SPAWAR
Systems Center Charleston

Practical Experiences and Lessons Learned in Implementing CMMI®

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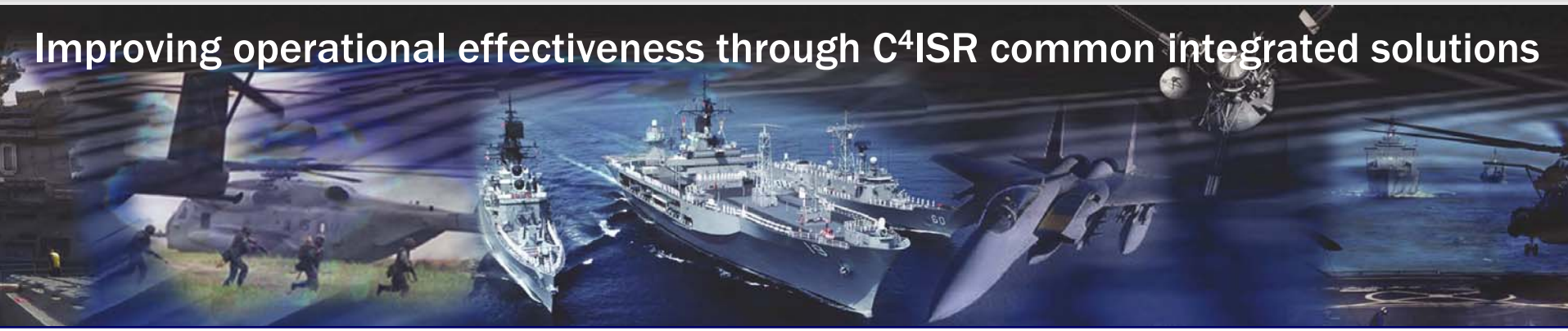
Engineering Process Office
SPAWAR Systems Center Charleston (SSC-C)

NDIA CMMI Conference, November 13, 2006 - NDIA 3762



SEI Partner
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Technical Software Services, Inc.

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
- What we are known for
- Who we are

Where We Fit

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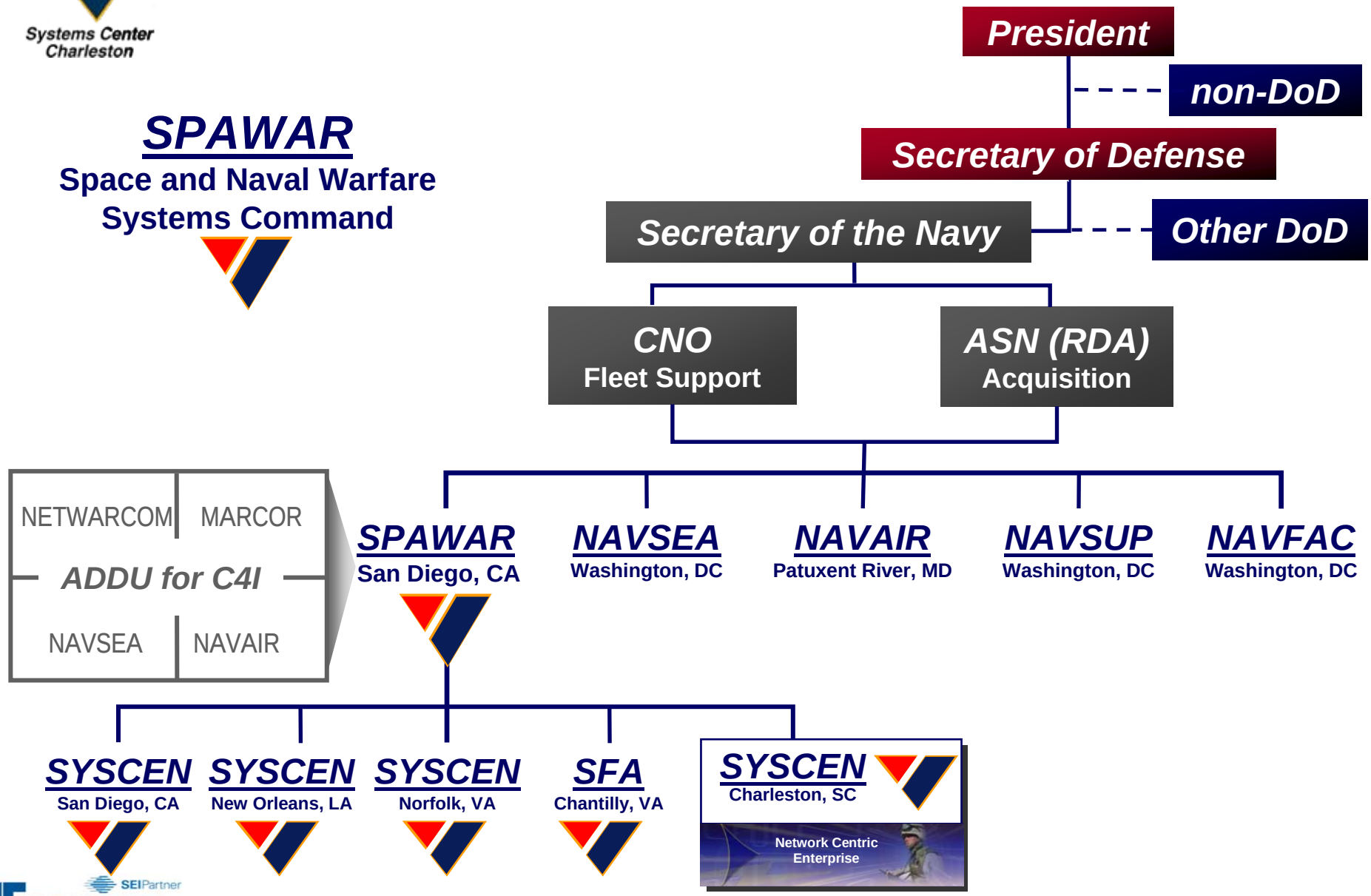
Systems Center Charleston

SPAWAR
Space and Naval Warfare Systems Command



SEIPartner
TECHSOFT
Technical Software Services, Inc.

What We Do

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.

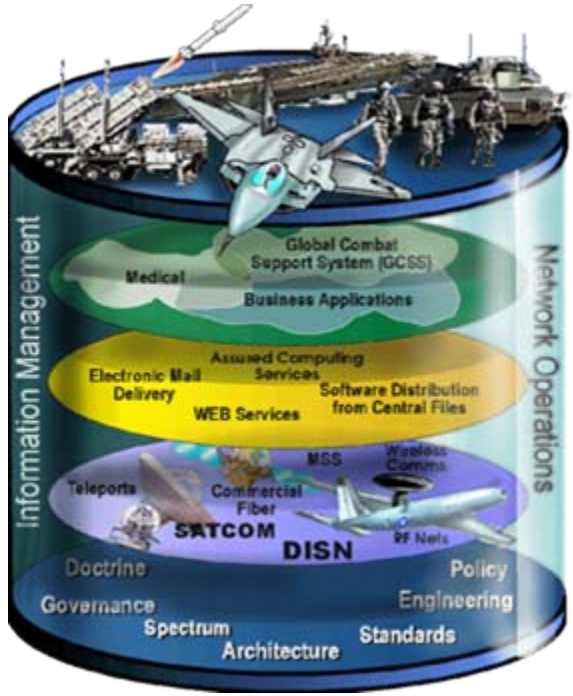
Vision-
Fully Netted in Three

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

SPAWAR
Systems Center Charleston

What We're Known For

- **Developer of FORCEnet joint collaborative assessment tools** that promote netCentric interoperability and reduce system redundancy
- **Principal SPAWAR provider for Joint and Homeland Security** C4I solutions in a responsive manner
- **Navy's most efficient provider of critical engineering** and acquisition expertise for Navy/Joint commands and other federal agencies

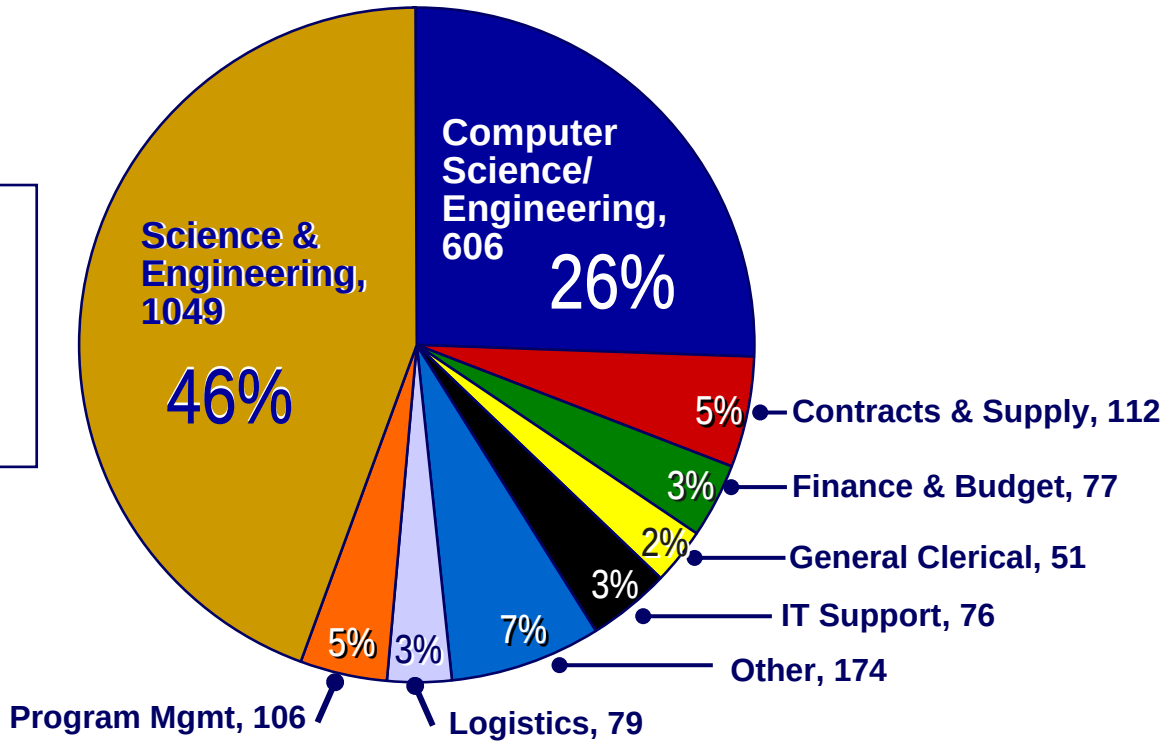


- **Rapid integrator and deployer of interoperable technologies** to the Navy, Federal Government, and Joint Warfighter
- **Developer and employer of life-cycle logistic support solutions** in a web-enabled portal environment

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.

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

- Extensively researched industry and government organizations that have successfully used the CMM® and CMMI® to implement process improvement*
- Identified commonality among implementation approaches and lessons learned
- Identified Benefits of CMMI®
- Identified "Critical Success Factors"

*** 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; Defense Finance and Accounting Service; Thales Training and Simulation; Jet Propulsion Laboratory; Bosch Automotive; Jacobs Sverdrup**

Benefits of Implementing CMMI®1

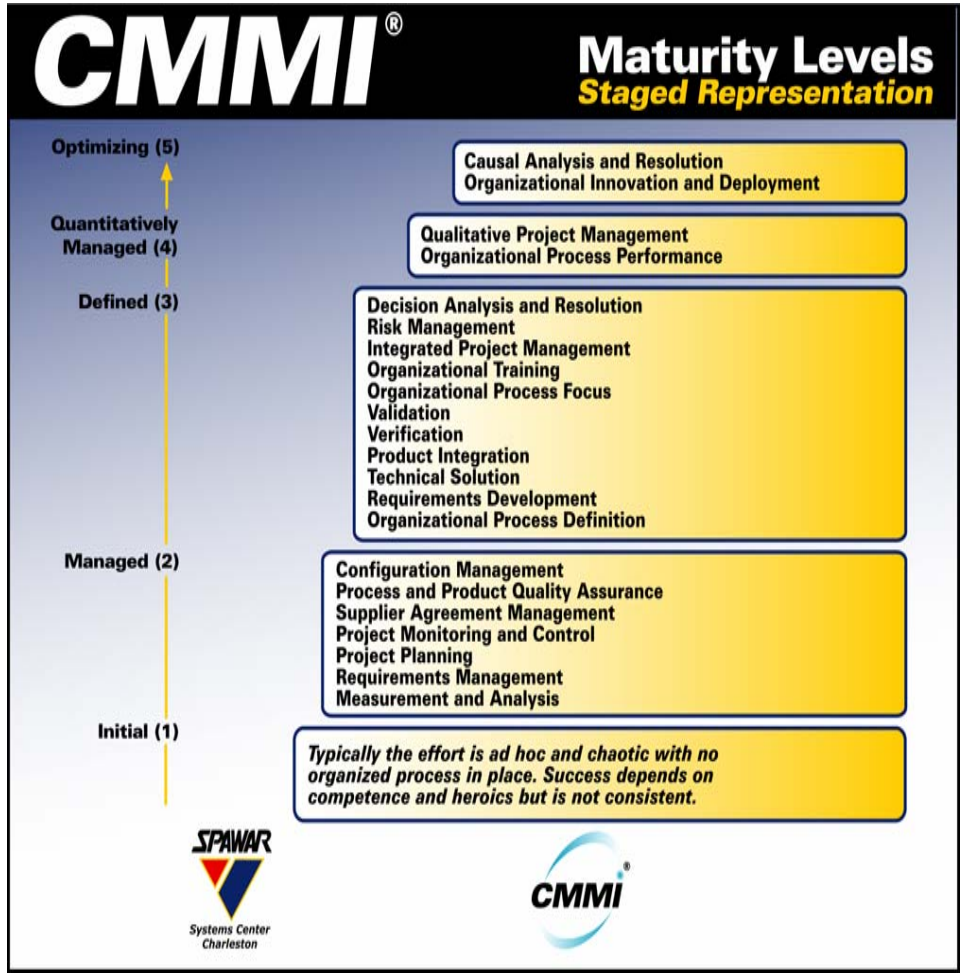
- Increased control of requirements, costs and schedule
- Increased ability to predict schedule and costs of product and product components
- Ability to remove defects early and efficiently from the work products
- Reduced rework leading to reduced development cycle time
- Increased predictability and control of product quality (the quality of a system is highly influenced by the quality of the process used to acquire, develop, and maintain it)

Benefits of Implementing CMMI®2

- Enhanced ability to make cost-benefit trade-offs of implementing new technologies and processes
- Increased capability to select and manage qualified suppliers
- Enhanced ability to make management decisions based on quantitative data
- More time available for top innovators to spend on problems and challenges requiring creative energy
- Enhanced communication and involvement of everyone in continuing process improvement efforts

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.



