Integrating CMMI, TSP\textsuperscript{SM} and Change Management Principles to Accelerate Process Improvement

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P-3C Maritime Surveillance Aircraft Software Support Activity

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\textsuperscript{R} CMM, CMMI and Capability Maturity Model are registered in the U.S. Patent and Trademark Office.

\textsuperscript{SM} Personal Software Process (PSP); Team Software Process (TSP); and SCAMPI are service marks of Carnegie Mellon University
Objectives

- Background and current status of the Process Improvement effort
- Applying change management principles to successfully change an engineering culture
- Lessons learned in integrating improvement initiatives and transitioning from SW-CMM to CMMI
Background

P-3C Maritime Surveillance Aircraft Software Support Activity

- Integrate new capabilities into the Navy’s land-based, long range P-3C anti-submarine warfare patrol aircraft

- Primarily perform software maintenance and enhancements
Process Improvement Goals

- Positively impact cost, schedule, quality
- Pursue credential as evidence of strong business practices
- Improve the work environment
- Apply High Performance Organization principles to improve MSA SSA’s leadership philosophy, culture and business processes
- Satisfy NAVAIRINST 5234.2 - Requires software intensive programs to initiate process improvement
MSA SSA Process Improvement Effort

- **November 04**
- **P-3C Maritime Surveillance Aircraft Software Support Activity**
- **Cleared for Public Release**

**HPO Process Improvement Group Kick-off**
- **February 2002**

**MSA SSA Process Improvement Effort**
- **May 2002**
- **PSP/TSP**

**Processes**
- **HPO**
- **Training**
- **Process Improvement Group Kick-off**
- **Documenting SSA Processes**
- **Defined Web Requirements**
- **Tools**
- **CMMI Level Rating**
- **CMM Level 4**
- **May 2004**

**Tools**
- **CM**
- **CMM Level 4**

**Process Action Teams (PATs)**
- **CM**

**Documented Web Requirements**
- **May 2004**

**Defined Web Requirements**
- **May 2004**

**Process Improvement Group Kick-off**
- **February 2002**

**Tools**
- **CM**

**CMMI Level Rating**
- **CMM Level 4**

**SCAMPI SM**
- **- Risk Management**
- **- Measurement & Analysis**
Reasons for Successful Improvement

- Strong Sr. Management commitment and support
- Developed a Process Improvement culture
  - Applied change management principles to gain and maintain buy-in from the team
- Used the Team Software Process (TSP) as a framework and tailored it as needed
- Used SEI Report TR-008 to determine how TSP completely or partially addressed the SW-CMM
- Assigned Process Action Teams (PATs) to form the organization’s standard process architecture (the Golden Process) and document processes for each phase of the product life-cycle based on the organization’s best practices
P-3C Maritime Surveillance Aircraft Software Support Activity
Golden Process
Applied Change Management Principles

- Used High Performance Organization (HPO) Methodologies to motivate the team and gear up for change
  - Mission Statement
  - Values Statement
  - Organizational Goals
  - Strategic Customer Value Analysis
- Built a coalition and shared decision-making
- Created an environment that encouraged individual and collective learning
- Maintained momentum
- Managed resistance patiently, but firmly
  - resistance to change occurs because people don’t understand it, they perceive it as a threat, or it’s forced on them

"People don't resist change. They resist being changed!"

~ Peter Senge
Developed a Process Improvement Culture

Launched a communications campaign

- Kept the team informed – Continued to remind them that Process Improvement is an integral part of their job
  - Pep talks from Sr. Management
  - Training
  - Posters
  - Newsletters
  - Team-building picnics
  - Logos
  - Contests
  - Process Improvement Group (PIG) Mascot

Process Improvement is hard work – do what you can to make it fun!

