Rapidly Implementing Lean CMMI® Processes That Meet Business Needs

NDIA CMMI Conference - November 19, 2009

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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.

CMMI is a registered trademark in the US Copyright and Patent Office by Carnegie Melon University.

Outline

Business Needs

Some Lean Success Stories

Lean Principles

Lean CMMI Processes

Some Rapid CMMI Approaches

Summary

Best-In-Class Benchmarks

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

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).

· Olson, Timothy G., Kellum, Julie, and Tufail,Zia., "Rapidly Defining a Lean CMMI Maturity Level 3 Process", Presentation, NDIA CMMI Conference, 2006.

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

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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.

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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.
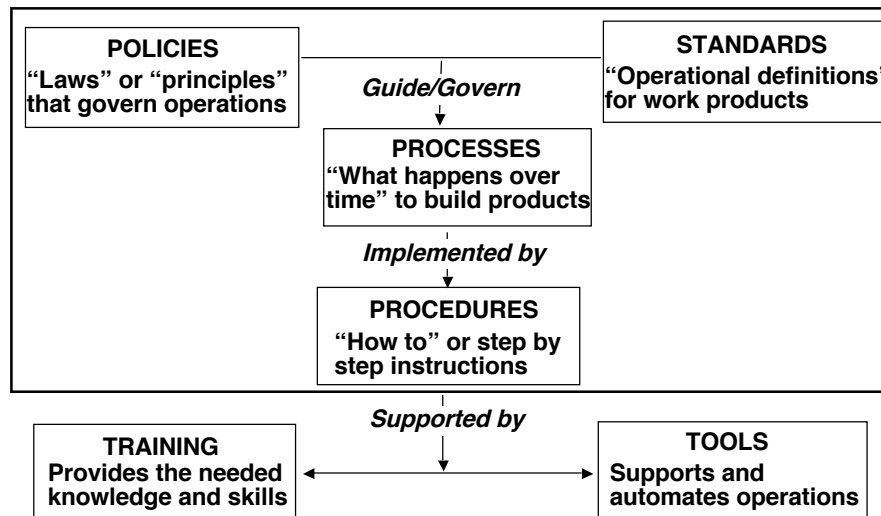
Question every step of the process.

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
	Guide/Govern ↓	
	PROCESSES "What happens over time" to build products	
	Implemented by	
	PROCEDURES "How to" or step by step instructions	

Supported by

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

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

• Slide adapted from "A Software Process Framework for the SEI Capability Maturity Model", Olson, Timothy G., et al, CMU/SEI-94-HB-01

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**
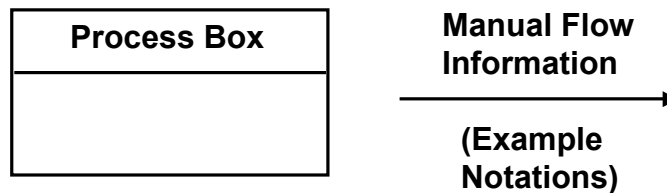- **Pointers to detailed explanations**

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)

Process Box

Manual Flow Information

→

(Example Notations)

· **Adapted from Keyte, Beau, and Locher, Drew.** *The Complete Lean Enterprise: Value Stream Mapping for Administrative and Office Processes*, **Productivity Press, New York, NY, 2004.**

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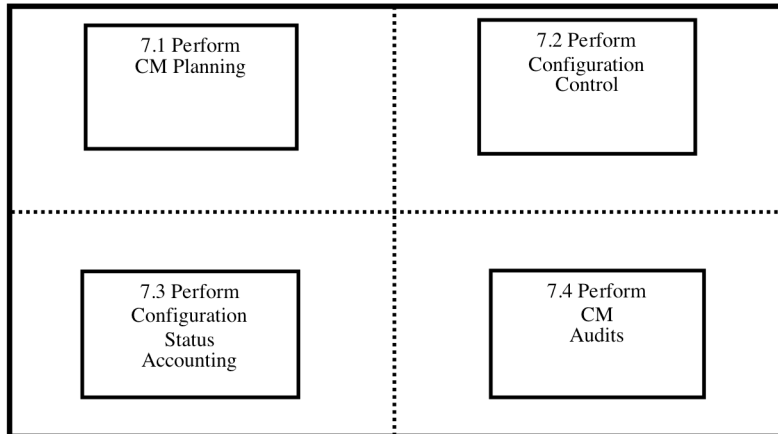
LSI has a lean patent pending process modeling approach that puts the 5 W's on one page in a diagram.

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

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Example Plan CM Process

5 W's on 1 Page in a Process Model

7.1 Perform CM Planning
PURPOSE: **Develop CM Plans that meet project needs.**

INPUTS/ENTRY CRITERIA:
CONTEXT
- **Project initiated AND Draft Project Plan**
- **Organizational CM Plan is approved and meets CM Standard.**

PROCESS

ROLES & ACTIVITIES:

Project Manager　　　CM Lead　　　QA

Start

7.1.1 Assign Project CM Plan to CM Lead

7.1.2 Develop Project CM Plan according to CM Plan Standard

7.1.3 Review Project CM Plan

Patent Pending Approach
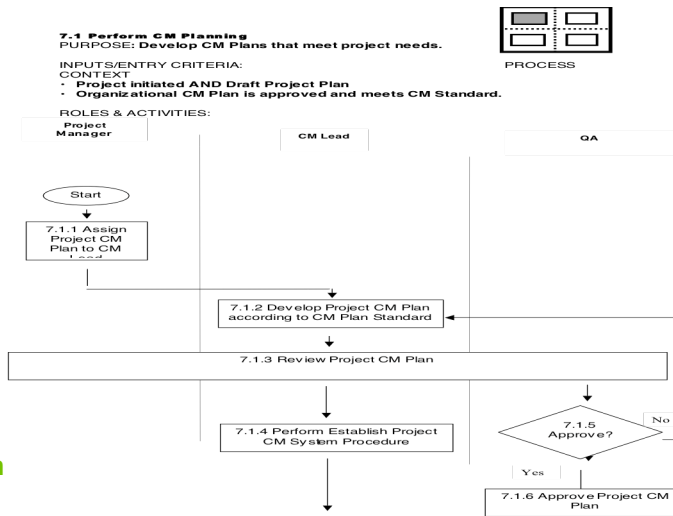
7.1.4 Perform Establish Project CM System Procedure

7.1.5 Approve?　No

Yes

7.1.6 Approve Project CM Plan

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Some Rapid CMMI Approaches

"Lean out" current processes.