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 Technical 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

Practical Experiences

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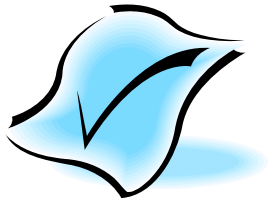
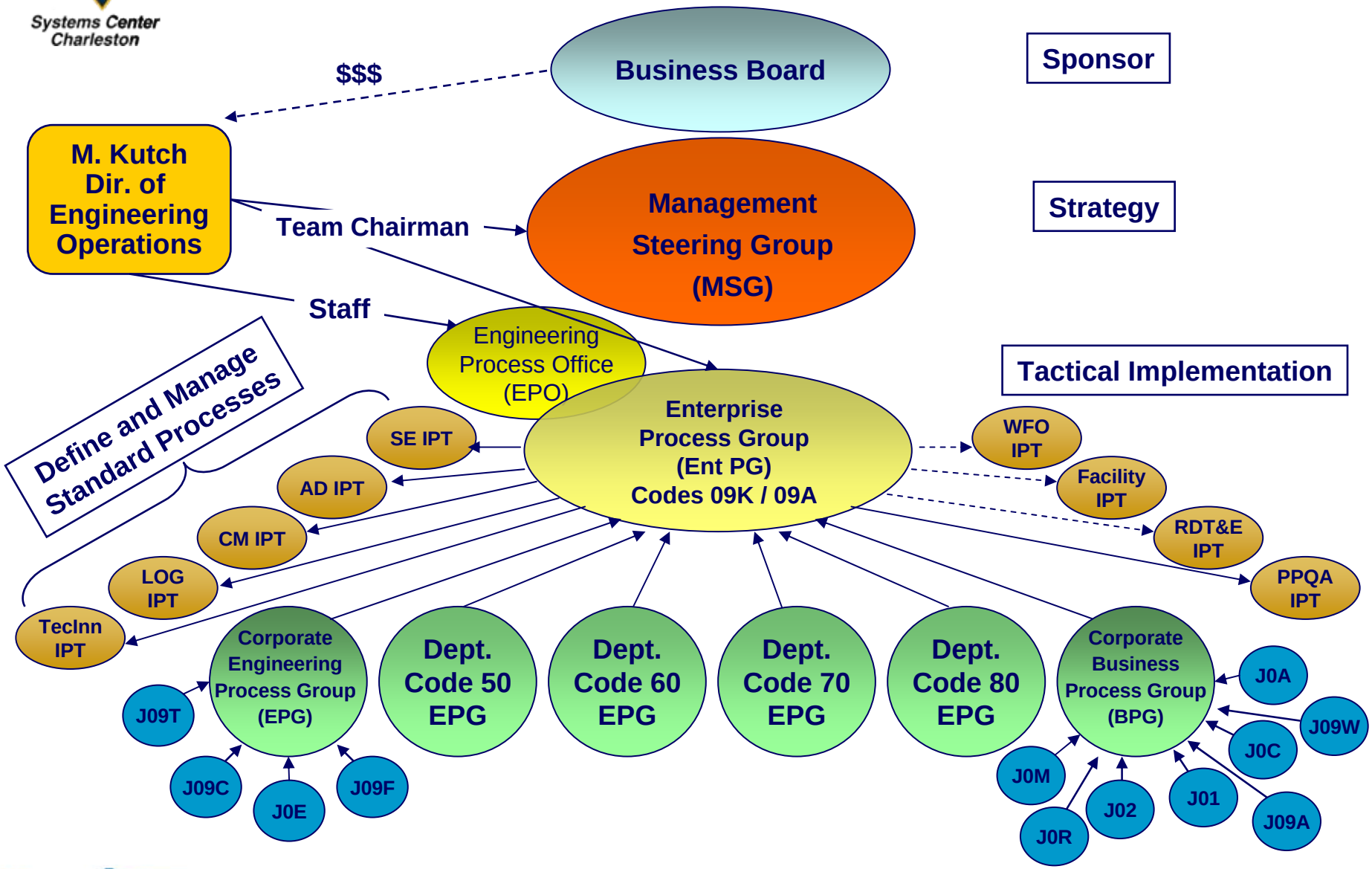
3. Resources and Responsibility



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



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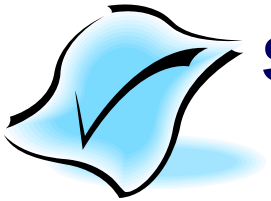
4. Build Support for PI Initiative



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
- Communicate what is expected from SSC-C Projects

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...

Practical Experiences

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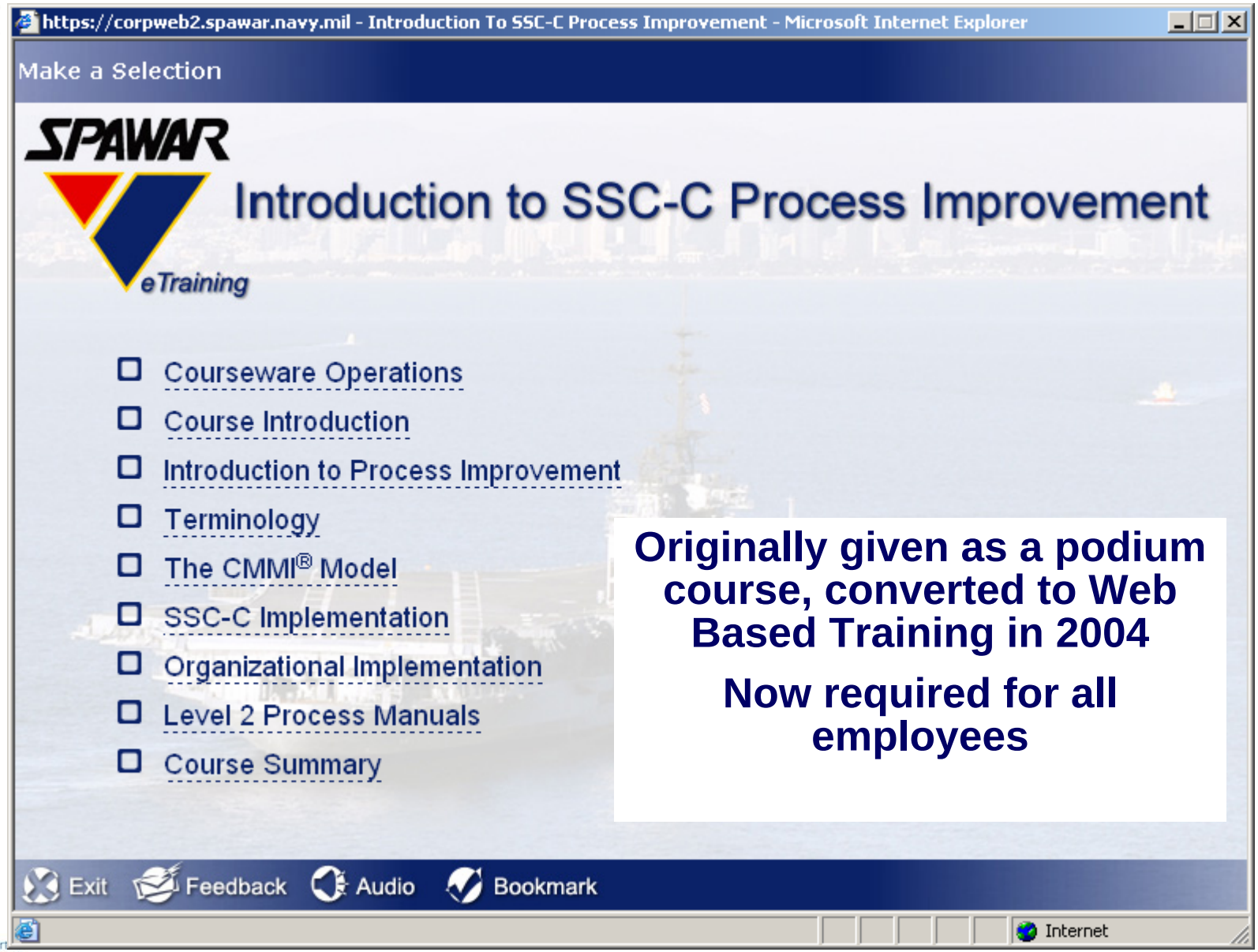
5. Plan and Provide Training

- **Intro to Process Improvement**
  - Formal Classroom Course Initially
  - Currently Provided via WBT
  - Now Mandatory for all employees
- **CMMI®**
  - SEI Intro to CMMI®
  - SSC-C Level 2 Processes
- **Systems Engineering Fundamentals Classes**

Intro to Process Improvement WBT



SEI's Intro to CMMI®

- **SEI's *Introduction to CMMI*® course teaches the full CMMI® model**
  - Students learn how the best practices build and relate across process areas
  - Learn the terminology and complete model
  - SEI-Authorized instructors are well-versed in our implementation to augment material with SSC-C specific content
  - Highlight SSC-C tools and resources
- **Over 300 employees trained**

Systems Engineering Fundamentals Classes

- **Teach the Systems Engineering process**
- **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**

"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

Practical Experiences

Applied the Critical Success Factors:

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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 other WBT courses
- Links to Reference materials and guidebooks
- Link to ePlan Builder (EBP) - Our CMMI Tool

Engineering Process Office Website

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

SPAWAR Systems Center Charleston

SSC-Charleston Engineering Process Office

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

Navigation

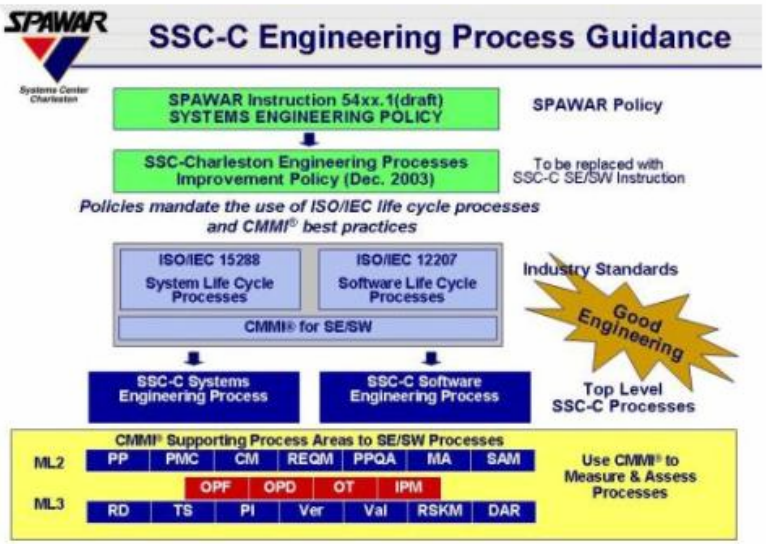
- Calendar
- SSC-C Standard Processes
  - Systems Engineering Process
  - Software Engineering Process
  - Life Cycles
  - Tailoring Criteria
- Process Areas
- Projects
- Process Improvement Teams
- Organizational Measurement Repository
- Training
- Innovation Program

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
- Organizational Process Focus
- Organizational Process Definition
- Organizational Training
- Integrated Project Management

Practical Experiences

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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 Apprasial tool
- EPO performed Class B/C appraisals of selected projects
- SEI performed Standard CMMI® Appraisal Method for Process Improvement (SCAMPI^{SM}) Class A's at the Project-level
- SEI performed Command-wide SCAMPI^{SM} Class A appraisal in April, 2005

7. Measure and Communicate Progress[2]

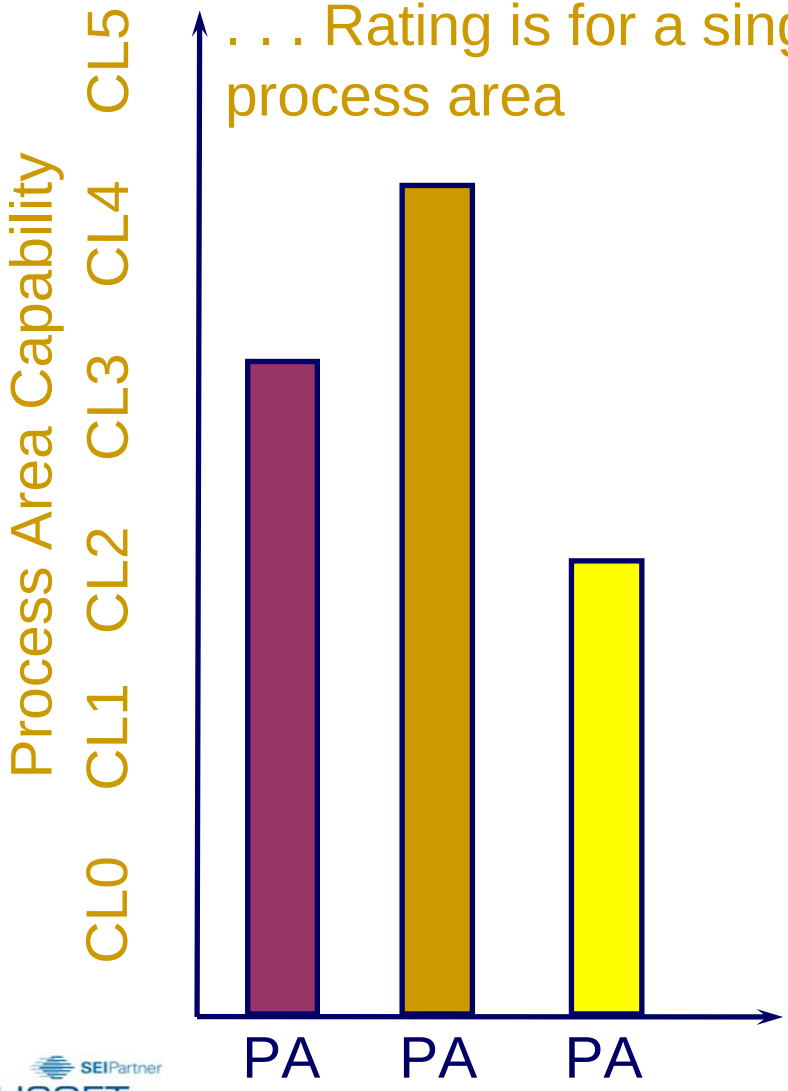
Recognize and Publicize Early Successes

- '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)

Capability verses Maturity Level

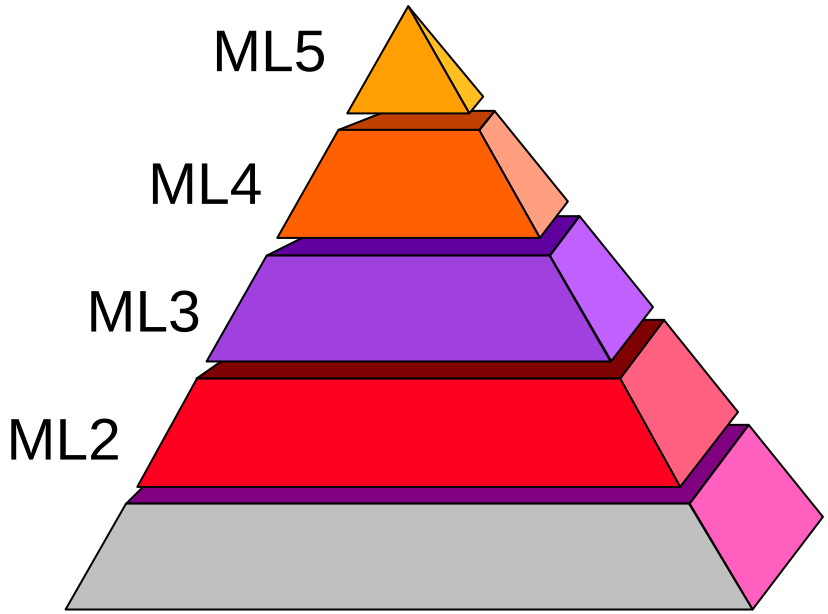
Continuous

. . . Rating is for a single process area



Staged

. . . Rating is for a specified set of process areas



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)

Question?

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

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), Assign Responsibility and Communicate Progress	2.10 Review Status with Higher Level Management

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 Learned[2]

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 rest of the story……..

