



Fusion: Integrating Lean Six Sigma and CMMI®

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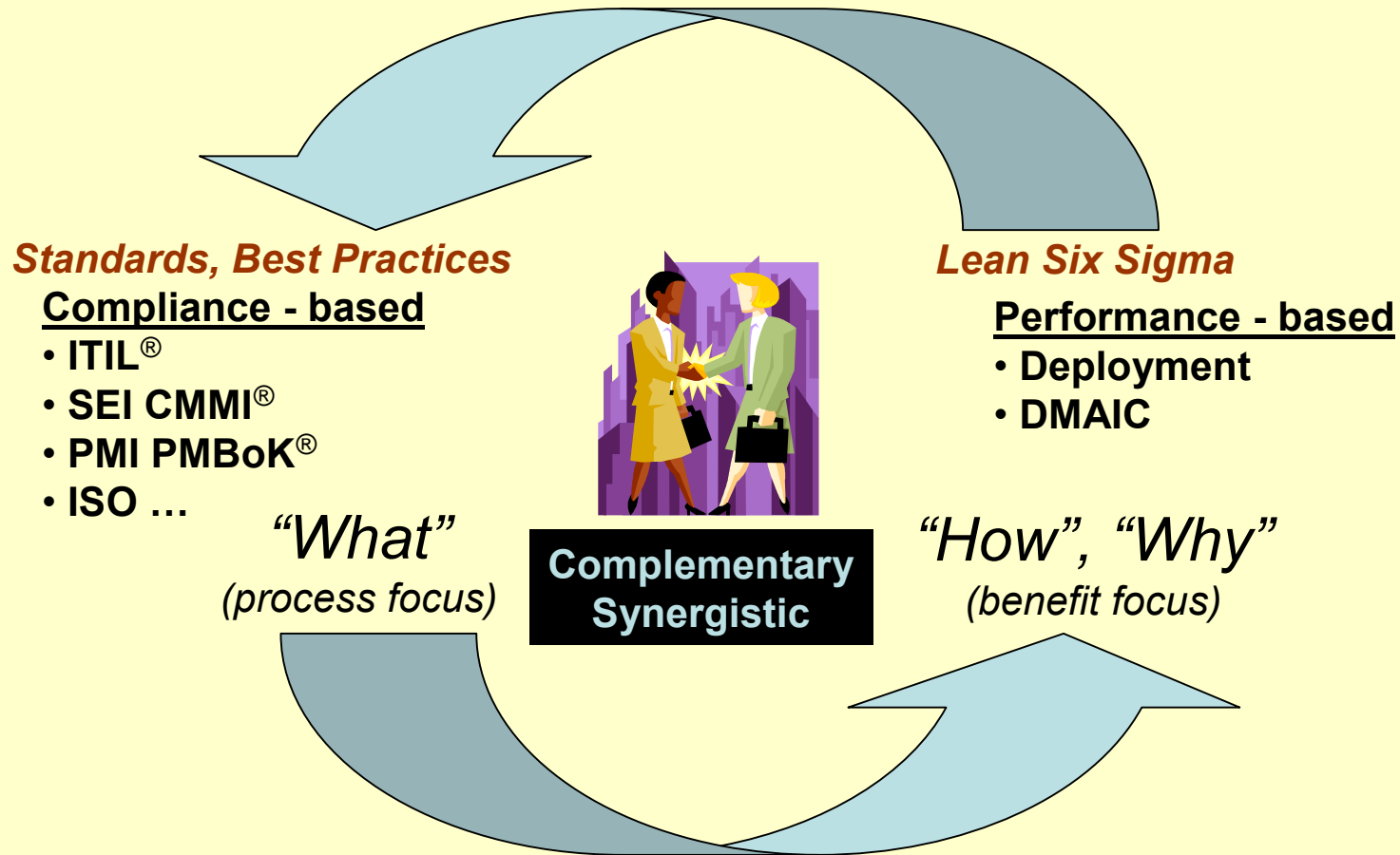
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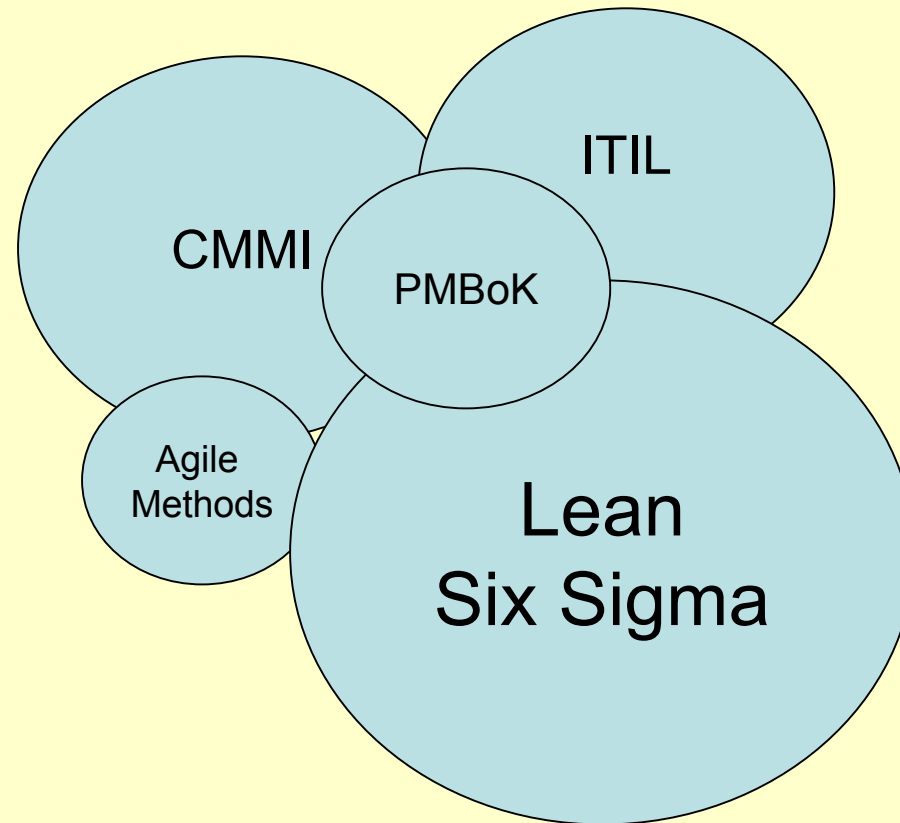
Lean Six Sigma and CMMI® Agenda

