Lean, Six Sigma and CMMI…
Working Together to Achieve High Success

by:
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Redstone Arsenal, Alabama
Why Lean, Six Sigma and CMMI?

- AMC/DA directives
- Supports Software Engineering Process (SEP) Improvement
- Integrate and compliment one another
- Gives insight into reality
  - Data-based decision making
  - Measure variation
  - Know when to react
- Used for problem solving
Lean, Six Sigma and CMMI

- All are process improvement methodologies
- Lean focuses on speed, efficiency, and removing waste
- Six Sigma is aligned with precision and accuracy
- CMMI supports best practices for software development including risk reduction, increasing efficiency, and improving the overall quality of products and deliverables
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Organization Background

- Small, Federal organization (140 civilian/contractor)
- Achieved SW-CMM Level 2, August 2002
- Lean approach implemented, Feb 2005
- Achieved CMMI Level 2 and Capability Level 3 in 9 Process Areas rated, May 2007
- Working toward CMMI Level 3, Class A appraisal planned for Mar 2008
Lean Improvement Benefits

- VSM Conducted Feb 2005 resulting in 14 Kaizen events and many tasks
- Kaizen improvements yielded new Software Engineering Process (SEP) iterations
- Improved metrics – data driven management
- Eliminated unnecessary steps identified as wastes
- Provided customer’s first critical needs faster
- Test driven approach focused on FTQ
- Improved workload/workflow management/staffing
- Better communication through teaming
- Reduced backlog
The SEP processes have been rolled out incrementally by versions since June 2005. SEP Implementations were:

- June 2005, Version 5 (Interim)
- December 2005, Version 6 (Loop 1 Rollout)
- February 2006, Version 6.1
- February 2006, Version 6.2
- March 2006, Version 7 (Loop 2 Rollout)
- July 2006, Version 8
- August 2006, Version 9
- September 2006, Version 10 (Loop 3 Rollout)
- November 2006, Version 10.1
- January 2007, Version 11.0
- February 2007, Version 11.1
- April 2007, Version 11.2
- August 2007, Version 11.3
- October 2007, Version 12.0 (CMMI ML3 Remaining Process Rollout)
## VSM Projected/Actual Results

<table>
<thead>
<tr>
<th>Category</th>
<th>Metric</th>
<th>Current State Baseline</th>
<th>Future State Projected</th>
<th>FY06</th>
<th>FY07</th>
</tr>
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<tbody>
<tr>
<td><strong>Flow</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # Jobs/yr</td>
<td>25</td>
<td>&gt; 50</td>
<td></td>
<td>33</td>
<td>47</td>
</tr>
<tr>
<td>Tot # AKO pgs</td>
<td></td>
<td></td>
<td></td>
<td>27</td>
<td>12</td>
</tr>
<tr>
<td>Backlog</td>
<td>21 CRs</td>
<td>&lt; 10</td>
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<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Lead Time</td>
<td>374 days</td>
<td>&lt; 90 days</td>
<td>Changed goal &lt; 105 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>165</td>
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<td>138</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(G6 Ready for Production)</td>
<td></td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Phases-Loops</td>
<td>9</td>
<td>4</td>
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<tr>
<td># Activities</td>
<td>63</td>
<td>24</td>
<td>22</td>
<td>22</td>
<td>22</td>
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<tr>
<td># Approvals</td>
<td>65</td>
<td>18</td>
<td>7</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td># Documents</td>
<td>25</td>
<td>11</td>
<td>8</td>
<td>8</td>
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</tr>
<tr>
<td><strong>Process Maturity</strong></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>CMM/CMMI Level</td>
<td>2 (CMM)</td>
<td>3 (CMMI)</td>
<td>2 (CMM)</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2(CMMI)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL3 in 9 Process Areas</td>
<td></td>
</tr>
<tr>
<td>DA Compliance</td>
<td>TBD</td>
<td>100%</td>
<td>100% FISMA, AR 70-1, etc*</td>
<td>100% FISMA, AR 70-1, etc*</td>
<td>100%</td>
</tr>
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</table>
## FY 08 Projected Events