Phase 2 - ML2 to ML3

The Second Wave – ML2 to ML3[1]

- Shift Focus of Process Improvement Strategy from "Implementing CMMI®" to "Executing Sound Systems Engineering"
- Educate Project Managers on What's Expected
- Improve Project's Planning and Documented Processes
- Provide additional CMMI® Training and WBTs
- Incorporate ISO, Lean Six Sigma (LSS) and Balanced Scorecard (BSC) Initiatives

The Second Wave – ML2 to ML3²

- Develop internal "self-assessment" process for measuring ongoing implementation of Maturity Level 2 processes
- Populate EPO/CMMI® Website with 'best examples'
- Implement Tailoring Guidelines
- Implement SSC-C Measurement Repository
- Implement ML2-to-ML3 Action Plans
- Continue to Measure and Communicate Progress
- Maintain Momentum and Commitment to Goals

SSC-C SE Revitalization Plan

Elements of SSC-C SE Revitalization

Policy / Guidance

- SSC-C SE Instruction
- SSC-C SE Process Manual
- SSC-C SW-Dev Process Manual
- SSC-C SW-Maint Process Manual
- EPO Website
- ePlan Builder

Training / Education

- Intro to PI WBT
- SE 101 WBT
- SE Fundamentals
- SE for Managers
- Project & Process Workshop
- Intro to Software Engr.
- Architecture Dev. WBT
- Certification/Degrees

Assessment & Support

- CMMI® Level 2
- CMMI® Level 3
- Balanced Scorecard
- Lean Six Sigma
- Integrated Product Teams
- IT Tools

Underway

Completed/Ongoing

SSC-C Engineering Process Guidance

SPAWAR Systems Center Charleston

SPAWAR Instruction 54xx.1(draft) SYSTEMS ENGINEERING POLICY

SPAWAR Policy

SSC-Charleston Engineering Processes Improvement Policy (Dec. 2003)

To be replaced with SSC-C SE/SW Instruction

Policies mandate the use of ISO/IEC life cycle processes and CMMI® best practices

ISO/IEC 15288
System Life Cycle Processes

ISO/IEC 12207
Software Life Cycle Processes

CMMI® for SE/SW

Industry Standards

Good Engineering

SSC-C Systems Engineering Process

SSC-C Software Engineering Process

Top Level SSC-C Processes

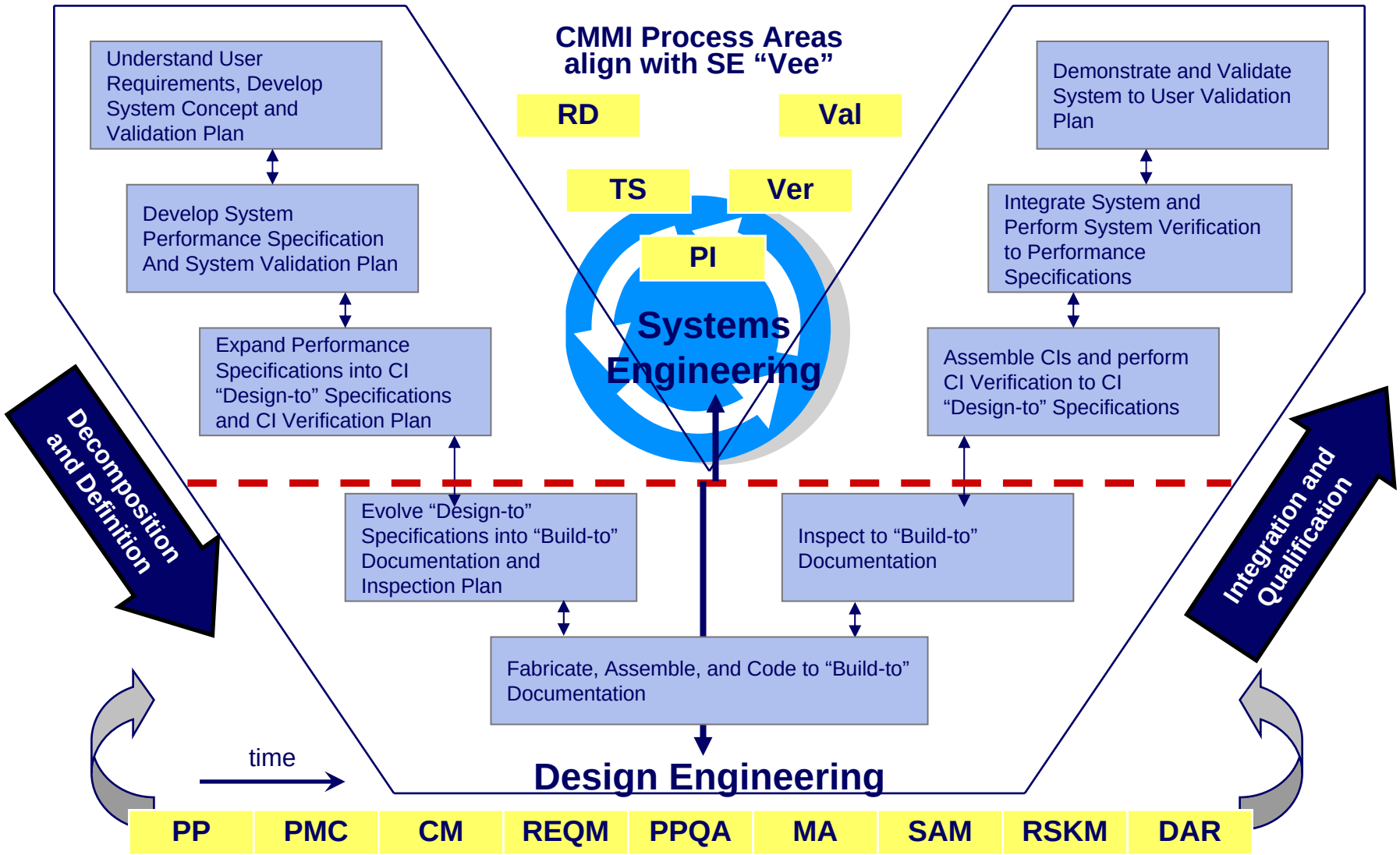
CMMI® Supporting Process Areas to SE/SW Processes

ML2	PP	PMC	CM	REQM	PPQA	MA	SAM
ML3	OPF	OPD	OT	IPM			
	RD	TS	PI	Ver	Val	RSKM	DAR

Use CMMI® to Measure & Assess Processes

Classic System Engineering "Vee" Diagram Aligning SE with CMMI and Process Improvement

Systems Center Charleston



The Second Wave – ML2 to ML3

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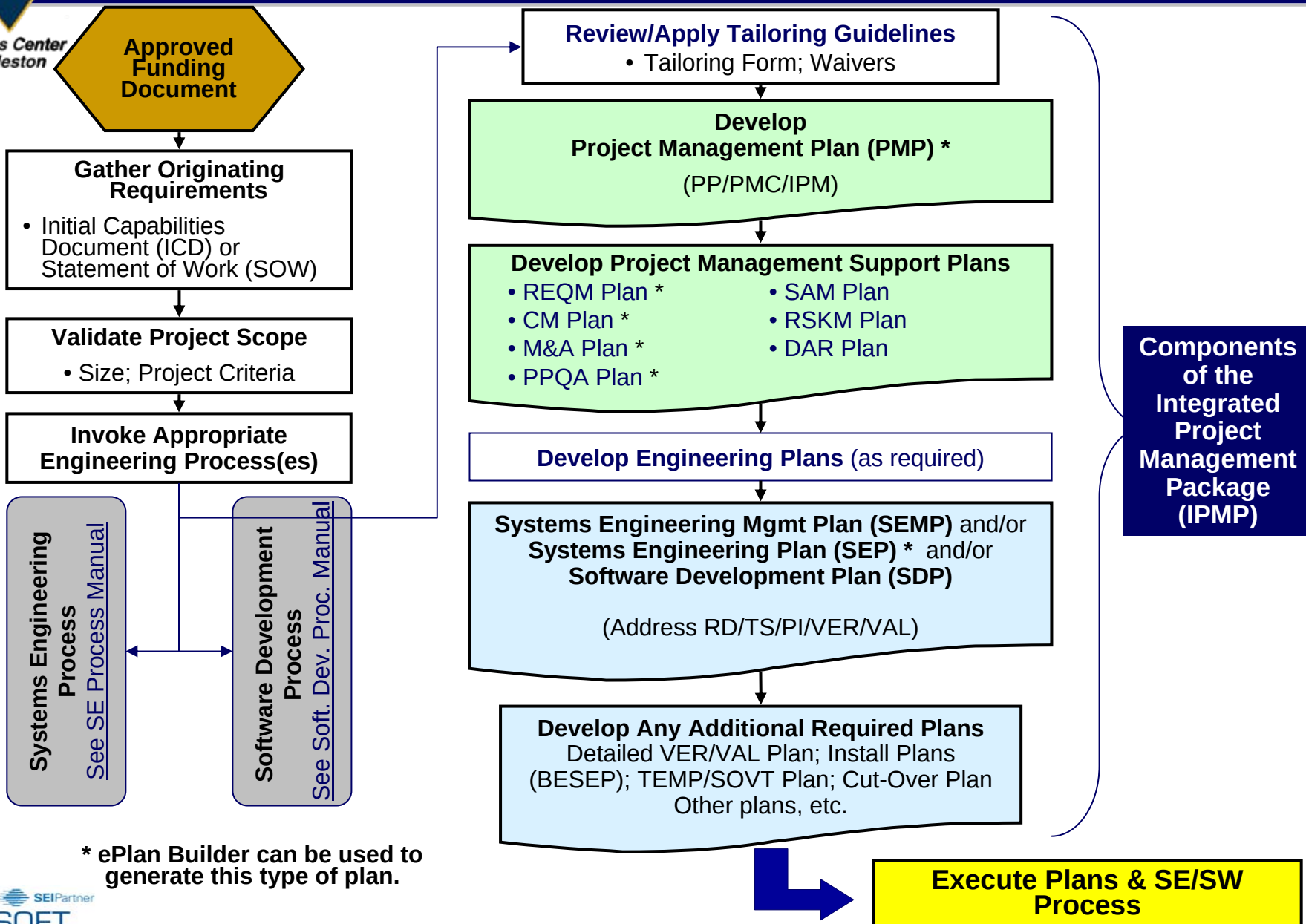
What is expected from SSC-C projects?

- **Execute sound systems engineering**
  - Utilize the organizational processes, tools, guidance available
- **Sound systems engineering requires**
  - Proper Project Planning
  - Control over the project and process
    - Configuration Management, Requirements Management
    - Verification (Peer Reviews), Process Quality Assurance, …
  - Iterative and robust design and development methodology
    - Decomposition of Requirements, Analysis, Alternatives, …
  - Frequent interaction of senior management and customers (sponsor)

CMMI® provides a standard to assess progress against sound systems engineering practices

SSC-C Project Process - Planning



*** ePlan Builder can be used to generate this type of plan.**

Pitfalls in Developing Plans

- **Generating from scratch**
  - Author specific
  - What did I forget?
  - Time – “Re-inventing the wheel”
- **Copy from “good” example**
  - Is it good?
  - Cut and Paste errors – old project data
  - What did they forget or intentionally leave out?
  - Is my project really the same?
- **Document Outlines/Templates**
  - Provide placeholders; not explanation/examples
  - No validation
- **General issues with all above alternatives**
  - Consistency from Plan to Plan
  - Formatting
  - What belongs in this section?

ePlan Builder Tool

SPAWAR Systems Center Charleston

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
  - Definitions
  - Acronyms
  - Roles and Responsibilities
- Generates an initial project-specific document

TurboTax® Usability

- **TurboTax® (and other income tax software)**
  - Simplifies the process for completing income tax returns
  - Uses an “interview” format with the user to collect information
  - Provides common defaults (that can be changed)
  - Branches to necessary sections based on input collected; skips unnecessary sections
  - Information entered once, but used in several places
  - Validates information for gaps and inconsistencies
  - Provides page/field specific help text
  - Automatically generates final forms

Apply Concept to Building Plans

- **Collect common project information once**
  - Ensures consistency from plan to plan
- **Acts as on-line template**
  - Ask questions, give choices, prompt for input
  - Application logic ensures full coverage of required sections (from standard process manuals)
  - Logic permits skipping / branching as appropriate
  - Provide on-line, section sensitive help
- **Standard content can be included in all plans**
- **Automatically generate initial draft of plan**

ePlan Builder Tool[1]

SPAWAR Systems Center Charleston

- Generates CMMI®-compliant (Maturity Level 3) Plans:
  - Project Management Plan (with WBS)
  - Configuration Management Plan
  - Quality Assurance Plan
  - Requirements Management Plan
  - Systems Engineering Plan (DoD SEP Format)
  - Measurement and Analysis Plan
  - Systems Engineering Management Plan (under development)
  - Verification Plan (under development)
  - Decision Analysis and Resolution Plan (under development)

ePlan Builder Tool²

- **Generates plan in Rich Text Format (rtf)**
  - For further editing and updating
- **Generates SSC-C compliant plan-specific standard lists for:**
  - Definitions
  - Acronyms
  - References
  - Roles/Responsibilities

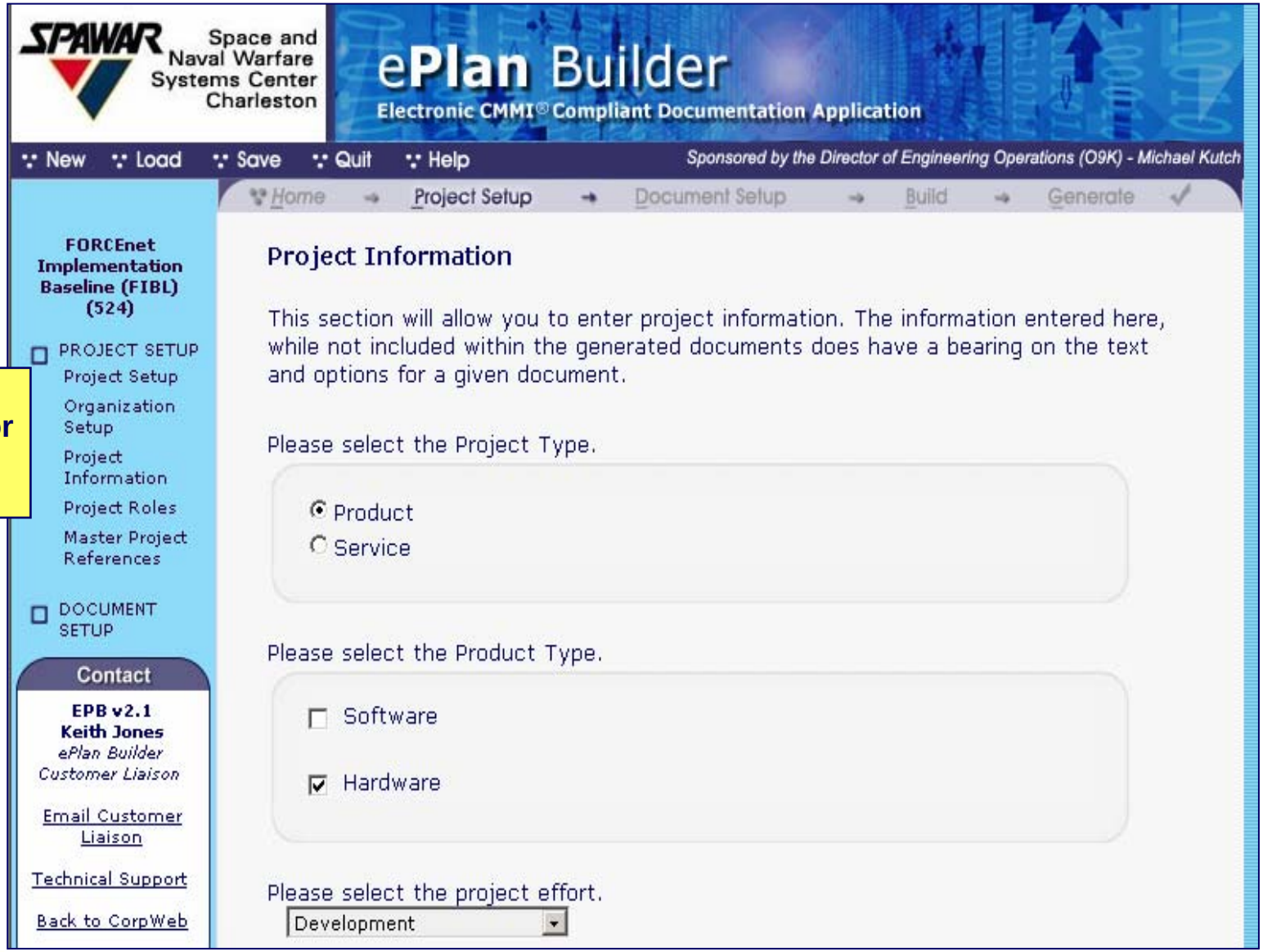
Project-specific content can also be added to these sections

