



World-Class Quality

Defining Lean Service and Maintenance Processes

NDIA CMMI Conference
November 2007

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World-Class Quality

Presentation Objectives

Provide motivation and principles for lean, maintenance, and service.

Describe Service/Maintenance in terms of “projects” and CMMI®.

Describe successful CMMI Tailoring for Service/Maintenance Organizations.

Answer any of your questions.

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Tailoring Project Management

Tailoring CM

Tailoring Engineering

Miscellaneous Tailoring

Questions and Answers



Lean Problems

Most organizations have too much waste (e.g., non-value added).

Most processes have too many “non-value added” steps.

How can organizations focus on “value added” and remove waste?

How can organizations measure value and waste?

Lean is a recent quality approach to help organizations focus on “value” and remove “non-value”.



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 (books):

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



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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Some Service/Maint. Successes

HP Success Story

- Lean CMMI® L3 Process 25% of the size of HP India Process
- Very Small Projects (0.25-0.5 FTE projects)
- Includes website development
- Includes maintenance/service
- See References [Kellum 2006]

Raytheon/NASA JPL Success Story

- Documented in SEI Report
- Tailored all CMMI L3 practices in report
- Only one customer (JPL) - Simple model
- See References

Numerous CMM Success Stories

- More and more CMMI service/maintenance success stories emerging

Draft CMMI® for Service

- Has not been released by SEI



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Project Management PAs

Project Planning (PP - L2)

Project Monitoring and Control (PMC - L2)

Integrated Project Management (IPM - L3)

–Tailoring

–Advanced Project Management

Risk Management (RSKM - L3)

Supplier Agreement Management (SAM - L2)

• Reference: "CMMISM for Systems Engineering and Software Engineering," CMMI-SE/SW Staged Version, Version 1.1

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Project Planning Goals

SG 1: Estimates of project planning parameters are established and maintained.

SG 2: A project plan is established and maintained as the basis for managing the project.

SG 3: Commitments to the project plan are established and maintained.

• Reference: "CMMISM for Systems Engineering and Software Engineering," CMMI-SE/SW Staged Version, Version 1.1

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Commitment Metrics

	COMMITs	Size	Effort	Cost	Schedule	Defects
Plate Full	1.					
	2.					
	3.					
	.					
	.					
	N					
Backlog	N+1					
	...					



Service/Maint. Principles

The CMMI is “project” oriented. In a Service/Maintenance organization, there may not even be a “project”.

The term “Project” may not work in your organization (“Project” definition: Start Date/End Date). This can be a major problem when interpreting the CMMI for Service/Maintenance.

Most of the time, there are a collection of activities that can be grouped together:

- Releases/Bundles
- Tasks/Service Requests
- Change Requests/Problem Reports
- Annual Plans (e.g., service, maintenance)



Example Service/Maint. Plans

Possible Equivalents to CMMI Project Plans:

- **Release Plan (e.g., Annual, Quarterly, Monthly)**
- **Task Plan (e.g., for a customer under a PO)**
- **Service Request**
- **Service Level Agreement (SLA)**
- **Annual CM Plan**
 - Change Requests(CRs)/Problem Reports (PRs)
- **Annual Plans (e.g., service, maintenance)**
 - Can have releases, CRs/PRs, Service Requests, Tasks



Service/Maint. PM Tailoring

**Don't change your business to match CMMI.
Improve your business to meet CMMI Goals.**

Use Lean Templates that implement CMMI requirements (combine items).

Put many of the CMMI requirements that don't change across tasks in annual plans (e.g., Scope, Data, Training, Risks, CM, etc.) The things that do change (e.g., estimates, schedule, etc.), make lean and tailor to tasks.

**Schedules can be very different (e.g., more focused on releases/CM than milestones).
Tracking can be done periodically (e.g., monthly),
and meetings may be combined.**



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The Customer and CM

Why perform CM?

