became the first SPAWAR Systems Center to achieve CMMI® Maturity Level 2 (April 2005)
- Continuing similar approach to Maturity Level 3
  - 1 Successful ML3 Program – July 2006
  - 1 Project Achieved CL3 in 16 of 18 Process Areas
  - 4 more projects with planned SCAMPIs in 2006

Success!

First SPAWAR Systems Center to Achieve Command Level CMMI® Maturity Level 2

Also, First SPAWAR Systems Center to have a Program Achieve CMMI® Maturity Level 3 (July 2006)

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Question?

What do these Critical Success Factors and the model itself have in common?

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Answer!

"Both Institutionalize the PI/CMMI® Process"

Critical Success Factors	CMMI® Generic Practices
Ensure Policy Published at Highest Level	2.1 Establish an Organizational Policy
Get the Plan Approved	2.2 Plan the Process
Get Resources (Funding) and Assign Responsibility	2.3 Provide Resources
Get Resources (Funding) and Assign Responsibility	2.4 Assign Responsibility
Plan and Provide Training	2.5 Train People
Build and Maintain Central Repository	2.6 Manage Configurations
Get Resources (Funding) and Assign Responsibility	2.7 Identify and Involve Relevant Stakeholders
Measure and Communicate Progress	2.8 Monitor and Control the Process
Measure and Communicate Progress	2.9 Objectively Evaluate Adherence
Get Resources (Funding) and Assign Responsibility and Communicate Progress	2.10 Review Status with Higher Level Management

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Lessons Learned[1]

1. ***Do your homework*:** Researching what others have done to successfully implement process improvement and what challenges they encountered helped prepare us.
2. ***Formulate a good plan*:** Building a Plan based on the "Critical Success Factors" led to our success.
3. ***Policy needs to be Top-down:*** Having Command-level policy energized the PI initiative.
4. ***Train, train, train:*** Providing an understanding of what the CMMI® is all about, what SE is all about, and how to implement within a project is critical.

Lessons Learned²

5. ***Train some more*:** Train process owners (PPQA, CM, REQM, etc.) to be subject matter experts (SMEs).
6. ***Bite off small pieces*:** Approach change in small steps and use those experiences, successes and 'best practice' artifacts to ease the change for all Command personnel.
7. ***Ensure they know what's in it for them:*** Value added must be visible. Share benefits that others have experienced in implementing CMMI®.
8. ***Advertise successes early on:*** Publicize each positive outcome as progress is measured.

Lessons Learned[3]

9. ***Full-time SME to mentor and coach*:** Dedicated Engineering Process Office (EPO) maintained momentum and resolved issues.
10. ***Build a support system*:** Identify key "change agents" within the organization to overcome resistance to change (those most respected and energized).
11. ***Make sure the plan gets implemented:*** Promulgate realistic timeframes to all stakeholders (EPGs, IPTs, projects) and monitor schedules for continued successes in the PI Program.

Lessons Learned[4]

12. ***Establish organizational assets early:*** Developing Process Manuals, Naming Conventions, Formats/Style Guides, Templates and Tools provided value, consistency and 'starting points' for projects.
13. ***Communication is constantly needed*****:** Use multiple methods and channels for effective understanding, up to date status, and cross-communication among teams.

The Second Wave – ML2 to ML3

- Built SSC-C Measurement Repository for projects to use for managing their projects and capturing standardized cost, schedule, and process performance
  - Defined Balanced Scorecard measures directly related to CMMI® and Process Improvement
- Generated Tailoring Guidelines and ML2-to-ML3 Action Plans
- Developed internal "self-assessment" process for measuring ongoing implementation of Maturity Level 2 processes
- Enhancing ePlan Builder tool to create new plans (e.g., SEP/SEMP) that are ML3 compliant. Updated/Improved existing plans.
- Provide additional CMMI® Training
- Added WBS Tool and Architecture Development WBT
- Continue to Measure and Communicate Progress
- Maintaining Momentum and Commitment to Goals

Summary[1]

- Decided on Approach – use CMMI® for Process Improvement and Measuring Progress
- Using extensive research, determined the 'Critical Success Factors for Implementing CMMI®'
- Built Plan of Action
- Advertised Early Successes
- Implemented Plan Successfully for Phase 1 – CMMI® Maturity Level 2
- Following Plan for Phase 2 – CMMI® Maturity Level 3
  - Laying groundwork for higher maturity

Summary²

- **Aggressive SE Program**
- **Industry Standards**
  - Systems Engineering
  - Software Engineering
- **Best Practices**

- **Automated Tools**
  - ePlanBuilder
  - eWBS
- **Training – 1,600+**
  - SE Fundamentals - 305
  - Web-Based Training courses
    - SSC-C PI; Intro to SE; Arch. Dev.

corpweb2.spawar.navy.mil/cmmi/

- **Successes**
  - April 2005 Command Achieved CMMI® Maturity Level 2 as certified by Software Engineering Institute
  - June 2006 Common Information Centric Security (CICS) project achieved CMMI Level 3 in 16 of 18 Process areas
  - 1st SPAWAR Systems Center to achieve these levels
- **Goals**
  - World-Class SE Program
  - Support Command Balanced Scorecard
  - April 2007, Command to achieve CMMI® Level 3

Any Questions?

Thank you!

Contact Information:

Michael T. Kutch, Jr.
SPAWAR Systems Center Charleston
Email: michael.kutch@navy.mil
Phone: 843-218-5706

Mike Knox
TECHSOFT, Inc.
Email: mjknox@techsoft.com
Phone: 850-469-0086