ePlan Builder - Home

EPB – Project Setup

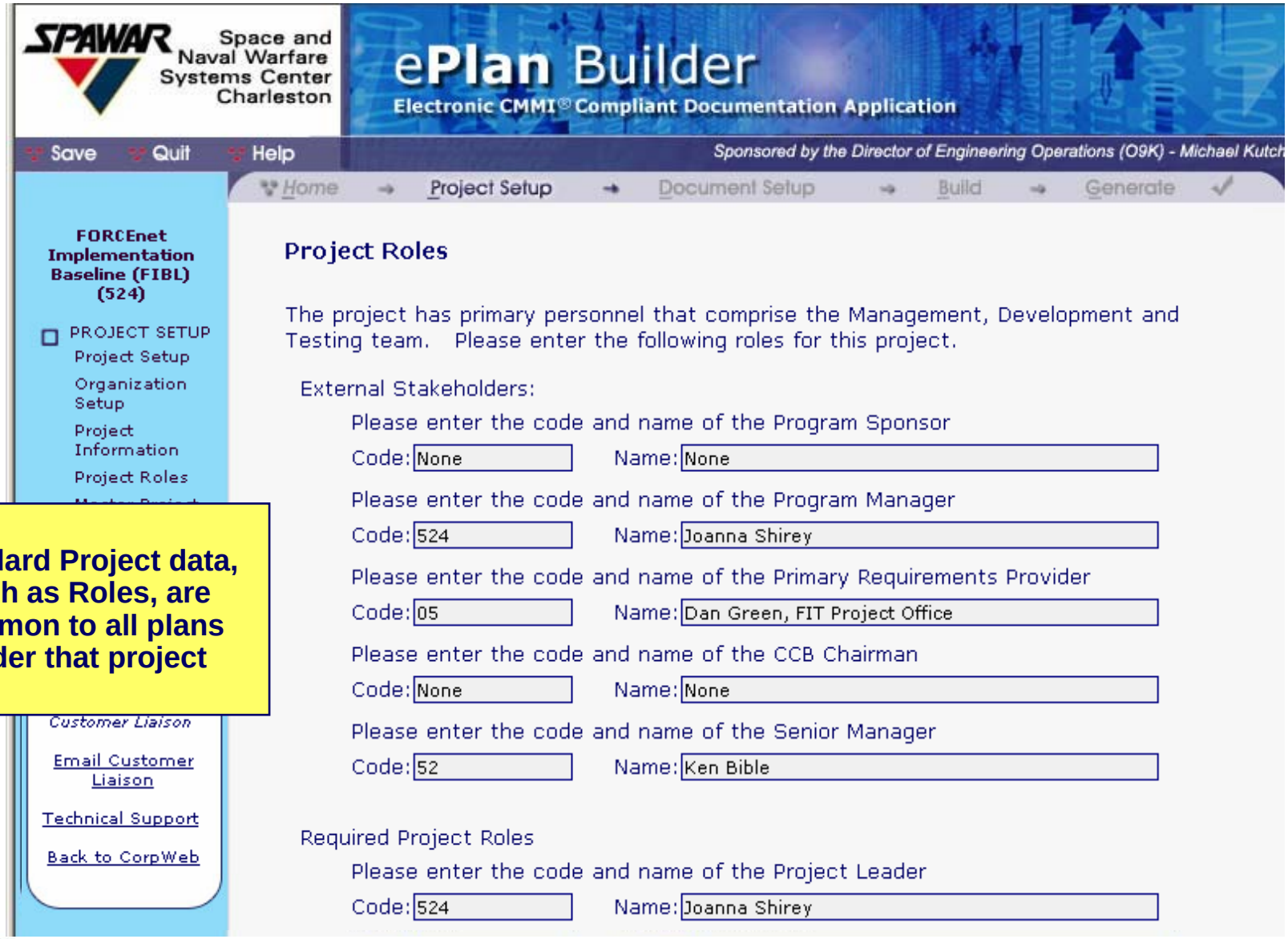
Systems Center Charleston

1 of 5 sections for Project Setup



EPB - Project Roles

Systems Center Charleston

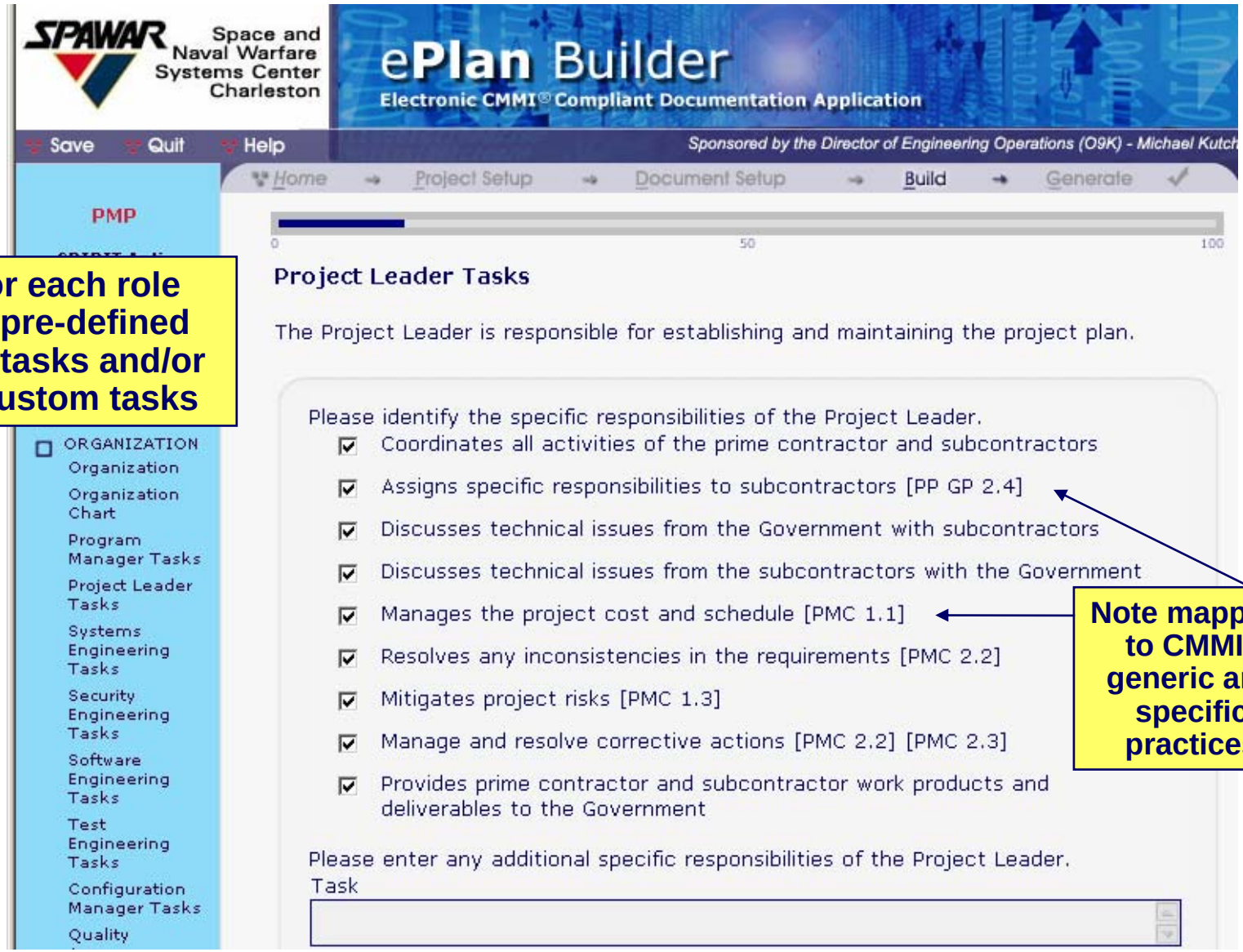


Standard Project data, such as Roles, are common to all plans under that project

EPB – Select Tasks for each Role

Systems Center Charleston

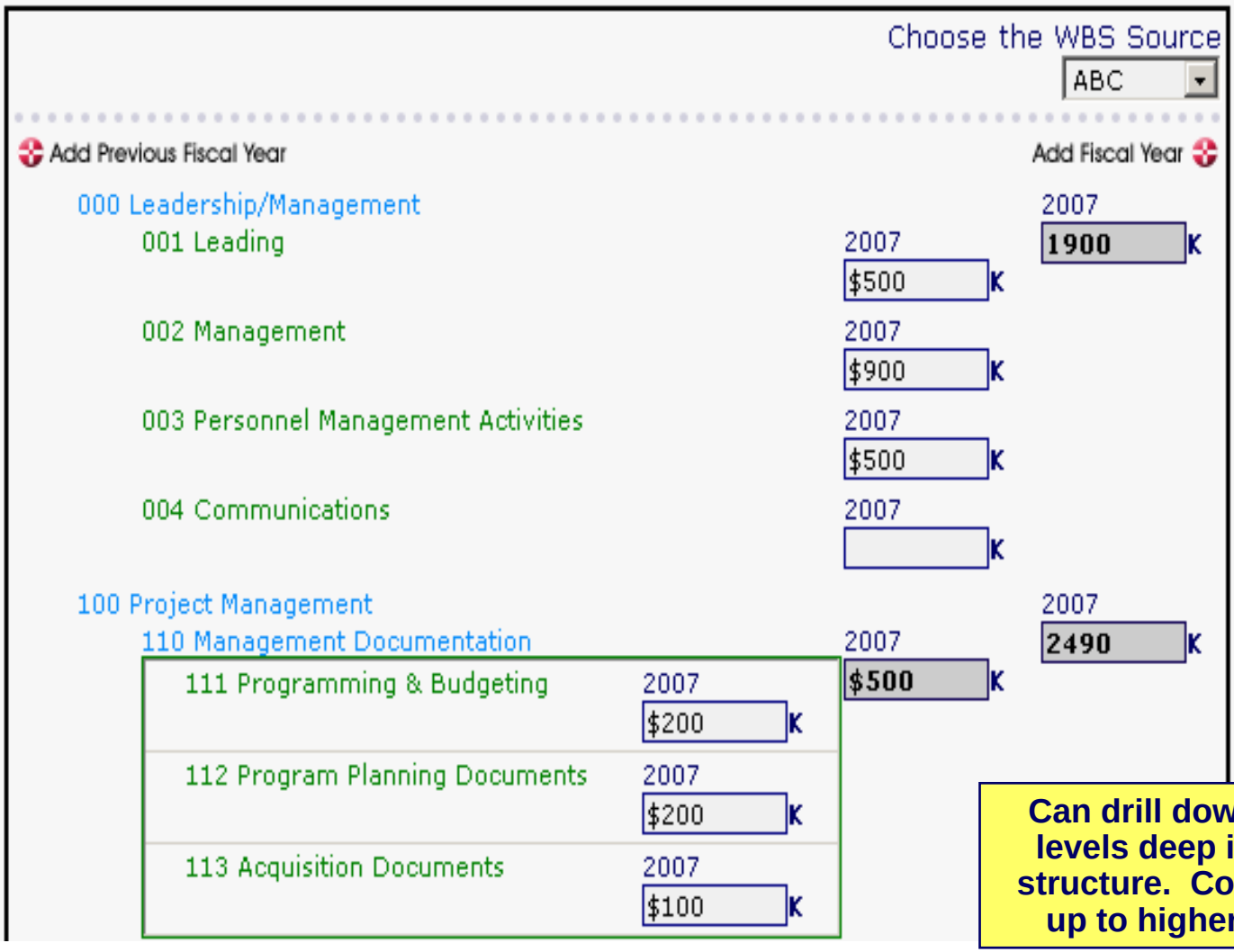
Tailor each role from pre-defined list of tasks and/or add custom tasks



Note mapping to CMMI® generic and specific practices

Work Breakdown Structure (WBS) in a Project Management Plan

SPAWAR Systems Center Charleston



Cost estimates entered using the SPAWAR global WBS or the SSC-C Activity Based Costing WBS

ePB accommodates multi-year projects

Can drill down three levels deep in WBS structure. Costs sum up to higher level.

Risk Identification in PMP

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Risks

This page allows you to enter a list of known or expected risks. The severity of the risks and the mitigation approach for each should be identified. Please use the table below to identify the major risks associated with the project.

Click for more information about risks

Risk Category	Impact/Concern	Level	Mitigation Approach
Schedule	Products are required by the customer by 10/1/06	High	Be prepared to provide draft materials if development of
Quality	Will products be ready for 10/15/06 in a condition	Medium	Provide technical data to contractor in accordance with schedule with
Technical	Ability to get teh technical ata from the	High	Interact directly with the satellite manufacturer to obtain the technical

Add More Items

PMP may also reference a more comprehensive Risk Management Plan

Measurement & Analysis Plan[1]

Systems Center Charleston

Cost, Schedule, and Process Performance are standard categories of measures

Collection, Storage, and Analysis is defined for each Project measure

Cost is a measure within the Financial Performance category that measures the cost for activities, events, and products. The measure provides an easy-to understand view of the budget. Comparison of planned and actual cost data provides insight into significant and repetitive cost changes at the activity level.

While more detailed cost information provides more insight into the project's total cost, until the project personnel have achieved a certain level of proficiency in estimating costs, it is recommended that the cost data should be captured at a level commensurate with this level of experience.

Collection and Storage

Identify the level of detail for capturing cost data
Project Level

Please select how the Project Leader will report contract costs from the list below. If the Project Leader is not responsible for managing contracts, select "Project".
Project