- Best Practices Integration
- CMMI Overview
- Deployment Comparison: LSS & CMMI
- “Generic” Goals and Practices
- Direct vs. Indirect Connections
- Direct Connections “Specific” Goals and Practices
- Case Study
- Discussion, Q&A

Lean Six Sigma, CMMI® , PMBoK® , ITIL® ...



Best Practices Integration





CMMI® 1.2 Overview

- An Assessment Methodology
 - Based on Crosby’s “Quality Maturity Grid”
 - Ratings based on attainment of Goals, evidenced by Practices
 - “Generic” apply to all Process Areas (PAs), “Specific” to individual PAs
 - Numbering scheme associates Goals and Practices with levels
 - “Capability” ratings are used with the “Continuous” representation (process focus)
 - No pre-determined sequencing of PAs – each “stands alone”
 - 0-Incomplete; 1-Performed, 2-Managed, 3-Defined, 4-Quantitatively Managed, 5-Optimizing
 - EVERY Successful LSS project is expected to achieve CL 4 within project scope
 - “Maturity” ratings are used with the “Staged” representation (organization focus)
 - PAs are grouped by level – for ML2 and 3 all must meet level Capability to attain Maturity rating
 - 1-Initial, 2-Managed, 3-Defined, Quantitatively Managed, 5-Optimizing
 - Widely used by larger government contractors where it is essentially required
 - *Does not* evaluate Performance
- A Guide to Process Improvement
 - Identifies necessary processes
 - Identifies best practice attributes of processes
 - Non-prescriptive regarding “how to”



CMMI® 1.2 Overview

Table 1: CMMI® v1.2 – "Continuous" Representation

Process Category	Process Area
Process Management	Organization Process Definition (OPD) + IPPD
	Organizational Process Focus (OPF)
	Organizational Training (OT)
	Organizational Process Performance (OPP)
	Organizational Innovation and Deployment (OID)
Project Management	Project Planning (PP)
	Project Monitoring and Control (PMC)
	Supplier Agreement Management (SAM)
	Integrated Project Management + IPPD (IPM)
	Risk Management (RSKM)
	Quantitative Project Management (QPM)
Engineering	Requirements Management (REQM)
	Requirements Development (RD)
	Technical Solution (TS)
	Product Integration (PI)
	Verification (VER)
	Validation (VAL)
Support	Configuration Management (CM)
	Process and Product Quality Assurance (PPQA)
	Measurement and Analysis (MA)
	Decision Analysis and Resolution (DAR)
	Causal Analysis and Resolution (CAR)



CMMI® 1.2 Overview

Staged Representation (partial)

