The Road to Lean CMMI in a Small Federal Organization

Susan Bassham

Command Data/Applications Support (Business Area)
Application Information Processes
Agenda

- About Us
- CMMI Status
- Terminology
- Construction Detours
  - Changes
  - Goals
- Navigation
  - Road Map
    - Lean/Six Sigma
  - New Direction
    - Lean CMMI
- Repairs Along the Bumpy Road
- Current Points of Interest
- Future Destination
About Us

• Small Government Software Development Organization (70 government & 70 contractor employees)

• Develop business applications in support of aviation and missile mission

• Software products consist of web based applications, support of AKO fielded websites, mainframe sustainment
CMMI Status

- Currently assessed at SW-CMM Level 2
- Implemented Lean CMMI activities
- CMMI Appraisals Conducted
  - Class C
  - Class B
- Preparing for SCAMPI A Appraisal in early next year
Terminology


- **Kaizen** – Japanese word meaning “take apart and make better,” a standardized approach to problem solving.

- **Lean** – concept that focuses on improving customer value by removing the 8 deadly wastes: waiting, underutilized people, defects, extra processing, transportation, motion, inventory, over processing.

- **Lead Time (LT)** – Total flow days from customer order to receipt of full order.

- **Cycle Time (CT)** – hands-on touch time without wastes.
Construction Detours
Barriers

• Worked toward SW-CMM Level 3
  – Technical Working Groups
    • Started and stopped
    • Developed additional documentation
  – Piloted the Level 3 processes
    • Little buy-in
    • Duplication
    • Frustrated employees

• Lengthy development cycle for large products
  – Average delivery 374 days
  – High defect rate
  – Process took too long

• Attempted to define process for multiple project types
  – Urgent, small products
  – Larger products
  – COTS products
While we detoured…

Things were changing
Lean/Six Sigma

• Army Materiel Command (AMC) embraced Lean/Six Sigma and directed adoption by Subordinate Commands
• AMCOM Leadership required continuous improvement using Lean/Six Sigma Tools
• Conducted Value Stream Map in Feb 2005
  – Identified current wastes, delays, duplication
  – Refocused teams on a long term ideal state
  – Developed a near term future state (chunking approach)
Why Change?

- Software Engineering Process (SEP) needed improvements
  - Too complex
  - Duplication across documentation
  - Took too long to complete, especially for small products
  - Delayed product delivery
- Sunset of the SW-CMM
- Keep/increase customer base
- Better utilize our resources
- Improve morale
Goals

- Level the workload and share resources to accommodate increasing demands
- Provide first time quality
- On time delivery
- Reduce lead time
- Standard, easy to follow Map
  - Streamline
  - Eliminate duplication
- Collect valuable metrics – Visual at a Glance
- Improve customer and employee satisfaction
- Improve communication within the organization
- Achieve CMMI maturity level
Navigation with a Map and New Direction
Value Stream Map
Software Engineering Process (SEP)

• Loop 0 – Concept Definitions and Product Requirements
• Loop 1 – Job Planning and Analysis
• Loop 2 – Design and Development
• Loop 3 – Implementation and Test
Lean: The Roadmap

Value Stream Map Event

– Implementation Plan
  • Kaizens, Projects, Tasks

– Insight into Lean Concepts
  • Reduce wastes
  • Eliminate delays and unnecessary approvals
  • Focus on flow
New CMMI Direction

• Performed initial Gap Analysis with Class C
• Trained employees, supervisors, and champions on Intro to CMMI Version 1.1
• Developed first cut at a Lean(er) SEP
• Created Milestone Schedule for future appraisals and process releases
• Conducted Class Bs on ML 2 Process Areas
  – Identified deficiencies
  – Held Kaizen events to address weaknesses
Business Objectives
(used for appraisal focus)

• Develop lean CMMI software development capability to better respond to customer
• Improve product quality
• Improve process quality
• Increase productivity
Repairs Along the Bumpy Road
Lean Events