Identify who will provide the actual cost data:
Project Leader

Identify the tool to be used to collect cost data:
BSA and PMACS

Identify how often the actual cost data will be collected:
Monthly

Analysis Procedures

Identify how often the cost data will be analyzed:
Monthly

Identify the cost alert threshold:
95%

Measurement & Analysis Plan²

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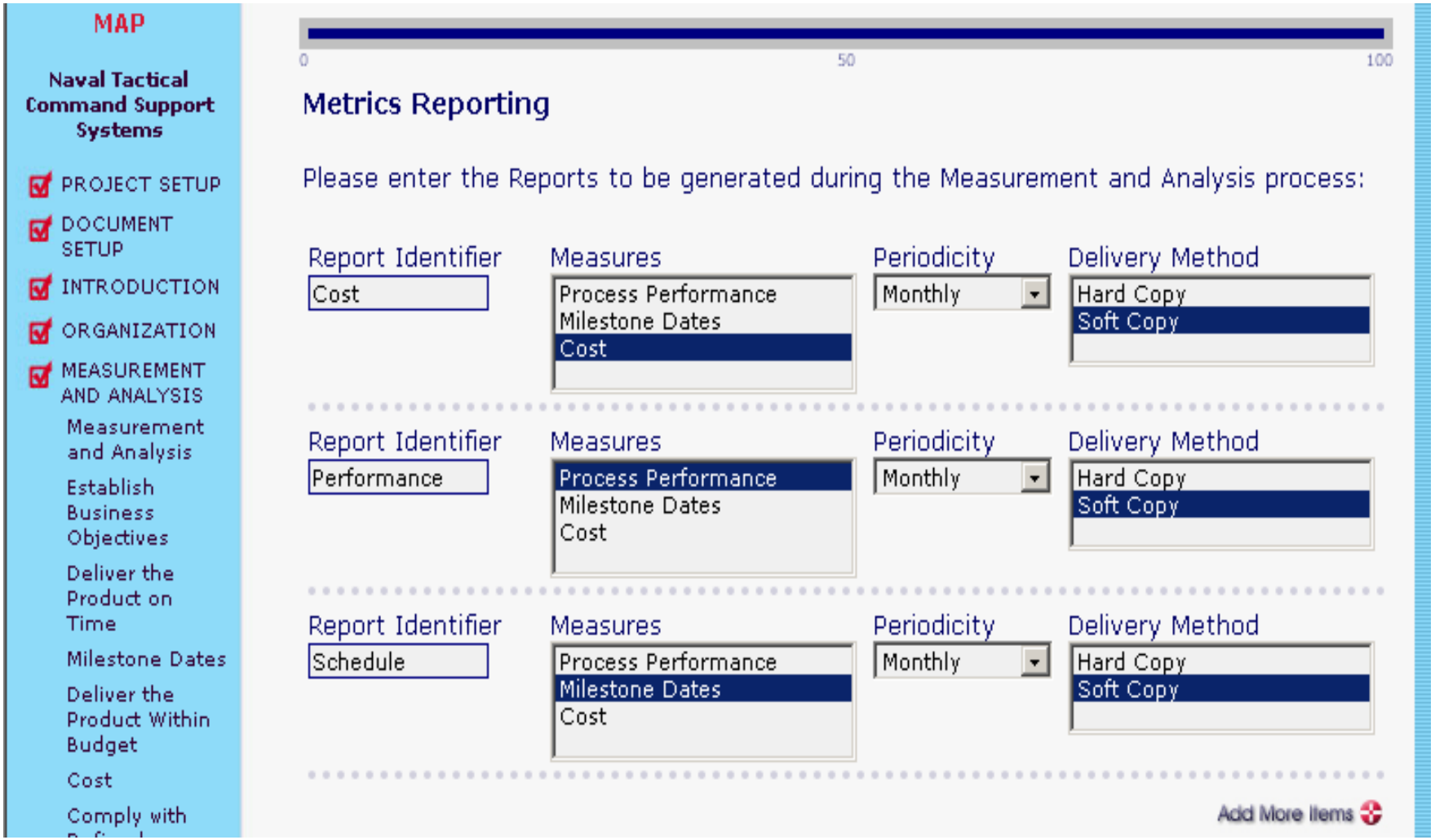
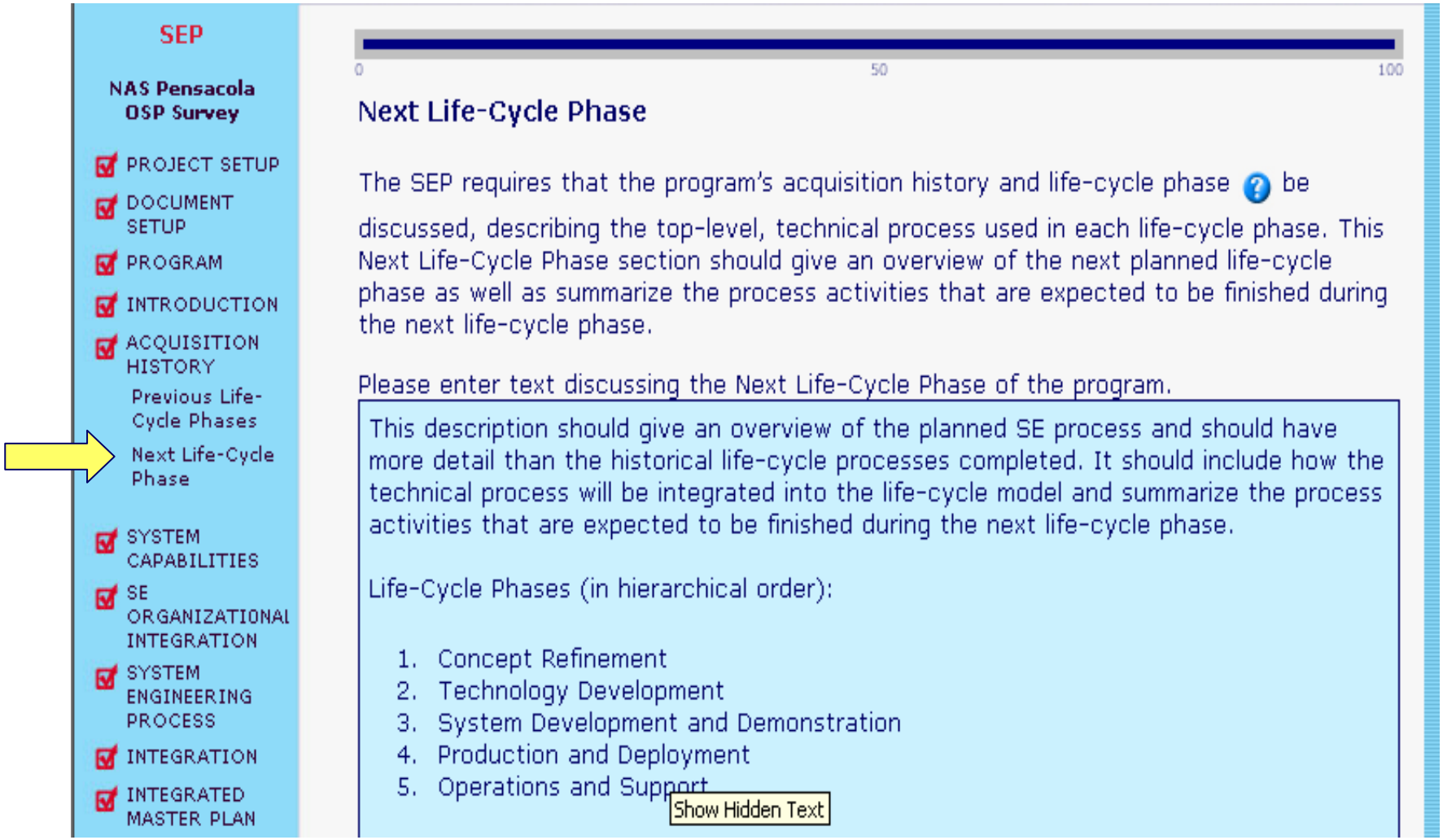


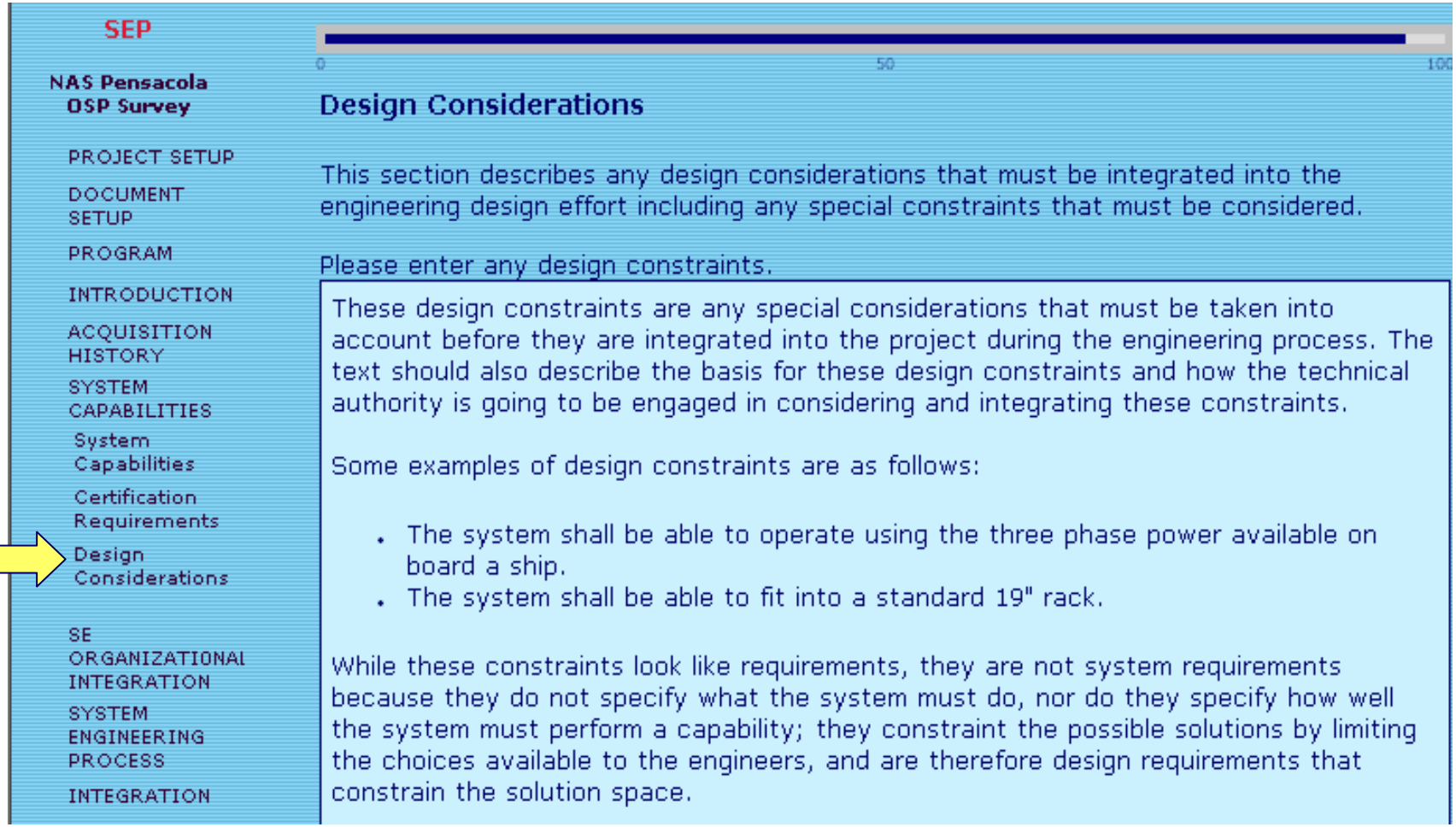
Systems Engineering Plan (SEP)[1]

SEP format follows the DoD SEP Preparation Guide



Systems Engineering Plan (SEP)²

Systems Center Charleston



The nature of the SEP requires more open input text fields, but EPB helps by providing elaborations and examples for the user

SEP – Planned Trade Studies

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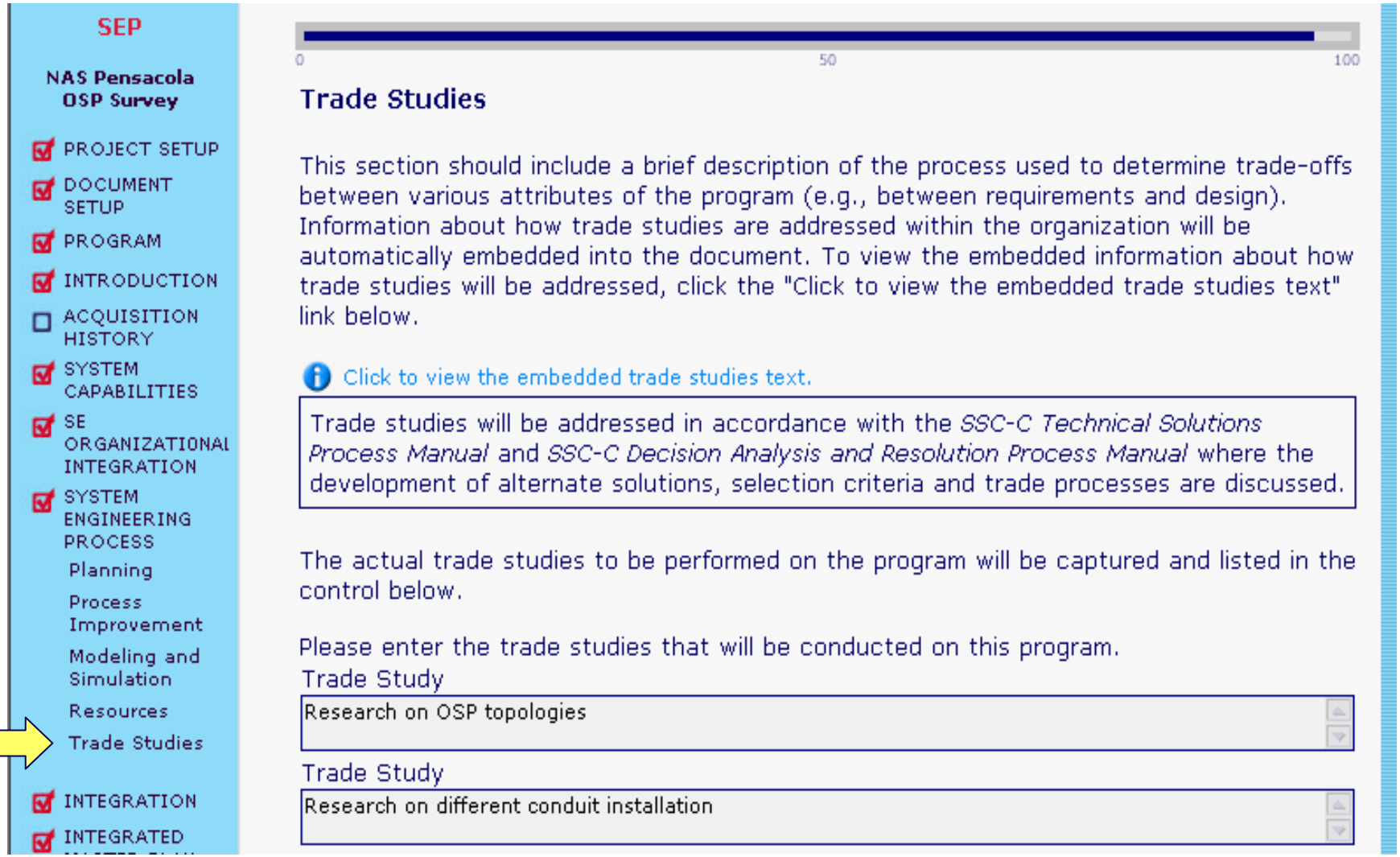

EPB Output – a Plan

SPAWAR Systems Center Charleston

N65236-593-PMP-0001-v1
August 18, 2006

Project Management Plan (PMP)

For

MARSOC West SCAMPI CER (593)

August 18, 2006

Prepared by:

Space and Naval Warfare Systems Center, Charleston
(SSC-C)
(593)
P. O. Box 190022
North Charleston, SC 29419-5542

Approved by: Mark Renaud (593) Date: August 23, 2006

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Table of Contents

EPB Output – CMMI® Compliance Matrix

Compliance matrix cross references CMMI® practices with associated SSC-C Process Manual and Project-specific plan

N65236-593-PMP-0001-v1
August 18, 2006

PROJECT PLANNING

CMMI®-SE/SW Goal/Practice Number	CMMI®-SE/SW Level 2 Process Area Project Planning (PP)	SSC-C PP Process Manual Paragraph	593 PMP Paragraph
PP 1	Establish Estimates. Estimates of project planning parameters are established and maintained.	3.2	1.2.1
PP 1.1	Estimate the Scope of the Project. Establish and maintain a top-level work breakdown structure (WBS) to estimate the scope of the project.	3.2	1.2.1 3 Appendix A
PP 1.2	Establish Estimates of Project Attributes. Establish and document estimates of the attributes of the work products and tasks.	3.2	1.2.1 1.3
PP 1.3	Define Project Life Cycle. Define the project life cycle phases upon which to scope the planning effort.	3.2	1 1.2.1
PP 1.4	Determine estimates of Effort and Cost. Estimate the project effort and cost for the attributes of the work products and tasks based on estimation rationale.	3.2	1.3 1.2.1 Appendix A
PP 2	Develop a Project Plan. A project plan is established and maintained as the basis for managing the project.	3.3	1 1.2.1

EPB – Technical Specs

- **Architecture**
  - Web-based application, with supporting database
    - MS SQL Server® 2000 Relational Database Management System (RDBMS)
  - Web architecture: Active Server Page, MS .NET Framework® 1.1 (ASP.NET)
  - Programming Language: MS Visual Basic® .NET (VB.NET)
  - Scripting Language: HTML, Javascript
  - Master Page engine that uses only one Active Server Page (ASP) that dynamically retrieves required information (questions, client answers, document template text, etc.)
- **Development - Incremental life-cycle model**

The Second Wave – ML2 to ML3

- Shift Focus of Process Improvement Strategy from "Implementing CMMI®" to "Executing Sound Systems Engineering"
- Educate Project Managers on What's Expected
- Improve Project's Planning and Documented Processes
- Provide additional Training, Workshops and WBTs
- Incorporate ISO, Lean Six Sigma (LSS) and Balanced Scorecard (BSC) Initiatives

Provide Additional Training

- **All employees need a basic understanding of process improvement**
  - What is their process now?
  - How to add value by formalizing and improving their process (based on Organizational process)

- **All project teams need to fully understand the CMMI model (all processes, all levels)**
  - To understand all of the best practices and maturity levels
  - To comply/prepare for DoD and NAVY policy

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

Provide Workshops

- **All project team members and supporting personnel need to know how to perform the standard processes and best practices required**
  - How to do good SE, CM, PPQA, Planning, Measurement, Risk, VER/VAL, etc.
- **To properly prepare for and complete an assessment or appraisal, key project team members need to map the project work products to the practices assessed.**