<i>Process Area</i>	<i>Category</i>	<i>Maturity Level</i>
Configuration Management	Support	2
Measurement and Analysis	Support	
Project Monitoring and Control	Project Management	
Project Planning	Project Management	
Process and Product Quality Assurance	Support	
Requirements Management	Engineering	
Supplier Agreement Management	Project Management	



CMMI[®] and DMAIC

different perspectives, common goals

CMMI[®] Generalizations

- Origins are in the DoD – intended for large contractor organizations, used elsewhere
- Specifically designed for software development orgs
- A “project” refers to a software development effort
- Progress is measured by assessment of organizational “Maturity” (staged view) or process “Capability” (continuous view) vs. defined Goals and Practices
 - Typically 1 – 3 years between levels

DMAIC Generalizations

- Originated at Motorola in the 80’s – initially used in manufacturing, later extended to “transactional”, more recently adapted to software and IT
- A general purpose process/product improvement methodology
- A “project” refers to an application of DMAIC to improve a process or product
- Progress is measured by financial results of each project
 - Projects typically 4-6 months in duration

Both expect to result in improved performance
Both report high ROI (3x – 10x)

Top-Level View of LSS “DMAIC”

Initiate **DMAIC**

Finding the Factors that Drive Performance

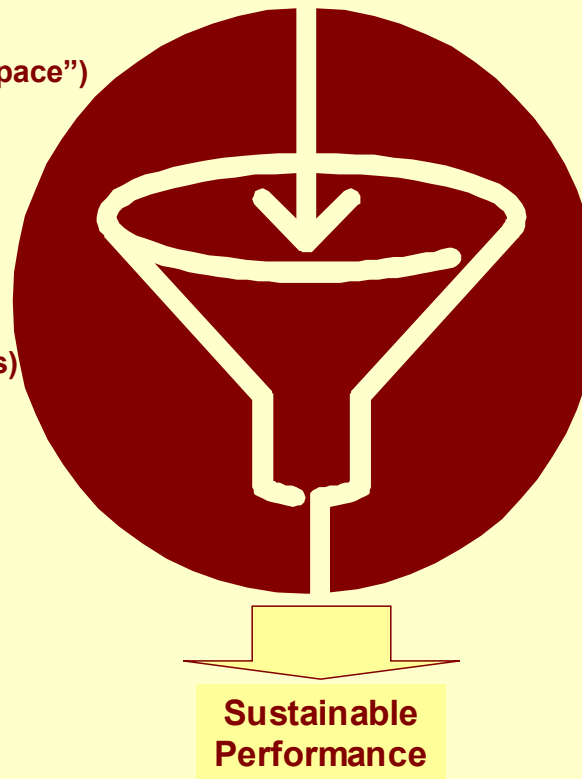
Define (identify “search space”)

Measure (wide screen)

Analyze (narrow the focus)

Improve (the critical few)

Control (make it stick)



*Remember ...
It's not really
sequential –
loop as necessary*

Deployment Comparison

	Deployment Strategy Comparison	
	LSS	CMMI 1.2
Getting Started	Provides an Explicit Strategy - defines roles (Sponsors, Champions, 'Belts') and a Project Selection & prioritization process, including selection of 'Belt' candidates & training strategy (often includes baseline opportunity assessment); defines Business Cases in financial terms	not explicit - CMMI "SCAMPI" defines an assessment approach, "Organizational Process Focus" (level 3 in the Staged model) requires identification & prioritization of improvements, but does not provide guidance on how to do that

Deployment Comparison

Deployment Strategy Comparison		
	LSS	CMMI 1.2
Training	~ "Yellow Belt" (3-5 days)	Intro to CMMI 1.2 (3 days)
	~ "Green Belt" (8-10 days, cumulative)	Intermediate CMMI 1.2 (5 days)
	~ "Black Belt" (15-20 days, cumulative)	SCAMPI Lead Appraiser (5 days)
	Outcomes: knowledge of the DMAIC product/process improvement methodology, basic or advanced statistics ("how")	Outcomes: knowledge of the CMMI ("what"); knowledge of Appraisal method (~ "how")

Deployment Comparison

	Deployment Strategy Comparison	
	LSS	CMMI 1.2
Focus	"Y" - achieving a specific level of performance for the selected Y(s); satisfy all requirements up to level 4 within scope of each project; pilot & measure \$ gains for each project	Maturity level (staged, groups of PAs) or Capability level (continuous, single PAs); progression typically one level at a time; no explicit focus on performance ("Build it and They Will Come")



An Alternative: “*Low Calorie Fusion*”