If effective CM is not performed, the risk of shipping the wrong version to a customer is too high. For example, a version delivered to a customer might ...

- Have defects
- Have untested changes
- Not be reproducible

CM is all about “Product Integrity”:

- Knowing exactly what customers have
- Knowing the exact status of products, versions, baselines, configuration items (e.g., exactly what is in which version)
- Knowing how to reproduce every product, version, component, configuration item, etc.



CM Principles

Configuration Identification:

- What are configuration items, and what configuration does your customer have?

Configuration Control:

- How do I control changes made to the configuration?

Configuration Status Accounting:

- What is the current status of the configuration?

Configuration Auditing:

- Does the configuration have product integrity?

• Reference: "Configuration Management" Training; Copyright © by Process Assets, LLC (PAL).

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CMMI CM Goals

SG 1: Baselines of identified work products are established

SG 2: Changes to work products under configuration management are tracked and controlled

SG 3: Integrity of baselines is established and maintained

• Reference: *CMMI_{so} for Systems Engineering and Software Engineering, CMMI-SE/SW Staged Version, Version 1.1*

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Service CM Tailoring

What is the operational definition of a “project”?

How big does a “project” need to be before it can handle the overhead of the CMMI?

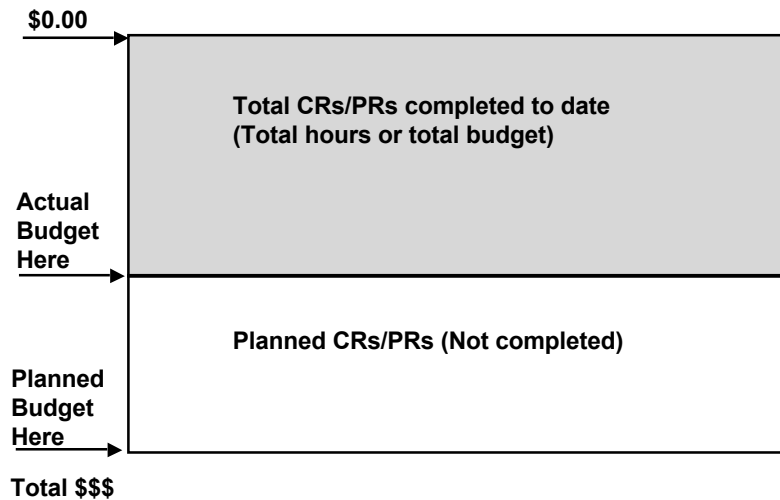
Small Change Requests (CRs) and Problem Reports (PRs) are what CM is all about.

How do you plan for interrupt driven CRs and PRs? (e.g., you know the customer will make changes and you know there will be defects)

Budget for CRs/PRs based on historical data in an Annual Plan.



Annual CM plan





Example Requirements Matrix

#	Requirement	Reference	Allocation	Stability (H/M/L)	Risk (H/M/L)	Priority (H/M/L)



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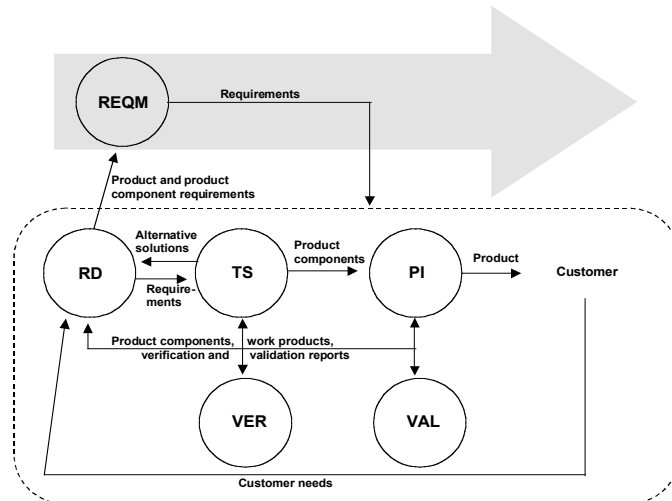
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Engineering Process Areas