These needs can be depicted in a Training Architecture

Training Architecture

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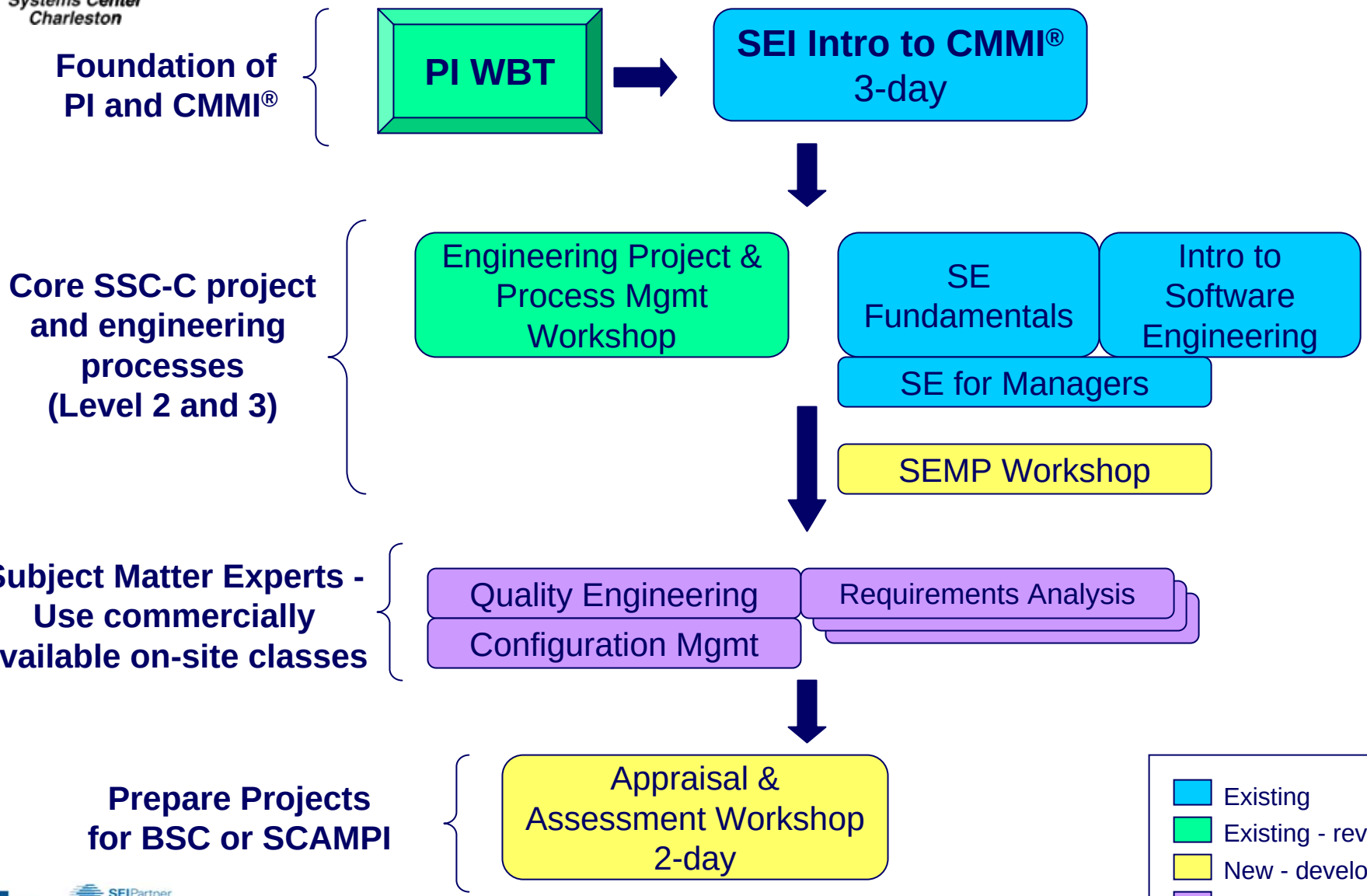
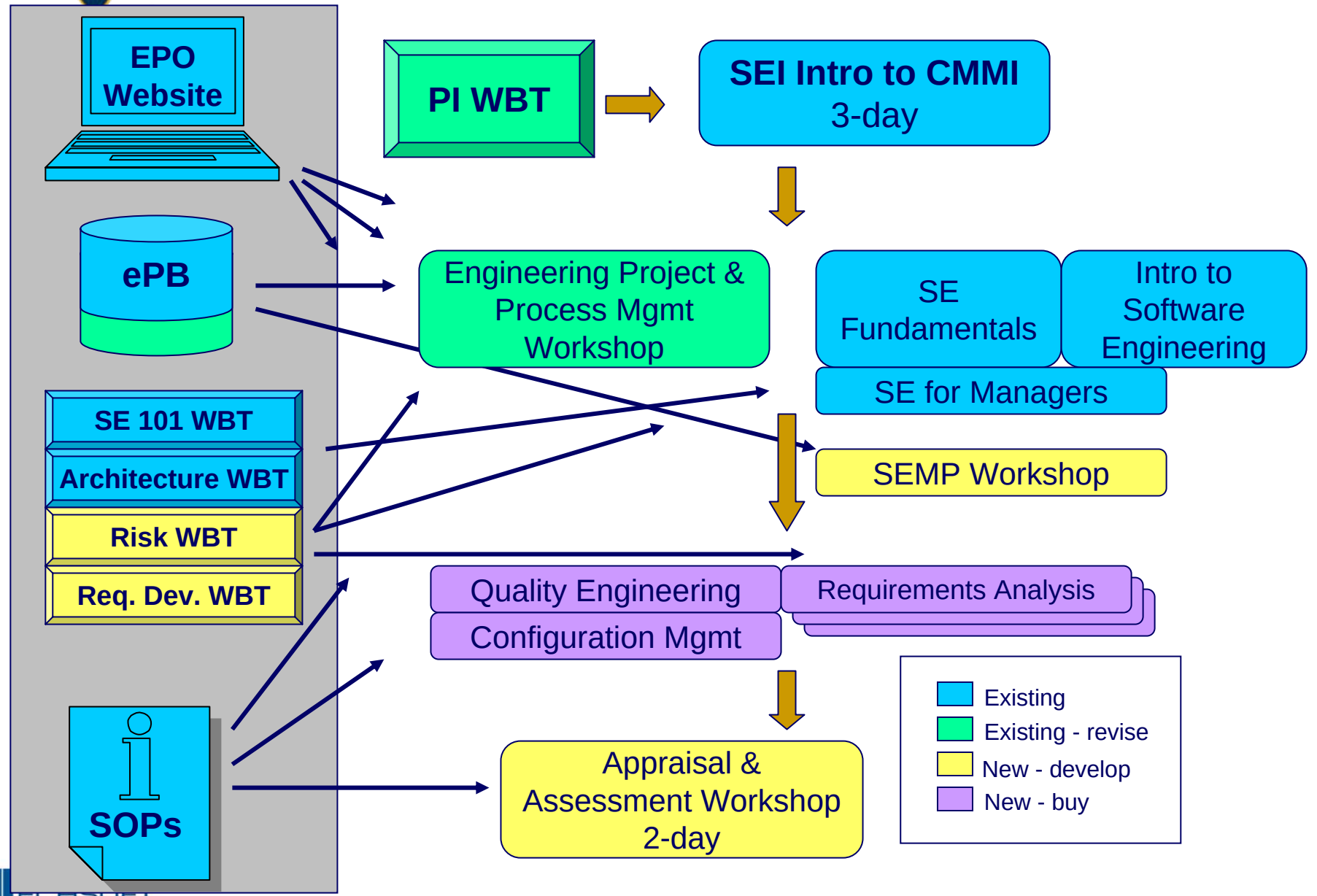
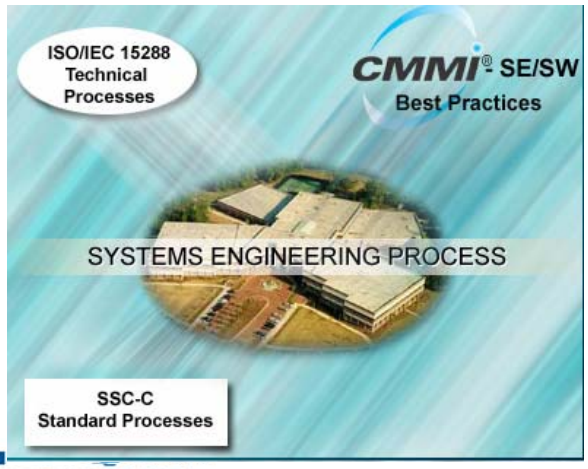


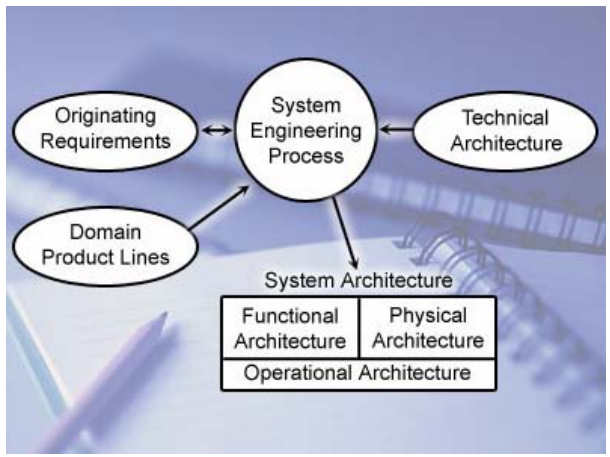
Training and Tools

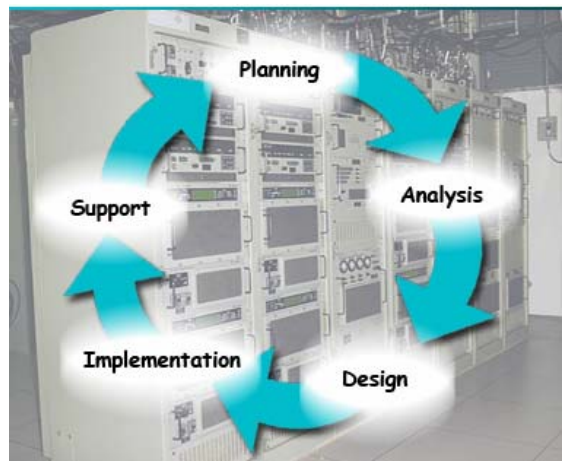


SE 101 Web-Based Training

- **Introduction to Systems Engineering WBT**
  - 10-module web based training
  - Closely aligned to SSC-C SE Process, SE Fundamentals Course, and ISO/IEC 15288
  - Includes hotlinks to referenced documentation
    - SSC-C Process manuals, policies, standards
  - Extensive branching for more detail

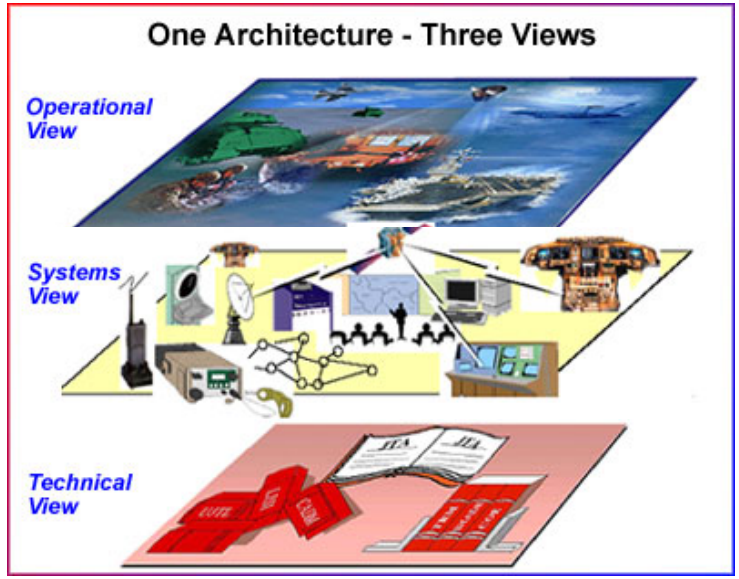






Topical WBTs

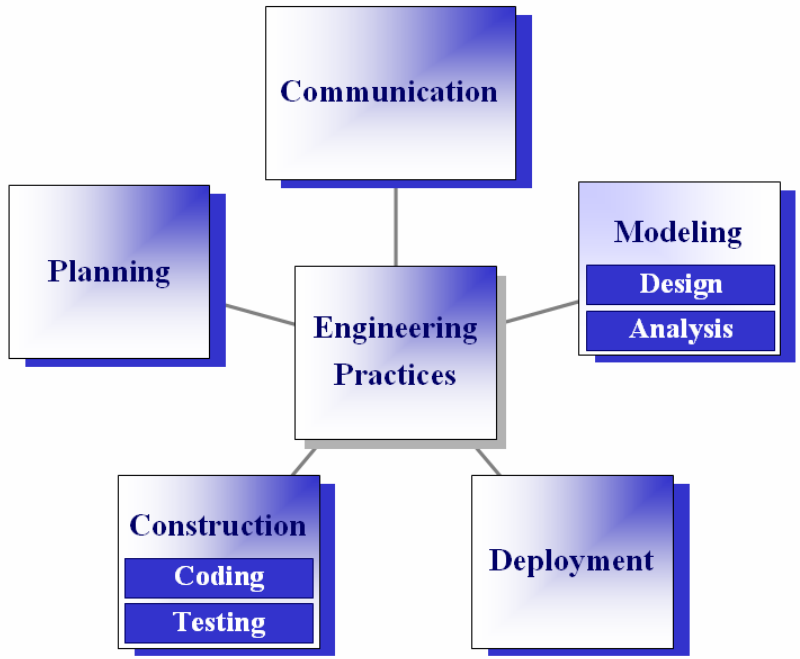
- **Developing web-based training courses in specific topics**
- **Architecture Development WBT - completed**
  - Introduction to Architecture Development and DoDAF
  - Designed to educate and promote value of system architecture to non-architects and new engineers
  - Tests for understanding
- **Risk Management WBT**
  - Risk identification
  - Analysis tools and techniques
  - Mitigation planning
  - Risk monitoring
- **Requirements Development**



Introduction to Software Engineering

- **Similar format to the Systems Engineering Fundamentals**
  - 3 days, primarily lecture
  - Aligned with the SSC-C Software Development Process Manual

- **Course Outline**
  - Intro to Software Engineering
  - Roles
  - Software Engineering Practices
  - Software Development Process
  - Software Maintenance
  - Managing Software Projects
  - Tailoring