- Most Appropriate for mid- and smaller-size organizations
 - Acknowledges real-world resource constraints
- An Application of the Pareto Principle
 - 80% of the benefit, 20% of the cost
- Training limited to core essentials (DMAIC + software processes)
 - Minimal statistics (most are rarely used in software)
 - Only those LSS tools “almost always used”
 - key software engineering best practices, locally selected
- ‘Just in Time’ learning / doing model
 - 4 days of DMAIC essentials @ 1 day every 2-4 weeks
 - Interleaved with assigned improvement project
 - Learn a little, do a little (applied knowledge)
 - Remote coaching, blended learning
- “Round 1” (4-6 months elapsed) will show positive ROI
 - Scales flexibly with number of trained practitioners, concurrent projects



Relationship to Generic Goals & Practices			
Level	Generic Goal	Generic Practices	LSS Projects
2	The process is institutionalized as a managed process	2.1 Establish an Organizational Policy	Every LSS project is expected to achieve ALL of these goals and practices within the scope of the project; every project will also address Root Cause Analysis (a level 5 goal)
		2.2 Plan the Process	
		2.3 Provide Resources	
		2.4 Assign Responsibility	
		2.5 Train People	
		2.6 Manage Configurations	
		2.7 Identify and Involve Stakeholders	
		2.8 Monitor and Control the Process	
		2.9 Objectively Evaluate Adherence	
		2.10 Review Status with Management	
3	The process is institutionalized as a defined process (The difference between "Defined" and "Institutionalized" is essentially the difference between local and global scope of the process definition)	3.1 Establish a Defined Process	
		3.2 Collect Improvement Information	
4	The process is institutionalized as a quantitatively managed process	4.1 Establish Quantitative Objectives for the Process	
		4.2 Stabilize Sub-process Performance	
5	The process is institutionalized as an optimizing process	5.1 Ensure Continuous Process Improvement	Achieved by the aggregate impact of the LSS project portfolio
		5.2 Correct Root Causes of Problems	



CMMI® 1.2 Connections

- Every LSS project concerned with essentially any aspect of software development can be related to one or more CMMI PAs
- It is always advisable to identify the relevant PAs and familiarize the team with Generic and Specific Goals associated with them
 - If deploying CMMI is an organizational intent, applicable LSS projects “begin with the end in mind” and make incremental progress while delivering near term financial benefits
 - If deploying CMMI is not an intent, good ideas may nonetheless be suggested by the PAs (which do not define “solutions” but do suggest attributes of solutions proven successful in the industry)
 - See: <http://www.sei.cmu.edu/publications/documents/06.reports/06tr008.html> to download a complete copy of CMMI 1.2



“Direct” and “Indirect” Connections

- Lean Sigma Project Selection + DMAIC tools and methods are used directly to achieve PA goals
 - Organizational Process Definition (OPD)
 - Organizational Process Performance (OPP)
 - Organizational Process Focus (OPF)
 - Organizational Innovation and Deployment (OID)
 - Causal Analysis and Resolution (CAR)
 - Decision Analysis and Resolution (DAR)
 - Measurement and Analysis (MA)
- All of the Project Management and Engineering PAs and several of the Support PAs are potentially the focus of DMAIC projects
 - All of these PAs produce data that is input to Lean Sigma Project Selection and is used by DMAIC projects
 - DMAIC projects can produce Control plans that define Process Assets and describe how metrics are to be used to monitor, control, and guide process execution





CMMI® “Direct” Connections

- Achieving the intent of these PAs essentially *requires* DMAIC and a Project Selection Process
- Whether explicitly or not, these PAs will employ tools and methods indistinguishable from those included in Lean Six Sigma DMAIC
- All of these PAs are all found in the “Process Management” and “Support” categories – they are “infrastructural” in nature rather than “operational”



CMMI® 1.2 Connections

- Organization Process Definition (OPD)

SG 1 Establish Organizational Process Assets

A set of organizational process assets is established and maintained.

- SP 1.1 Establish Standard Processes (*Control*)
- SP 1.2 Establish Life Cycle Model Descriptions (*Control?*)
- SP 1.3 Establish Establish Tailoring Criteria and Guidelines (*Control?*)
- SP 1.4 Establish the Organization's Measurement Repository (*Control?*)
- SP 1.5 Establish the Organization's Process Library (*Control?*)
- SP 1.6 Establish Work Environment Standards (*Control?*)

This PA, especially SP 1.1, may be influenced by DMAIC projects, and is also likely to engage other groups such as the PMO, SEPG, QA group, or standards and methods group



CMMI® 1.2 Connections

- Organizational Process Performance (OPP)

SG 1 Establish Performance Baselines and Models

Baselines and models, which characterize the expected process performance of the organization's set of standard processes, are established and maintained.

