Rapidly Implementing Lean CMMI® Processes That Meet Business Needs
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“I have made this letter longer than usual because I lack the time to make it shorter.”

Blaise Pascal
Presentation Objectives

Present an overview of lean and lean principles.

Describe some 21st century business needs.

Describe some lean CMMI® success stories.

Describe aggressive lean approaches to implement CMMI® Processes that meet business needs.

Discuss how to define lean processes.

Describe some lean measurable results.

Outline

Business Needs

Some Lean Success Stories

Lean Principles

Lean CMMI Processes

Some Rapid CMMI Approaches

Summary
Best-In-Class Benchmarks

<table>
<thead>
<tr>
<th>MEASUREMENT</th>
<th>WORLD-CLASS BENCHMARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs of Poor Quality (COPQ)</td>
<td>Reduced from ~33% to ~15% (e.g., cut COPQ in half in 3-5 years)</td>
</tr>
<tr>
<td>Defect Removal Efficiency</td>
<td>70-90% defect removal before test</td>
</tr>
<tr>
<td>Post-Release Defect Rate</td>
<td>Six Sigma (i.e., 3.4 Defects Per Million)</td>
</tr>
<tr>
<td>Productivity</td>
<td>Doubled (e.g., in 5 years at ~20% a year)</td>
</tr>
<tr>
<td>Return on Investment</td>
<td>7:1 - 12:1 ROI</td>
</tr>
<tr>
<td>Schedule / Cycle Time</td>
<td>Reduced by 10-15% (e.g., per year)</td>
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21st Century Business Needs

The usual business needs (e.g., “time and money”):
- Save Money (e.g., ROI)
- Reduce Cycle Time
- Improve Quality
- Improve Performance (e.g., CPI, SPI)
- Improve Productivity

New 21st Century business needs (e.g., Baldrige):
- Agility, Lean, etc.
- Architectures and Models
- Innovation, Diversity, etc.
- Reuse
- Special Topics: Reliability, Safety, Security, etc.
Learning from CMMI Efforts

For successful organizations, the average time to achieve CMMI Maturity Levels is about 2 years a level.

The cost of achieving CMMI Maturity Levels is too high, and the cost of appraisals is too high.

Major problems reported from CMMI Maturity Level 3-5 organizations are:
- CMMI processes usually aren’t lean
- Can lose money on small projects
- Professionals not liking processes (e.g., usability problems)

21st Century CMMI Needs

Agile CMMI Process
Innovative CMMI Processes
Lean CMMI Process
Architecture Based Engineering
Model Based Engineering
Dramatically Improved Reuse
Special Topics: Reliability, Safety, Security, etc.
Example Lean CMMI

Reaching CMMI Maturity Levels in 1 year (or less) instead of 2 years.

Reaching CMMI Maturity Levels for 25-50% of the cost of a typical CMMI effort.

Lean CMMI Process (20-25% of the typical size; Visual; More Usable).

Agile CMMI Processes (e.g., 30 day builds).

Innovative CMMI Processes (e.g., new products).

Architecture and Model Based Processes.

Dramatically Improved Reuse (process and product).

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What is Lean?

Lean has its roots in quality and manufacturing, and is a recent popular movement in quality.

“Lean Production” is the name for the Toyota Lean Production System.

The following are major lean references (see references in back of presentation for full references):

- “The Machine That Changed The World”
- “Learning to See”
- “The Toyota Way”
- “The Toyota Product Development System”
- “Lean Thinking”

Some Lean Success Stories

Toyota - Best lean documented success story in industry (from manufacturing - see references). Number 1 automobile manufacturer in the world, most quality awards, number 1 market share in the world, highest revenue per employee, etc.

Hewlett Packard - a CMMI success story for software. 25% of the size of a typical CMMI implementation!!!