“We are what we repeatedly do. Excellence, then, is not an act, but a habit.”  ~ Aristotle
Process Improvement Group
MASCOT
Benefits of Using TSP

- Team communication has increased exponentially
  - Weekly TSP project meetings; monthly TSP project lead reports and meetings with Sr. Management create a collaborative work environment
- Team planning includes all stakeholders
- Outputs of the TSP launch constitute the project plans. No need to generate additional “shelf paper”
- By using historical data, teams estimate more accurately
Used TSP to Increase Performance

- Increased software engineering productivity
- Decreased defect density
- Improved schedule variance (6 months delay to 1 week delay to on time delivery)
- Increased ability to estimate costs
<table>
<thead>
<tr>
<th></th>
<th>A4.7.3 (Baseline)</th>
<th>ASQ-222 3.1</th>
<th>ASQ-227 3.1 **</th>
<th>Percent Change (Baseline)</th>
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<tr>
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<td>27,880</td>
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<td>Productivity (SLOCs/Hr)</td>
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<td>2.7</td>
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<td>Development Defects</td>
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<td>Test Defects (SPRs)</td>
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<td>69</td>
<td>12 ***</td>
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<tr>
<td>Defects per KSLOCs</td>
<td>4.6</td>
<td>2.1</td>
<td>1***</td>
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** Formal initiation of PSP/TSP process along with MSA specific processes.
*** Final build testing is incomplete, project number of test defects estimated to be 37 (1 per 1 KSLOCS)
**** Many requirements changes throughout program caused excessive replanning, dates meaningless
Used TSP to Accelerate to Level 4

- TSP satisfied approximately 90% of all Level 4 Key Practices

- Projects using TSP were performing Level 4 activities

- TSP measures were used for both process and product quality (size, time, defects, completion dates)
### TSP “Planned Quality”
Comes from the TSP “Quality Guide”

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<th>Measure</th>
<th>Goal</th>
<th>Comments</th>
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<td>Percent Defect Free (PDF)</td>
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<tr>
<td>Compile</td>
<td>&gt; 10%</td>
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<tr>
<td>Unit Test</td>
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<tr>
<td>Integration Test</td>
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<tr>
<td>System Test</td>
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<tr>
<td>Defects/KLOC:</td>
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<td>If not PSP trained, use 100 to 200.</td>
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<td>Total defects injected</td>
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<td>All defects</td>
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<td>All major defects (in source LOC)</td>
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<td>Defect Ratios</td>
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<td>Detailed design review defects/unit test defects</td>
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<td>All major defects (in source LOC)</td>
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<td>Code review defects/compile defects</td>
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<td>Development Time Ratios</td>
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<td>Code review/code time</td>
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<td>Requirements pages/hour</td>
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<tr>
<td>Code LOC/hour</td>
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<td>Logical LOC</td>
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How it All Comes Together

Set TSP Project Quality Goals

Record TSP Data

Review SumQ (Actual & Planned Quality) at Postmortems

Document and Update Organizational Quality Goals Based on Post-mortem Data

Use Maintained Organizational Quality Goals as Expected Goals for New Projects

What you are doing today  What you need for Level 4
Lessons Learned

- Develop a Process Improvement culture
- Keep the team informed and involved
- Use PSP/TSP and allow teams to tailor processes and templates based on what makes sense for them
- Recognize that not everyone needs to understand the model
  - Allow PATs to document what they do
  - Assign a process improvement lead to perform a gap analysis using the model and work with PATs to fill the gaps
- Ensure that PATs communicate early and often
- Network
- Create simple databases and spreadsheets to use for tracking training data, etc.
- Establish a central repository for process assets and institute standard nomenclatures for artifacts as early as possible
Transitioning to CMMI

- Review/revise
  - Mission
  - Values
  - Customer Needs
  - Goals
- Use SEI report to map TSP to CMMI (pending formal release)
- Perform a gap analysis and develop action plans for each PAT
  - Focusing first on areas not addressed in the CMM
- Address improvement opportunities noted in the CBA IPI
Contact Information

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QUESTIONS?