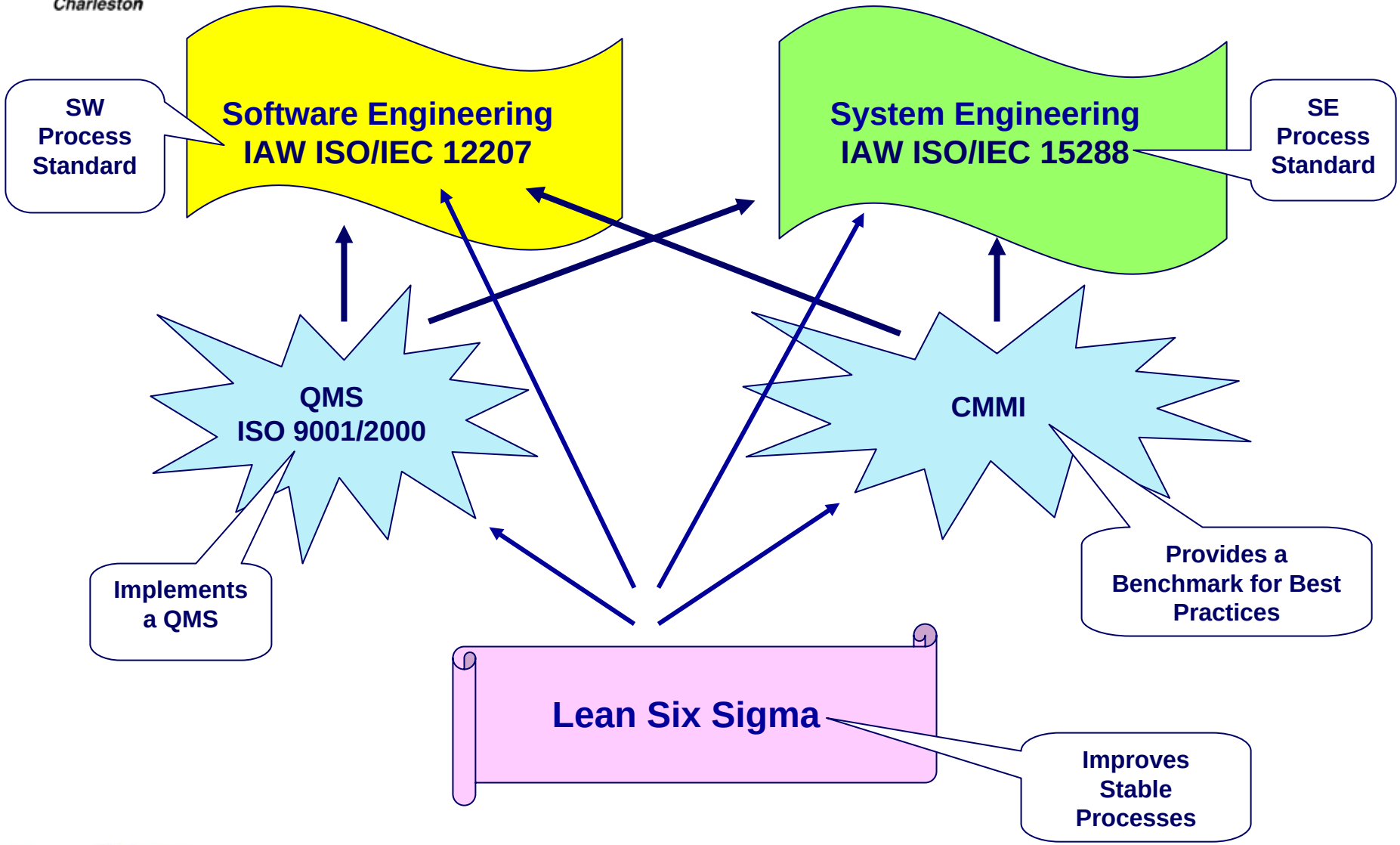
Engineering Project & Process Management Workshop

- **Multi-session workshop oriented "how to" class**
- **What is a good process? Is my process good?**
- **How to generate project plans**
  - What makes a good PMP, CM Plan, QA Plan…
  - How to use ePlan Builder
  - Hierarchy of plans (Based on level 2 or level 3 goals)
- **Configuration Mgmt**
  - Are my Configuration Items (CI's) and Change Control adequate?
- **PPQA**
  - How to execute a process review and work product review
- **Measurement and Analysis**
  - Are my measures measurable?
- **Requirements Management**
  - Traceability - simple to complex
- **Monitoring and Control using Reviews**

The Second Wave – ML2 to ML3

- Shift Focus of Process Improvement Strategy from "Implementing CMMI®" to "Executing Sound Systems Engineering"
- Educate Project Managers on What's Expected
- Improve Project's Planning and Documented Processes
- Provide additional Training, Workshops and WBTs
- Incorporate ISO, Lean Six Sigma (LSS) and Balanced Scorecard (BSC) Initiatives

A World Class Engineering Organization

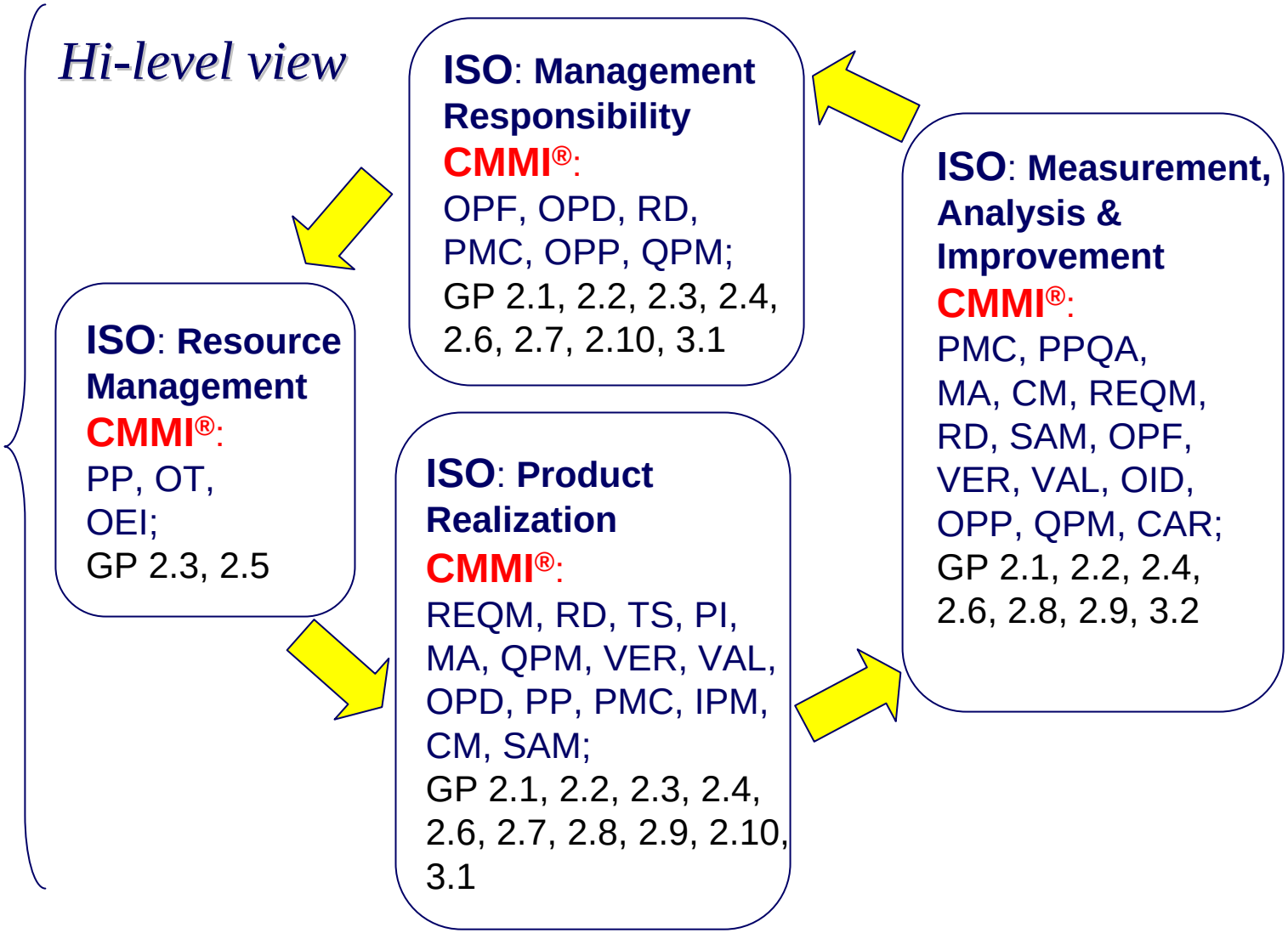


ISO and LSS Initiatives

- ISO 9001/2000 is an internationally recognized standard for Quality Management Systems (QMS) Principles.
  - **ISO requires the Organization to focus upon organizational processes, the Customer, and continual improvement.**
  - **ISO requires documented processes and procedures that complement and supplement existing processes and procedures.**
  - **It is a common sense, documented system focusing on consistency, reliability, and improving the way businesses operate.**
  - **ISO provides elaboration of the CMMI QA best practices, giving you the detail to implement the Quality Management System**

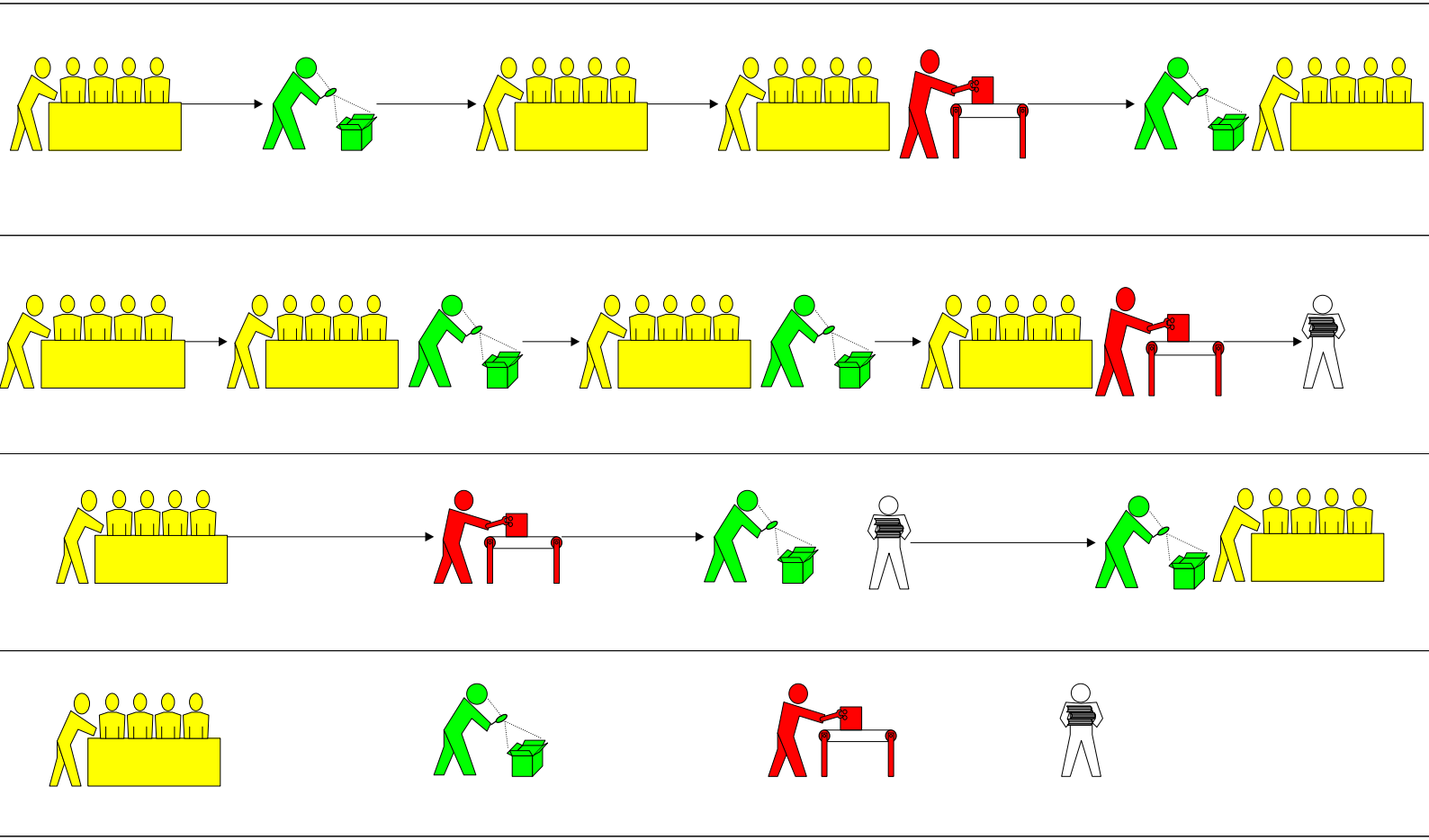
- Lean Six Sigma is an Internationally recognized process improvement methodology that combines both Lean and Six Sigma.
  - **Lean minimizes waste and improves process flow.**
  - **Six Sigma improves process capability and eliminates process variation.**
  - **Lean Six Sigma is an aid in improving stable processes and process flow.**
  - **Lean Six Sigma is applied to stable, mature processes.**