Lean Early Defect Detection - Averages 7:1 ROI!
HP Lean CMMI Success

**Reduced Time:** A small unit of HP implemented CMMI Maturity Level 3 in about 7 months (an average 4 year effort).

**Reduced Money:** Cost of about 30-50% of typical cost.

**Reduced Size:** The lean HP Maturity Level 3 process is about 20-25% of the size of the HP India Process (or a typical CMMI Maturity Level 3 process).

More Lean CMMI Successes

According to LSI data, the number one compliant from CMMI Maturity Level 3-5 companies is that their process is “not lean”.

LSI has many lean success stories. What are typical Lean CMMI Results?

- Processes are 20-25% of the size, and are more visual and usable.

- CMMI Maturity Levels reached in half of the average time (average 1 year instead of 2 years per level).

- 33-50% of the average cost.
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Some Lean Principles - (1)

Establish customer defined value (i.e., identify the “value stream”). Process = “value”.

Continuously eliminate non-value added activities (e.g., waste, rework, defects).

Use leadership and standardization to create a lean culture.

Align your organization through visual communication.

Create an optimized process flow (e.g., “Flow”, “Pull”, “Just-In-Time”, “Leveled”).
Some Lean Principles - (2)

Use lean metrics to manage the value stream.

Front-Load the process for maximum design space.

Build a learning organization to achieve lean and continuous improvement.

Adapt technology to fit your people and processes.

Strive for perfection through continuous improvement.

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Common Process Problems

**Too Big**: Processes become too large and complex

**Poor Usability**: Not “fit for use” by process users. Many processes contain mixed information types

**Poor Design**: Process documentation usually violates good definition and writing principles

**Not Visual**: Processes need to be defined by well thought out diagrams, pictures, or models

**Defined Sequentially**: Processes are not novels

**Shelfware or Unused Webware**: Unused processes

Why Lean Processes?

**Reduce Cost, Schedule, and Size**: Lean processes are shorter, cost less, and take less time to use.

**Better Usability**: Lean processes are more usable (require defining “chunks” and labeling them for use).

**Better Designs**: Lean processes require good process design, definition, and writing principles.

**Visual Diagrams**: Lean processes are “visual” (e.g., well thought out diagrams or “lean process models”).

**Defined Non-Linearly**: Designed to find something fast. Lean process models are dynamic and concurrent.
Guidelines for Lean Processes

Chunk steps (7 plus or minus 2) into usage scenarios (e.g., plan, control, improve, engineer).

Use process modeling and best practices (e.g., procedures, standards) to select the best chunks.

Question every step of the process.

Remove “non-value added” steps.

Combine similar steps.

Refine steps to be short and usable.

Lean Framework

- **POLICIES**
  - “Laws” or “principles” that govern operations

- **STANDARDS**
  - “Operational definitions” for work products

- **PROCESSES**
  - “What happens over time” to build products

- **PROCEDURES**
  - “How to” or step by step instructions

- **TRAINING**
  - Provides the needed knowledge and skills

- **TOOLS**
  - Supports and automates operations

*Slide adapted from “A Software Process Framework for the SEI Capability Maturity Model”, Olson, Timothy G., et al, CMU/SEI-94-HB-01*
Key Process Questions

<table>
<thead>
<tr>
<th>Key Process Question</th>
<th>Process Element</th>
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</thead>
<tbody>
<tr>
<td>Why is the activity performed?</td>
<td>1. Purpose</td>
</tr>
<tr>
<td>Who does what activity?</td>
<td>2. Role(s)</td>
</tr>
<tr>
<td>What work products are used?</td>
<td>3. Input(s)</td>
</tr>
<tr>
<td>What work products are produced?</td>
<td>4. Output(s)</td>
</tr>
<tr>
<td>When does the activity begin?</td>
<td>5. Entry criteria</td>
</tr>
<tr>
<td>When does the activity end?</td>
<td>6. Exit criteria</td>
</tr>
<tr>
<td>Where is activity performed?</td>
<td>7. Context (e.g., hierarchy)</td>
</tr>
<tr>
<td>What activities are performed?</td>
<td>8. Activities</td>
</tr>
<tr>
<td>How is the activity implemented?</td>
<td>9. Procedure</td>
</tr>
</tbody>
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Process Definition Modes