- Conducted VSM 31 Jan – 4 Feb 05
- Held 26 Lean Events during 05 and 06
- Employees empowered to make decisions and quick changes
- Briefed PCCB (formerly known as SEPG) at end of each event
  - Make decisions real-time
  - Accept, reject, modify proposed process changes
  - Reduce delays in implementation
SEP Version Releases

Incremental Implementations:
• Jun 05, Version 5 (Interim)
• Dec 05, Version 6 (Loop 1 Rollout)
• Feb 06, Version 6.1
• Feb 06, Version 6.2
• Mar 06, Version 7 (Loop 2 Rollout)
• Jul 06, Version 8
• Aug 06, Version 9
• Sep 06, Version 10 (Loop 3 Rollout)
• Nov 06, Version 10.1
Celebrations Along the Way

An Afternoon at the OSCARS

Kickoff

Final Frontier

Dec 05 Rollout
Improvements

• Changed Terminology
  – Process to Value Stream
  – Phase to Loop
  – SEPG to PCCB
  – Project to Product

• Introduced Lean Thinking
  – Faster, incremental releases
  – Test driven approach
  – Quality built in from the start
  – Better teaming
Supervisor’s Working Group (SWG)

• Both Government and Contractor Reps
• Develop Enterprise Plans for customers
• Meet weekly to balance the workload and staff jobs
• Record Lead Time status per job
Process Configuration Control Board (PCCB)

- Membership from each role (Champion, SWG, TL, SPL, LAD, QE/Tester, CM/IA)
- Communicate Value Stream Map changes to peers
- Facilitate buy-in throughout the organization
- Approve SEP Change Requests and manage SEP Version Releases
- Assist in training the workforce
## Changed Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Baseline</th>
<th>New Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead Time</td>
<td>374 days</td>
<td>105 days</td>
</tr>
<tr>
<td>Phases</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td># Activities</td>
<td>63</td>
<td>22</td>
</tr>
<tr>
<td># Documents</td>
<td>25</td>
<td>0 (Collect data)</td>
</tr>
<tr>
<td># Approvals</td>
<td>65</td>
<td>6</td>
</tr>
</tbody>
</table>
Lessons Learned

• People resist change – prepare for CAVE people
• Focus – minimal task switching
• Collect measurements often, check against goals
• Visual status boards help manage workload
• Pros/Cons to Interim Rollouts
• Peer Groups – key to successful continuous improvement
• Teaming with Wagon Wheel approach
• “Test-First” Approach reduces defects
Standardization: What’s in it for me?

- Makes decision-making easier!
- Reduces errors, defects, rework, cost!
- Improves quality and customer satisfaction!
- Reduces frustration!
- Is the baseline for improvement! (no standardization, no systematic improvement!)

Standardization is key to teamwork!
Current Focus
Visual Management

Reduce wastes of searching, defects, waiting:
• Visual graphical flow for each Loop
• Visual Online Help with drilldown
• Step by step checklists by activity and role
**CIO-G6 Software Engineering Process (SEP)**

**Loop 0: Concept Definition & Product Requirements**

**Goal**: 30 days

**29 September 2006**

---

**Customer** - Answer questions and identify risks.
- TL - Lead activity, conduct top-level design, and product estimation.
- SPL - Create prototypes, create process standards.
- LAD - Lead analysis, ensure feasibility, and identify risks.
- SLIM - Lead analysis, design documentation, and identify risks.
- CMIA - Monitoring, lead analysis, and identify risks.
- GETester - Monitor process, identify opportunities to improve, and provide feedback to the product team (PT).

**Customer** - Review requirements.
- TL - Lead activity, conduct top-level design, and product estimation.
- SPL - Create prototypes, create process standards.
- LAD - Lead analysis, ensure feasibility, and identify risks.
- CMIA - Monitoring, lead analysis, and identify risks.
- GETester - Monitor process, identify opportunities to improve, and provide feedback to the product team (PT).