• Reference: "CMMISM for Systems Engineering and Software Engineering.", CMMI-SE/SW Staged Version, Version 1.1

Tailoring Engineering

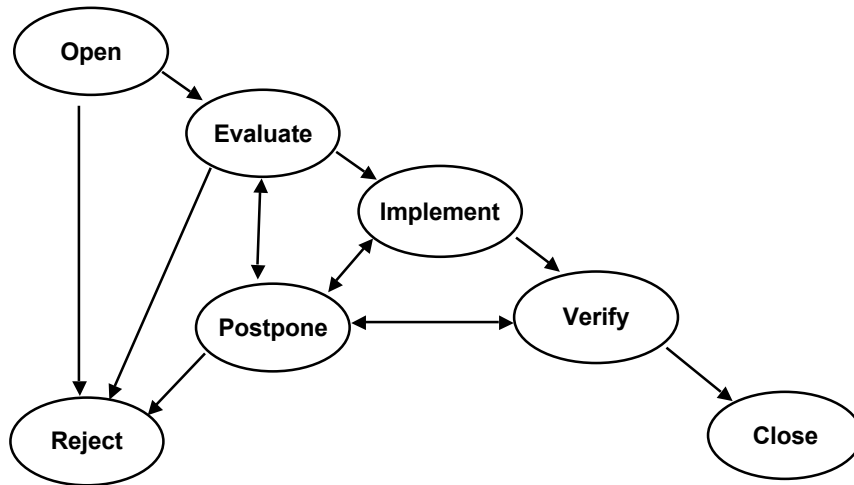
For large or medium projects (e.g., large tasks/service requests/change requests), the CMMI can be used effectively.

For small and very small stand-alone tasks, the CMMI engineering process areas have a lot of overhead. One solution is a "mini-spec".

For very small tasks, sometimes it is better to run them under CM as a CR/PR and not formally define them as a "project".

If desired, CM systems can be made to handle CMMI requirements.

Example CR/PR States



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Other CMMI Processes

Project Management, Engineering, CM - Covered.

Process Management PAs (i.e., OPD, OPF, OT, OPP, OID) apply well to Service/Maintenance organizations because they are at the organizational level (not the “project” level).

Most support process areas (i.e., PPQA, DAR, CAR) also apply well to Service/Maintenance organizations because they are like organizational level processes (e.g., supporting projects).

Metrics (e.g., MA, QPP) at the project level need to be tailored to Service/Maintenance organizations.



Lean Measurement FrameworkSM

Based on three industry best practices (will be presented on next few slides).

Helps organizations focus on the “vital few” metrics.

Based on the three primary usage scenarios for metrics.

Based on metrics that are strongly supportive of goals and objectives.

Award winning measurement framework from American Society for Quality (ASQ).



Lean Measurement FrameworkSM

GOALS	KEY QUESTIONS	METRICS	DC	DS
PLAN		Cost, defects, effort, size, schedule, etc.		
CONTROL		Cost, defects, effort, size, schedule, etc.		
IMPROVE		Cost, defects, effort, size, schedule, etc.		

• DC = Data Collection; DS = Data Storage



Some Example Lean Metrics

Takt Time
Lead Time
Process Time
Changeover Time
Available Time
Value-Added Time
Demand Rate
Number of People
Inventory
Percent Complete and Accurate
Information Technology Used
Reliability

Data Box



Metrics are “Top Down”

Organizational vision, mission, and strategy should drive metrics. Metrics should be driven by and connect to goals and objectives.

Strategic Planning should identify measurable success criteria and measurable objectives:

- **Compliance (e.g., Government requirements)**
- **Industry Standards (e.g., Baldrige, CMMISM, ISO, etc.)**
- **Market Share**
- **Performance (e.g., CPI, SPI)**
- **Productivity**
- **Quality**
- **ROI**
- **Time to market**



Some Lessons Learned - (1)

Project management processes need the most tailoring.