ISO - CMMI Relationships

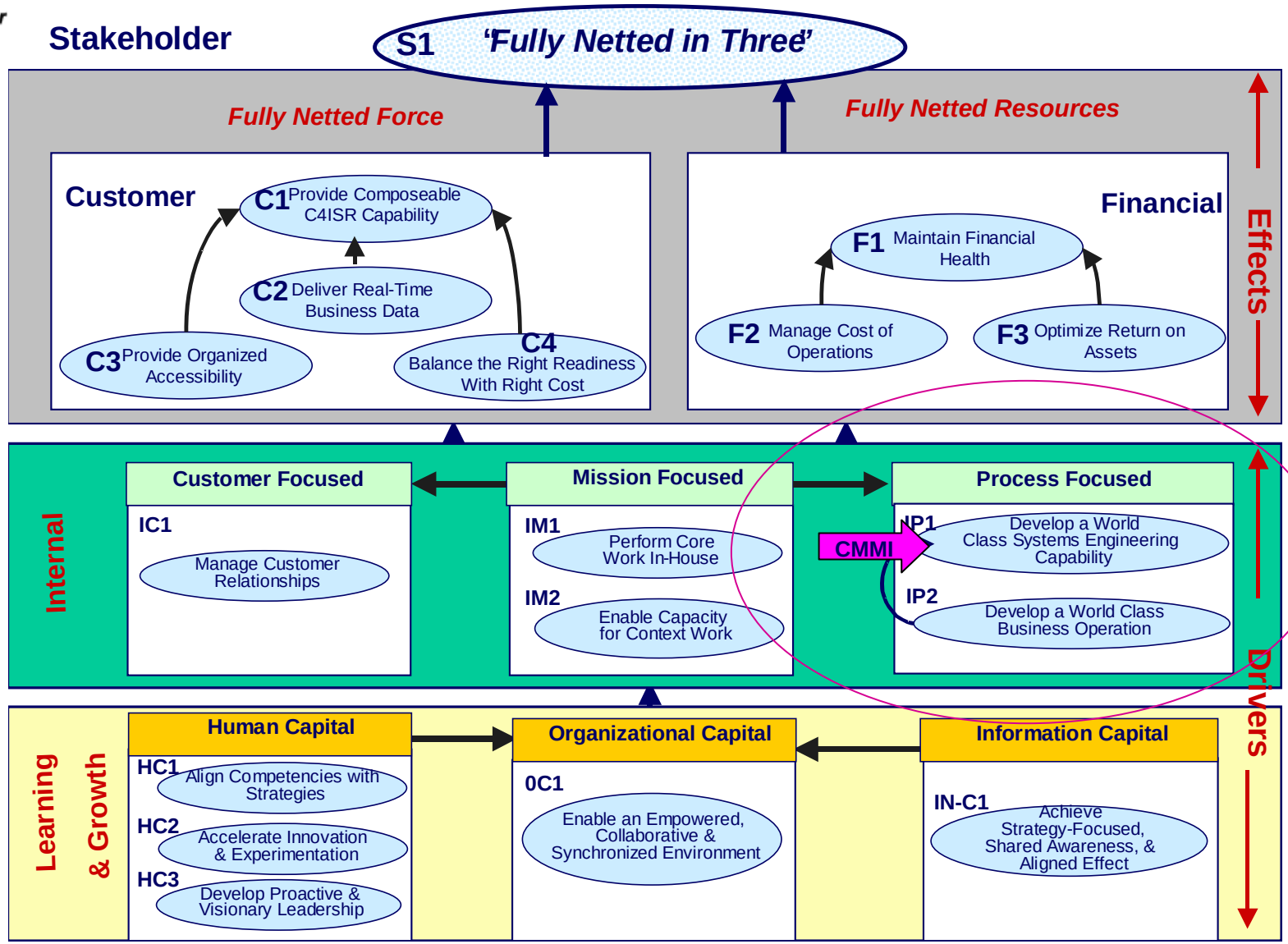


CMMI®, LSS and ISO Comparison

CMMI LSS ISO improvement framework comparison



Balanced Scorecard Strategy



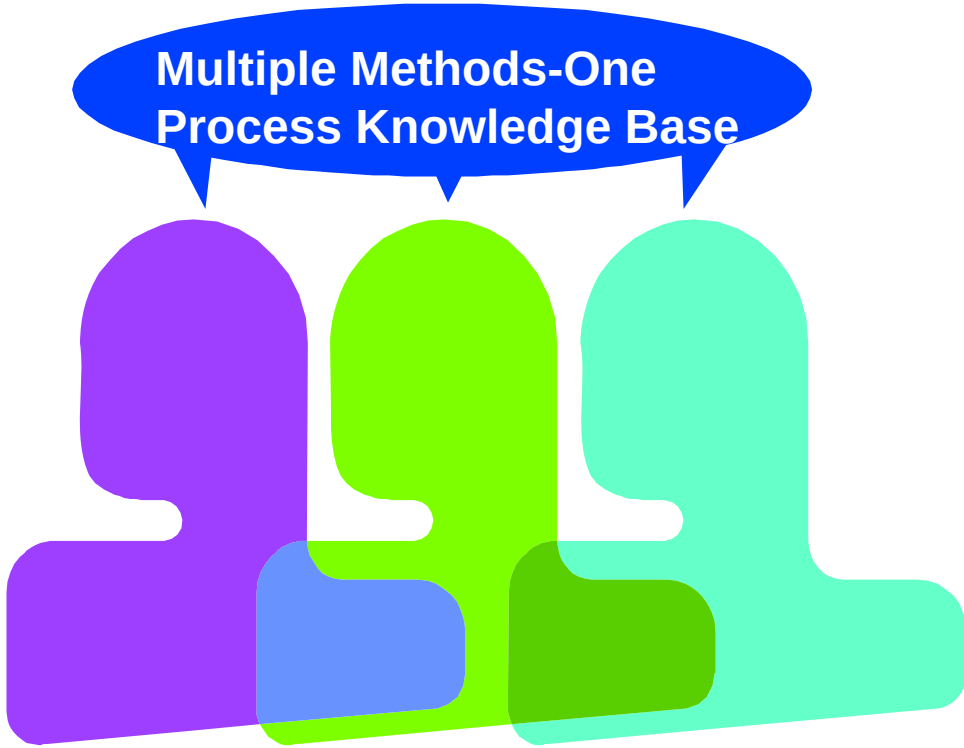
Balanced Scorecard Based on CMMI®

SPAWAR Systems Center Charleston

erspectives	Objective Headline	Objective Statement	Measure	Purpose
Customer (Internal)	IC1: Manage Customer Relationships	Construct and align our enterprise processes to insure maximum customer involvement.	On-line Customer Profile - Percent of customers for which we have current tasking and profiles that are enterprise wide accessible	To drive the customer focus thru all engineering and business processes
Mission	IM1: Perform Core Work In-House	Apply our limited government resources to the mission-critical and strategy-valued functions	Government Man-Hours on Core Work - Percent of government man-hours spent on core	To increase percentage of core government labor hours to total government man-hours
	IM2: Enable Capacity for Context Work	Maintain a sufficient level of contract capacity to support our outsourcing and out-tasking requirements.	Context Ceiling Capacity - Available contract ceiling with actual burn rate	Monitor available ceiling to ensure it exceeds expected work
Process	**IP1: Develop a World-Class Engineering Capability**	**Establish standard engineering processes that provide a qualitative competitive edge in the global market**	**A. Technical Maturity Assessments. Average ratings from assessments.** **B. Level Two/Three/Four Projects - Count the number of department projects self-assessed at Level 2/3/4.**	**Drive the level of implementation of common Systems Engineering practices at the Command**
	IP2: Develop a World-Class Business Operation	Establish standard business processes that complement our engineering processes and provide a competitive edge in the global market	A. Core business Processes Captured and Documented - Ratio of the business processes within the functional areas in Enterprise Process Management Architecture that are defined and documented with proper interfaces identified and controlled / facilitated	To promote standardization of processes and greater efficiency of overall business operations
			B. Core Business Process Improved - Dollars saved or costs avoided by the improvement of business operations processes, with their organizational interfaces accommodated by the Enterprise Process Management Architecture	To promote standardization of processes and greater efficiency of overall business operations

Incorporate ISO, LSS, BSC and CMMI®

- **Implementation**
  - Use all to complement each other
  - Promote consistent implementation from Command down
- **Benefits**
  - Objective evaluation and QA available to all projects, large or small
  - Cost sharing for QA or process reviews on an as-used basis
  - Central tracking of issues and lessons learned for sharing across division and department

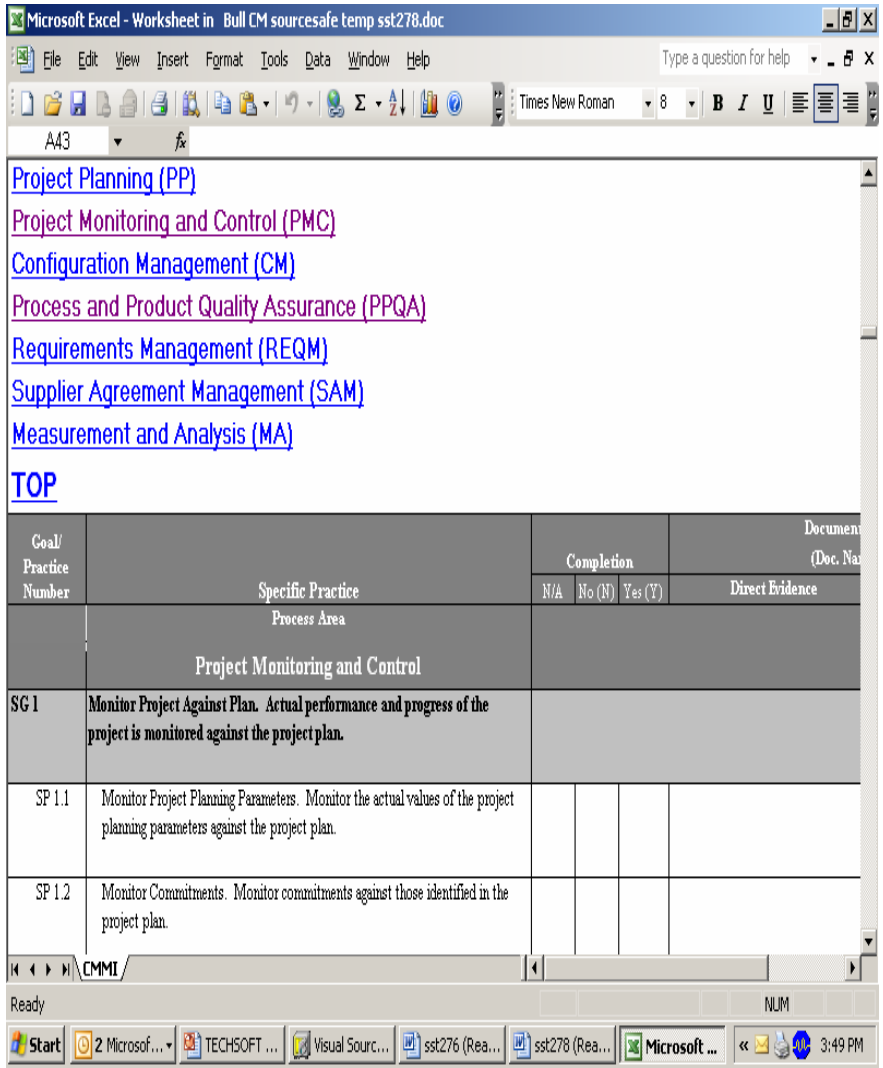


The Second Wave – ML2 to ML3

- Develop internal “self-assessment” process for measuring ongoing implementation of Maturity Level 2 processes
- Populate EPO/CMMI® Website with ‘best examples’
- Implement Tailoring Guidelines
- Implement SSC-C Measurement Repository
- Implement ML2-to-ML3 Action Plans
- Continue to Measure and Communicate Progress
- Maintain Momentum and Commitment to Goals

Internal "Self-Assessment" Process

- Good starting point for project to understand what's required
- Teaches difference between Direct and Indirect evidence and the need for both
- Serves as the BSC Measure of project's progress towards ML2/ML3/ML4
- Artifacts are reviewed for compliance



Populate Website with 'Best Practices'

- Improved/formalized process to populate EPO/CMMI® Website with 'best examples'
  - EPO submittal form to submit via email
  - Direct and timely response that artifact was received
  - Process for SME to evaluate artifact and recommend posting, holding for future date, not posting
  - Process for project to submit artifact with Do Not Post notice
  - Process to notify when submittal is posted or reason for not posting

Improved Content and Usability of Website

- Gave Website a “Facelift”
- Populated it with many “Good Samples” of ML2 and ML3 Plans and SOPs for projects to use
- Helps Institutionalize GP 3.2 for all Process Areas
  - ***Collect work products, measures, measurement results, and improvement information derived from planning and performing the process to support the future use and improvement of the organization’s processes and process assets.***

The Second Wave – ML2 to ML3

- Develop internal "self-assessment" process for measuring ongoing implementation of Maturity Level 2 processes
- Populate EPO/CMMI® Website with 'best examples'
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- Implement SSC-C Measurement Repository
- Implement ML2-to-ML3 Action Plans
- Continue to Measure and Communicate Progress
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Tailoring Guidelines

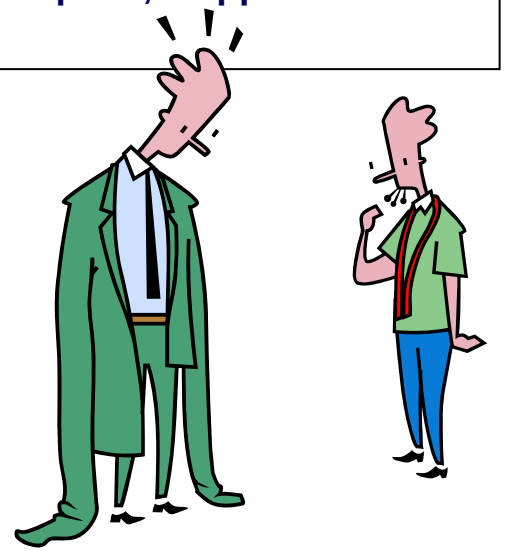
Excerpts from the *"SSC-C Developing Project Processes SOP"…..*

In order to initiate the Tailoring Process, a Project/Task Leader follows the guidance provided in the SSC-C Tailoring Guidelines and the SSC-C Integrated Project Management Process Manual to establish and manage a project according to an integrated and defined process that is tailored from the organization's set of standard processes. The SSC-C Tailoring Guidelines can be found on the EPO website.

There are six activities within the Tailoring Process, described in detail in the SSC-C Tailoring Guidelines:

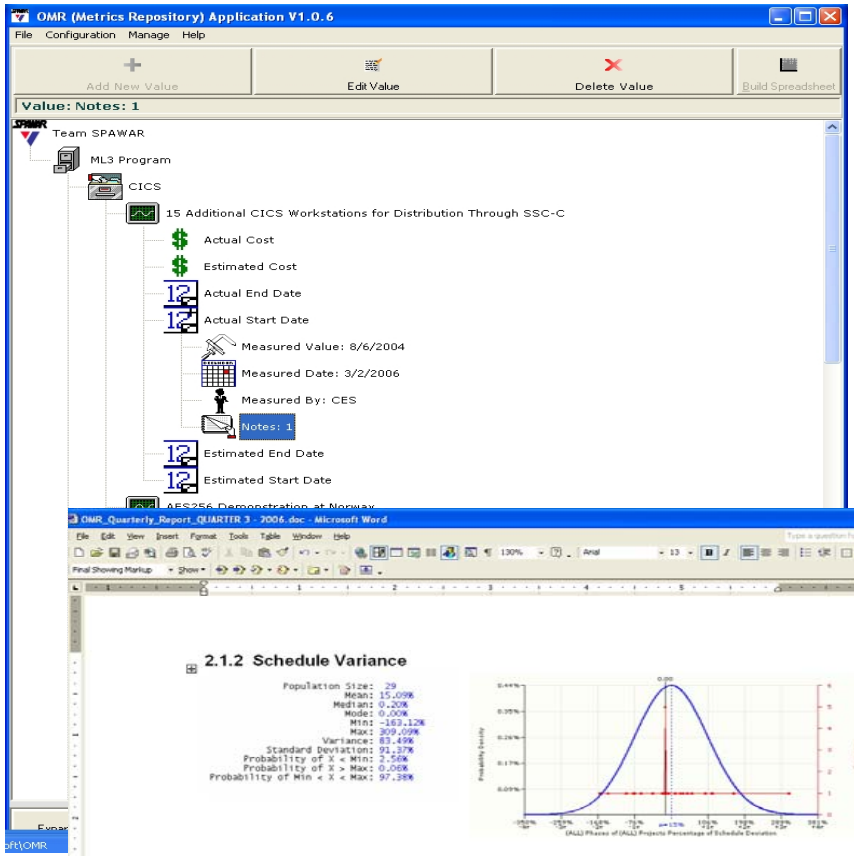
- Establish the project profile
- Select project processes from the SSC-C Set of Standard Processes
- Complete the Tailoring Form
- Complete Waiver Request, if applicable
- Complete Peer Reviews of Tailoring Forms and Waiver Request, if applicable
- Department Head reviews Waiver Request

The results of the completed Tailoring activities are used in conjunction with the SSC-C Integrated Project Management Process Manual to establish the Project's Defined Process. The basis for establishing the SSC-C Project's defined process is SSC-C's standard processes. The SSC-C Systems Engineering Process Manual, SSC-C Software Development Process Manual, and the SSC-C Software Maintenance Process Manual provide the detailed activities and tasks needed to successfully implement the process requirements provided in the SSC-C Level 2/3 Process Manuals.



Measurement Repository

- Built SSC-C Measurement Repository (OMR) for projects to use for managing their projects
  - Capturing standardized cost, schedule, and process performance
- Implementation included hands on training in reporting and using OMR
- Laying groundwork for higher maturity



ML2 to ML3 Action Plans

- PI Plan to address ML2 findings and ML3 actions
- Lessons learned from SCAMPIs
- Incorporate Tailoring Guidelines
- Provide metrics to OMR
- What's ML3 all about?
  - Peer Reviews
  - SEMPs
  - DAR Plan
  - RSKM Plan

The Second Wave – ML2 to ML3

- Develop internal “self-assessment” process for measuring ongoing implementation of Maturity Level 2 processes
- Populate EPO/CMMI® Website with ‘best examples’
- Implement Tailoring Guidelines
- Implement SSC-C Measurement Repository
- Implement ML2-to-ML3 Action Plans
- Continue to Measure and Communicate Progress
- Maintain Momentum and Commitment to Goals

Measure and Communicate Progress

- Continuing similar approach to Maturity Level 3
- Successful ML3 Program (with 4 projects) in July 2006
- Another project achieved CL3 in 16 Process Areas
- 4 more projects with planned SCAMPIs in 2006
- Continuing to use Continuous Representation and Equivalent Staging for early successes
- S2E Newsletter is a great means of communicating status and success

Maintain Momentum/Commitment to Goals

- **2007**
  - Conduct interim Maturity Level 3 appraisals on projects
  - Correct findings and strengthen institutionalization
  - Conduct Command Maturity Level 3 appraisal in April 2007
  - Incorporate new version of CMMI model (V1.2)
  - Incorporate IPPD (Integrated Product and Process Development)
  - Mentor projects to Maturity Level 3
- **2008 - 2009**
  - Begin Maturity Level 4/5 implementation
  - Establish/Refine/Compose organizational and project measures
  - Increase collection of project, process, and organizational measurement data
  - Conduct interim Maturity Level 4 appraisals on projects

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
- First SPAWAR Systems Center to achieve CMMI® Maturity Level 2 in April 2005

Summary²

- Following Plan for Phase 2 – CMMI® Maturity Level 3
- Focus on System Engineering Excellence
- Continue to apply "Lessons Learned"
  - Findings from SCAMPIs
    - Peer Reviews, Effectiveness of DAR, Senior Management Involvement, PPQA
  - Feedback from using the SSC-C Organizational Assets
  - Feedback for using the SSC-C Organizational Measurement Repository
  - Feedback from ePlan Builder (MR Process in place)

Summary[3]

- Leveraging from the first program in SPAWAR Systems Center to achieve CMMI® Maturity Level 3
  - Interviews and pictures in S2E Newsletter
  - Sample ML3 Documents on Website
  - Findings from SCAMPI
- Continuing to prepare for the Command Maturity Level 3 appraisal in April 2007
- Laying groundwork for higher maturity

Summary[4]

Systems Center Charleston

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

CMMI LEAN SIX SIGMA ISO 9001

- **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
  - July 2006 first program to achieve CMMI® Maturity Level 3
  - 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

SPAWAR
Systems Center Charleston

Thank you !

Any Questions ?

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