SP 1.1 Select Processes (*Project Selection*)

SP 1.2 Establish Process-Performance Measures (*Define, Measure*)

SP 1.3 Establish Quality and Process-Performance Objectives (*Define*)

SP 1.4 Establish Process-Performance Baselines (*Measure*)

SP 1.5 Establish Process-Performance Models (*Analyze*)

Every DMAIC Project will address this PA!



CMMI® 1.2 Connections

Organizational Process Focus (OPF)

SG 1 Determine Process Improvement Opportunities

Strengths, weaknesses, and improvement opportunities for the organization's processes are identified periodically and as needed. (Sponsors, Champions)

- SP 1.1 Establish Organization Process Needs (*Project Selection*)
- SP 1.2 Appraise the Organization's Processes (*Control ⇒ Assessment ⇒ Selection*)
- SP 1.3 Identify the Organization's Process Improvements (*Selection, Define*)

SG 2 Plan and Implement Process Improvements

Process actions that address improvements to the organization's processes and process assets are planned and implemented. (Sponsors, Champions)

- SP 2.1 Establish Process Action Plans (*Selection, Define*)
- SP 2.2 Implement Process Action Plans (*DMAIC*)

SG 3 Deploy Organizational Process Assets and Incorporate Lessons Learned

The organizational process assets are deployed across the organization and process-related experiences are incorporated into the organizational process assets.

- SP 3.1 Deploy Organizational Process Assets (*Control*)
- SP 3.2 Deploy Standard Processes (*Control*)
- SP 3.3 Monitor Implementation (*Control*)
- SP 3.4 Incorporate Process-Related Experiences into the Organizational Process Assets (*Control ⇒ Assessment ⇒ Selection*)

This is a Portfolio Level view of LSS-DMAIC



CMMI® 1.2 Connections

Organizational Innovation and Deployment (OID)

SG 1 Select Improvements

Process and technology improvements, which contribute to meeting quality and process-performance objectives, are selected.

SG 2 Deploy Improvements

This PA is largely synonymous with LSS Project Selection and will typically entail execution of a series of DMAIC projects to conduct pilots, plan and manage deployment, and measure effects. Closely related to OPF.



CMMI® 1.2 Connections Causal Analysis and Resolution (CAR)

SG 1 Determine Causes of Defects

Root causes of defects and other problems are systematically determined.

SP 1.1 Select Data for Analysis (*Define, Measure*)

SP 1.2 Analyze Causes, Propose Actions (*Analyze, Improve*)

SG 2 Address Causes of Defects

This is central to every DMAIC Project!



CMMI® 1.2 Connections

Decision Analysis and Resolution (DAR)

SG 1 Evaluate Alternatives

Decisions are based on an evaluation of alternatives using established criteria.

DAR may occur within a DMAIC Project or separately, but in either case will employ the DMAIC toolset and thought process



CMMI® 1.2 Connections

Measurement and Analysis (MA) Process Area

SG 1 Align Measurement and Analysis Activities

Measurement objectives and activities are aligned with identified information needs and objectives.

... results of DMAIC are institutionalized in the Control plan

SG 2 Provide Measurement Results

Measurement results, which address identified information needs and objectives, are provided.

... the Control plan is executed during a development project

MA will be an element of every DMAIC Project – taken in aggregate a series of projects achieve the goals of MA across the organization



Case Study: *Low Calorie Fusion*

- Small 'hi-tech' company, < \$100mm sales
- ~ 150 developers, 4 full-time process improvement specialists
- Trained 3 'belts' over 4 months, JIT mode
 - 4 days DMAIC (~ 1 day / month)
 - 1 day Sponsors and Champions (~ 15 key mgrs.)
 - 3 days software best practices
 - Each completed a project within 6 months, concurrent with training
- Total investment ~ 2.5 person years (including training, trainer, and project effort)
- Total 12 month benefit based on pilots ~ 4.5 person years
- 1.8x ROI *from the first 3 DMAIC projects*



Questions?



About **Process-Fusion.net**

Offerings:

- Assessments, Strategy, Training, Coaching and Facilitation

Positioning:

- Good ideas come from many sources.
 - ***There is no “one best way”***
- Intelligent and flexible integration of proven process improvement methods and best practices
 - Lean Six Sigma, ITIL®, CMMI®, PMBoK®, Agile
- Tailoring to software and IT
 - Not “one size fits all”
 - *Skillful tailoring based on the voice of the customer*
- “Just in time” and “Right-sized” – lean, fast, effective.