**Beginner Mode (Not Lean):**
- Assumes user has little or no experience
- Includes training material
- Includes process guidance and lessons learned

**Intermediate Mode (Lean):**
- Assumes user has some experience with process
- Includes process guidance and lessons learned

**Expert Mode (Very Lean):**
- Assumes user is very experienced
- Concise and precise as possible

**All Modes should be “Chunked” and Include:**
- Process models, checklists, forms, and tables
- Pointers to detailed explanations
**Value Stream Mapping**

- Define the product/service process to map.
- Define the current value stream map.
- Define the future value stream map.
- Implement the work plan (i.e., future state)

**Manual Flow Information**

(Example Notations)

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**Process Models**

Value Stream Mapping (VSM) is a lean best practice (primarily in manufacturing).

However, VSM currently lacks mature tool support.

Process Modeling can implement VSM, scales up to complex systems, and has automated tool support.

LSI has a lean patent pending process modeling approach that puts the 5 W’s on one page in a diagram.

Please see handout for example process model and success stories at NASA.
Example Lean CM Process

7.1 Perform CM Planning
7.2 Perform Configuration Control
7.3 Perform Configuration Status Accounting
7.4 Perform CM Audits

Example Plan CM Process

5 W's on 1 Page in a Process Model

Patent Pending Approach
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Some Rapid CMMI Approaches

“Lean out” current processes.

Design a path for “small, low risk” projects.

License and tailor lean existing lean processes.

Used “pre-defined” tailoring.

Used “Staged Implementation” instead of piloting.

Achieve a CMMI Maturity Level in 1 year instead of 2 years.
What to Lean Out?

SEI IDEAL\textsuperscript{SM} Model for Process Improvement

- Stimulus for Improvement
- Set Context & Establish Sponsorship
- Establish Improvement Infrastructure
- Appraise & Characterize Current Practice
- Develop Recommendations & Document Phase Results
- Set Strategy & Priorities
- Document & Analyze Lessons
- Establish Process Action Teams & Plan Actions
- Define Processes & Measures
- Plan & Execute Pilots
- Plan, Execute & Track Installation
- Act

Leveraging

- Revise Organizational Approach
- Revise Organizational Approach

Initiating

Diagnosing

Establishing

- Set Context & Establish Sponsorship
- Establish Improvement Infrastructure
- Appraise & Characterize Current Practice
- Develop Recommendations & Document Phase Results
- Set Strategy & Priorities

NOTES:
- Definition Phase can be eliminated or reduced with pre-existing Lean CMMI Compliant processes.
- Pilot Phase can be eliminated or reduced with “Staged Implementation”
- Implementation Phase CANNOT be reduced.

“Lean Out” the “Acting” Stage

SEI IDEAL Model “Acting Stage”

Definition Phase 6 Months

Piloting Phase 6 Months

Implementation Phase 6 Months

NOTES:
- Definition Phase can be eliminated or reduced with pre-existing Lean CMMI Compliant processes.
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World-Class Quality

Rapid Lean 7:1 ROI Strategy: Early Defect Removal


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**Lean Organizations:**
- Achieve measurable results (e.g., 7:1 ROI)
- Define customer value (i.e., the “value stream”)
- Process = “Value Added”
- Remove non-value added (i.e., waste)
- Visualize the process
- Optimize process flow
- Manage the process with lean metrics
- Create and sustain a lean culture
- Build a lean learning organization
- Adapt technology to fit people and processes
- Strive for perfection through continuous improvement

Some Lean References

- Olson, Timothy G., “How to Define Lean Processes that are CMMI Compliant”, Tutorial, NDIA CMMI Conference, 2006.
- Rother, Mike and Shok, John. Learning to See, Brookline, Mass.:Lean Enterprise Institute, 1998.