<table>
<thead>
<tr>
<th>Event</th>
<th>FY08 Projected</th>
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<tbody>
<tr>
<td><strong>Assessments</strong></td>
<td>SCAMPI-C (November)</td>
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<tr>
<td></td>
<td>SCAMPI-B (January)</td>
</tr>
<tr>
<td></td>
<td>SCAMPI-A (March)</td>
</tr>
<tr>
<td><strong>Value Stream Maps/SEP Readiness Reviews</strong></td>
<td>1 – VSM (May)</td>
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<tr>
<td><strong>Kaizen Events</strong></td>
<td>1 - Workplace Organization</td>
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<tr>
<td></td>
<td>5 – Projected from VSM</td>
</tr>
<tr>
<td><strong>Town Hall Meetings</strong></td>
<td>Jan – SCAMPI B Results</td>
</tr>
<tr>
<td></td>
<td>Mar – SCAMPI A Results</td>
</tr>
<tr>
<td></td>
<td>3rd Qtr – SEP Version 12.2 Rollout</td>
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<tr>
<td><strong>Training</strong></td>
<td>1 – Risk Management</td>
</tr>
<tr>
<td></td>
<td>1 – Functionality Test Cases</td>
</tr>
<tr>
<td></td>
<td>1 – CMMI v1.2 training</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>20</td>
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</table>
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Value Stream Map

CIC Software Engineering Process (SEP) Future State Map
31 Jan – 3 Feb 2005

Legend

Value Added Activity
Non-Value Added Activity
In-process
Pilot Program
Process
Analyze
Output

Planning Phase

POE Approve

Design and Development Phase

CIC SWP

Supporting Working Group

Scheduling Board

Assessment Panel

Customer Approve Schedule

Final Review

Design CDR

Value Add Code & Test

Design Peer Review

CDR

Design CDR

Value Add Code & Test

Design Peer Review

Implementation Phase

Perform Audit

Process

Value Add Activity

Non-Value Add Activity

Note: Does not include closeout Loop

Loop 1

Loop 2

Loop 5 (Across Value Stream)

Loop 6

11/15/2007
Lean CMMI Benefits

- Repeatable, standard process for the organization
- Reduction of defects through Peer Reviews
- Improved planning activities
- Improved testing activities
- Better management insight into products
- Improved communication through Process Configuration Control Board – Peer Groups
- Adherence to process with improved PPQA process
- Improved metrics – data driven decision making
Six Sigma Benefits

- Improved measurement process
- Manage and make decisions by the data
- Controls in place to maintain improvements
- Know when to react
Six Sigma Black Belt Project

- **Goals**
  - Reduce Loop Lead Time by 10%
  - Reduce Lead Time for Loops 0-1 from 113 days to less than 100
  - Increase meeting Customer Negotiated Delivery Date by 10%
  - Increase number of jobs delivered by 3 during the FY

- **Projected Cost Savings**
  - Job average calculated ~ $51,484
  - Increase productivity by 3 jobs each year
  - Savings of $154,451 annually

Do more with less!
Average Lead Time for FY07 Jobs

* Requirements and Customer Acceptance states rely heavily upon customer involvement

** Began capturing Planning Lead Time in April 2007
DMAIC Methodology

Define ➔ Measure ➔ Analyze ➔ Improve ➔ Control

Structured, data-based, problem-solving process

– Specific activities in specific sequence
– Gathering data to facilitate decision making
– Using problem solving techniques to ensure elimination of the problem
• Develop the charter
• Review existing data related to problem
• Draft a high level process map
• Create plan and guidelines (scope, how to measure success)
• Heart of what makes LSS work
• Evaluate existing measurement system
• Observe the process
• Gather data
• Map the process in more depth
• Use data to confirm source of delays, waste, and poor quality
• Stick to the data
• Look for patterns
• Find root causes
• Identify the most critical factors to control
• Make changes that eliminate waste, reduce costs, and are tied to goals
• Identify a range of possible solutions
• Review Best Practices
• Develop criteria for selecting solutions
• Pilot or simulate solution
• Plan for implementation
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- **Purpose**: make sure the changes will last
- **Document new, improved process**
- **Conduct training to the workforce**
- **Implement the change**

Diagram:

1. Define
2. Measure
3. Analyze
4. Improve
5. Control
Summary

• Lean, Six Sigma, and CMMI work together for success
  – Improved Quality
  – Data based decision making
  – Maintain improvements
  – Repeatable process that is standard across organization
Questions?