---

**Exit Criteria**
- VOI of customer
- Scope/Description of requirements
- Problem statement
- Current environment
- Key stakeholders
- Key decision drivers
- Customer references, comments, definitions, and recommendations
- Customer responsibilities
- Risks

**Risk Management Process**
- **Identifying risks**
  - Analyze/plan risks (mitigation)
  - Link mitigation to requirement (create new requirement)
- **Peer review**
  - Determine/review probability, loss, and exposure for risks (metrics)
  - Validate requirements/Risks
- **Track, manage, and control risks as new risks and/or requirements are identified**
  - Follow change management process
  - Report/communicate risk scores as necessary when and if elevated.
Loop 1 SEP VSM
Loop 2 SEP VSM
Loop 3 SEP VSM

Loop 3: Implementation and Test
Goal is 30 days
29 September 2006

Final Dataset on Job
- Hours and Cost
- Code Storage
- Scripts
- Completed Customer Survey
- LT
- Signed ASEC
- Defects by Loop/Activity
- OTD
- Cust. Product Acceptance
- Customer Job Acceptance
- # Trained
- Compliance Data – CM, QA, IA
- Lessons Learned
- Testimonials/Kudos

21. Registration
- Record LPS, or ASEC Report into APMS
- ASEC
- Approved
- Product
- LAD
- Support Demo
- CM/IA
- Update SLIM, Manage Closeout
- Generate QACR
- SWG – Update Enterprise Plan

21. Move to Production
- Re-compile
- Publish Final
- User Doc
- Notify WW that product moved to production
- # Process Deviations
- # Product Defects
- # Customer Acceptance Case Defects
- # Exceptions Delivered

22. Finalize Job
- Store Code
- Update data (In SPP)
- Collect, Analyze, Report:
- Customer Satisfaction – LT
- Qualify – OTD
- Baseline the product
- Lessons Learned
- End Job

Exit Criteria: Available Working Approved Product
Exit Criteria: Customer Tested & Staged Product ready for Training
Accept in SYNERGY/Change Audit Findings Report Tests - Acceptance Cases - Security - Integration

19. Customer - Final Acceptance
Schedule training Conduct Training

18. IPR (Optional)
Product Demo
Ensure test readiness
Required participants:
- TL
- CM/IA
- QA
- SP
- Metrics Plan
- CMMI
- DOIM
- SWG
- NDIACMMI Conf-S.Bassham, Oct06
Lean Internal Training

• Continuously improve
  – Add, Change, Modify, Delete
  – Innovative deliveries and celebrations
    • Rollout Celebrations
    • SEP Fair

• Provide high level overview

• Specialized Peer Group training sessions
  – Hands on tools
  – Simulate!
  – Role expertise
Future Steps on Our Lean Journey
Visual Status “at a Glance”

• Visual Management using metrics data
  – Enables better decision making
  – Insight into opportunities to improve
  – Allows monitoring of lead time and other metrics

• Dashboard concept
  – Data at your fingertips
  – Information for all roles
  – Meet the needs of managers and data calls
Continuous Improvement!

• Utilize Lean/Six Sigma Tools
  – Apply creative problem solving
  – Put SEP controls in place
  – Measure results

• Lean CMMI
  – Enhance business/management processes
  – Standardize
  – Improve Customer Satisfaction (product and SEP)
  – Plan/prep for Level 3-4 appraisals
Questions?
Contact Information

Susan T. Bassham
susan.bassham@redstone.army.mil
Glossary

- **PCCB** - A collection of specialists from each role including management who facilitate the definition, maintenance, and improvement of the process(es) used by the organization.
- **SWG** - An authorized group within the organization that balances the workload across the organization; provides product tracking and oversight; and assists in the implementation, sustainment and continuous improvement of the Software Engineering Process.
- **TL** - Leadership role on the Product Team who is responsible for Loop 0 (Concept Definition & Product Requirements) and ensuring the success of software product development.
- **SPL** - Technical leadership role on the Product and Development Team responsible for success of software product development.
- **LAD** - Leadership role on the Product and Development Team who is responsible for design and development of the software product.
- **QE/Tester** – Technical role on the Product and Development Team who is responsible for Quality Assurance and Testing activities during the software product development.
- **CM/IA** – Technical role on the Product Team who is responsible for Configuration Management and Information Assurance activities during the software product development.