Design a path for "small, low risk" projects.
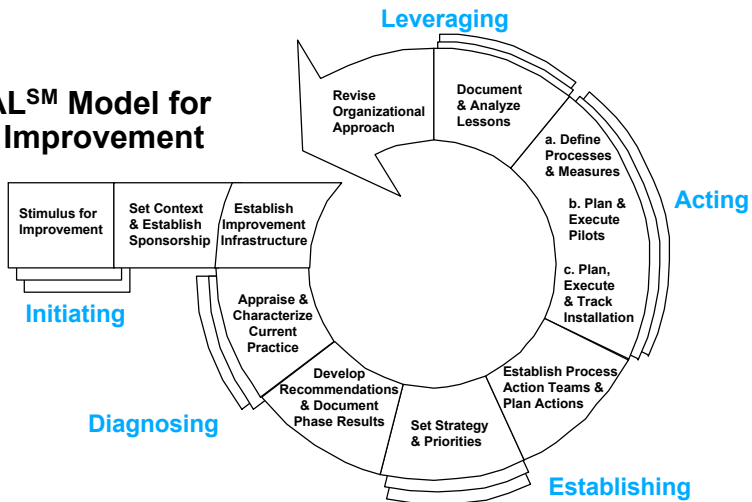
License and tailor lean existing lean processes.

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?

Leveraging

SEI IDEAL^{SM} Model for Process Improvement

Revise Organizational Approach

Document & Analyze Lessons

a. Define Processes & Measures

Acting

b. Plan & Execute Pilots

c. Plan, Execute & Track Installation

Stimulus for Improvement

Set Context & Establish Sponsorship

Establish Improvement Infrastructure

Initiating

Appraise & Characterize Current Practice

Develop Recommendations & Document Phase Results

Establish Process Action Teams & Plan Actions

Diagnosing

Set Strategy & Priorities

Establishing

• **IDEAL is a service mark of Carnegie Mellon University; Slide adapted from Software Engineering Institute (SEI)**
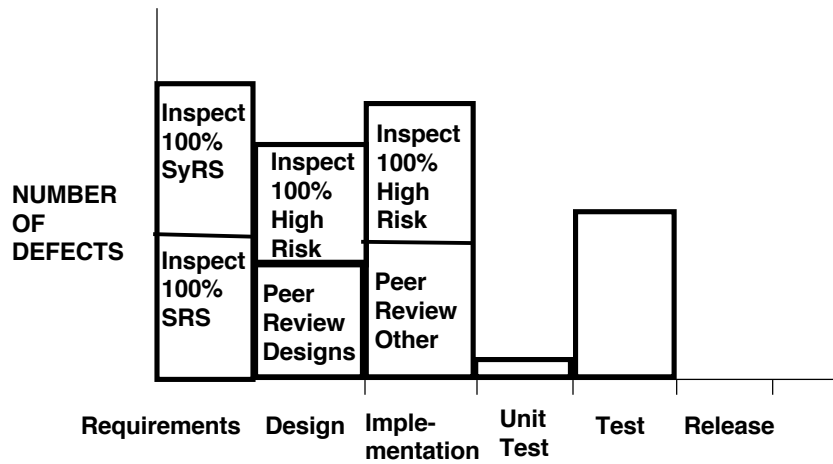

"Lean Out" the "Acting" Stage

SEI IDEAL Model "Acting Stage"

Definition Phase	→	Piloting Phase	→	Implementation Phase
6 Months		**6 Months**		**6 Months**
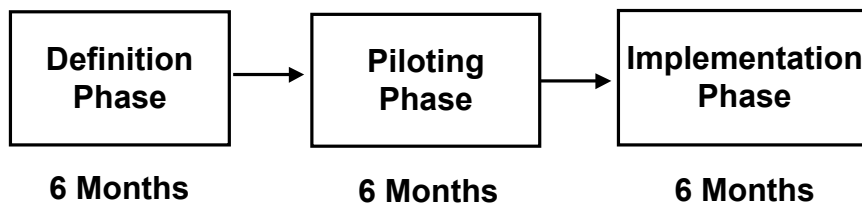
NOTES:
- **Definition Phase can be eliminated or reduced with pre-existing Lean CMMI Compliant processes.**
- **Pilot Phase can be eliminated or reduced with "Staged Implementation"**
- **Implementation Phase CANNOT be reduced.**

Rapid Lean 7:1 ROI Strategy: Early Defect Removal

NUMBER OF DEFECTS

Inspect 100% SyRS / Inspect 100% SRS	Inspect 100% High Risk / Peer Review Designs	Inspect 100% High Risk / Peer Review Other	Unit Test	Test	Release

Requirements | **Design** | **Imple-mentation** | **Unit Test** | **Test** | **Release**

- **Slide adapted from Olson, "A Software Quality Strategy for Demonstrating Early ROI", SSQ Journal, May 1995.**

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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

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