CM is a strong service/maintenance process - use it!

Engineering processes need to be tailored to service/maintenance (e.g., small projects).

Organizational and support processes work well for service/maintenance.



Some Lessons Learned - (2)

Define an operational definition of a “project”.

CMMI and processes must be tailored to service/maintenance organizations.

Implement a lean solution (e.g., lean processes, procedures, templates, etc). Many CMMI implementations are NOT lean.

Not every part of business needs to be under CMMI (only do what makes business sense).

Make a “project” large enough to handle CMMI overhead (i.e., should make business sense).



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References

- "CMMI: Guidelines for Process Integration and Product Improvement", Chrissis, Mary Beth, et al., Software Engineering Institute (SEI), Carnegie Mellon University (CMU), 2003.
- INCOSE, "Systems Engineering Measurement Primer", Version 1, 1998.
- Juran, Joseph. *Juran on Leadership for Quality: An Executive Handbook*. New York, NY: Macmillan, 1989.
- Kellum, Julie, Olson, Timothy G., and Tufail, Zia. "Rapidly Defining a Lean CMMI Maturity Level 3 Process", NDIA CMMI Conference, November 2006.
- Keyte, Beau, and Locher, Drew. *The Complete Lean Enterprise: Value Stream Mapping for Administrative and Office Processes*, Productivity Press, New York, NY, 2004.
- Liker, Jeffrey K. *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*, McGraw-Hill, New York, NY, 2004.
- Liker, Jeffrey K and Meier, David. *The Toyota Way Fieldbook: A practical Guide for Implementing Toyota's 4Ps*, McGraw-Hill, New York, NY, 2006.
- Mann, David, *Creating a Lean Culture: Tools to Sustain Lean Conversions*, Productivity Press, New York, NY, 2005.
- Morgan, James M., and Liker, Jeffrey K., *The Toyota Product Development System: Integrating People, Process, and Technology*, Productivity Press, NY, NY, 2006
- Olson, Timothy G., "Defining Lean Systems Engineering Processes", Paper and Presentation, INCOSE International Systems Engineering Conference, 2007.
- Olson, Timothy G., Dyer, Larry, and Mulligan, Dan "Using Best Practices at NASA to Define a CMMI DAR Process that Accommodates Dissent", Tutorial, NDIA CMMI Conference, 2006.
- Olson, Timothy G., "How to Define Lean Processes that are CMMI Compliant", Tutorial, NDIA CMMI Conference, 2006.
- Olson, Timothy G., Kellum, Julie, and Tufail, Zia., "Rapidly Defining a Lean CMMI Maturity Level 3 Process", Presentation, NDIA CMMI Conference, 2006.
- Olson, Timothy G., "Using Best Practices to Define a Lean Decision Analysis Process", Presentation, INCOSE Systems Engineering Conference, 2007.
- Olson, Timothy G., "Successfully Using a Process Measurement FrameworkSM to Achieve Measurable Results", ASQ, 13ICSQ, Best Paper, 2004.
- Olson, Timothy G. "A Software Quality Strategy for Demonstrating Early ROI", Society of Software Quality Journal, May 1995.
- Olson, Timothy G., et al, "A Software Process Framework for the SEI Capability Maturity Model", CMU/SEI-94-HB-01, 1994.
- [SEI 2005] "CMMI for Services", Ceva, Juan, Pumar, Mark, Ryskowski, John, and Ward, Gordon. April 2005, Technical Note, CMU/SEI-2005-TN-XXX.
- Rother, Mike and Shok, John. Learning to See, Brookline, Mass.:Lean Enterprise Institute, 1998.
- Womack, James P., and Jones, Daniel T., *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*, Free Press, New York, NY, 2003
- Womack, James P., Jones, Daniel T., and Roos, Daniel., *The Machine That Changed the World*, Rawson Macmillan, New York, NY, 1990.

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