SEPG 2005

CMMI® and Six Sigma Synergy

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Objectives

- Overview of CMMI® and Six Sigma relationships
- How to leverage the similarities to benefit and accelerate your improvement efforts
- Synergies are present at levels 2 and 3, as well as levels 4 and 5
- Some Generic Practices share common ground with Six Sigma concepts

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Topics

During this presentation we will cover the following:

1. Six Sigma Background Information
2. Six Sigma Methods and the CMMI®
3. CMMI® Process Area/Six Sigma Relationships
4. Sharing Process Improvement Infrastructure
5. Customer vs. Model Focus
6. CMMI®/Six Sigma Intersect Example
7. Six Sigma Tools and Techniques to Accelerate CMMI®
8. Summary of CMMI® and Six Sigma Synergies

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What is Six Sigma?

A. Quality Management Philosophy?

B. Quality Improvement Methodology?

C. Measurement of Product and Process Quality?

Answer: ___ (A, B, C)

The answer is "All of the above"

[1]

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What is Six Sigma? (Cont.)

A Quality Management Philosophy

Reduce variation in your business and make customer-focused, data driven decisions. This is commonly referred to as "*Management by Fact*."

[1]

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What is Six Sigma? (Cont.)

A Quality Improvement Methodology

- Methodology and tools to improve business processes
- Delivers “Better, Faster, Cheaper” solutions
- Uses statistical process control methods:

DMAIC – Define, Measure, Analyze, Improve, Control

DFSS – Design for Six Sigma – Approach that incorporates various methods

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What is Six Sigma? (Cont.)

Measurement of Product/Process Quality

- 3.4 Defects Per Million Opportunities (DPMO).
- Most business processes operate between 3-4 Sigma (~93.3% to ~99.4% efficient).
- Six Sigma capability = ~99.9996% efficient.

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What is Six Sigma? (Cont.)

Measurement of Product/Process Quality

Sigma Comparison Examples:

1. Six Sigma or better capability (~99.9996% efficient) - domestic airline passenger fatality rate.
2. 4 Sigma capability (~99.4% efficient)
   - 107 incorrect medical procedures a day
   - 200,000 incorrect drug prescriptions/year
   - 18,322 pieces of mishandled mail an hour
   - 2,000,000 documents lost by IRS a year

[5]

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Six Sigma Methods and the CMMI®

DMAIC – Define, Measure, Analyze, Improve, Control

- Define the project goals and customer (internal and external) deliverables
- Measure the process to determine current performance
- Analyze and determine the root cause(s) of the defects
- Improve the process by eliminating defects
- Control future process performance

Accepted as a standard methodology in industry.

[1]

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Six Sigma Methods and the CMMI®

DMADV – Define, Measure, Analyze, Design, Verify

- Define the project goals and customer (internal and external) deliverables
- Measure and determine customer needs and specifications
- Analyze the process options to meet the customer needs
- Design (detailed) the process to meet the customer needs
- Verify the design performance and ability to meet customer needs

DMADV is a Design for Six Sigma (DFSS) methodology. [1]

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Six Sigma Methods and the CMMI®

What do I need, DMAIC or DMADV/DFSS?

- DMAIC – EXISTING process/product not meeting customer specification.
- DMADV/DFSS – NEW process/product OR Revolutionary improvement on existing process/product.

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Six Sigma Methods and the CMMI®

Six Sigma	CMMI®
DEFINE	PP(L2), REQM(L2), RD(L3), OPD(L3), IPM(L3)
MEASURE	MA(L2), QPM(L4)
ANALYZE	REQM(L2), DAR(L3), QPM(L4), OPP(L4), CAR(L5)
IMPROVE	OT(L3), OPF(L3), OID(L5)
CONTROL	PMC(L2), IPM(L3), QPM(L4)

Based upon **[2]**

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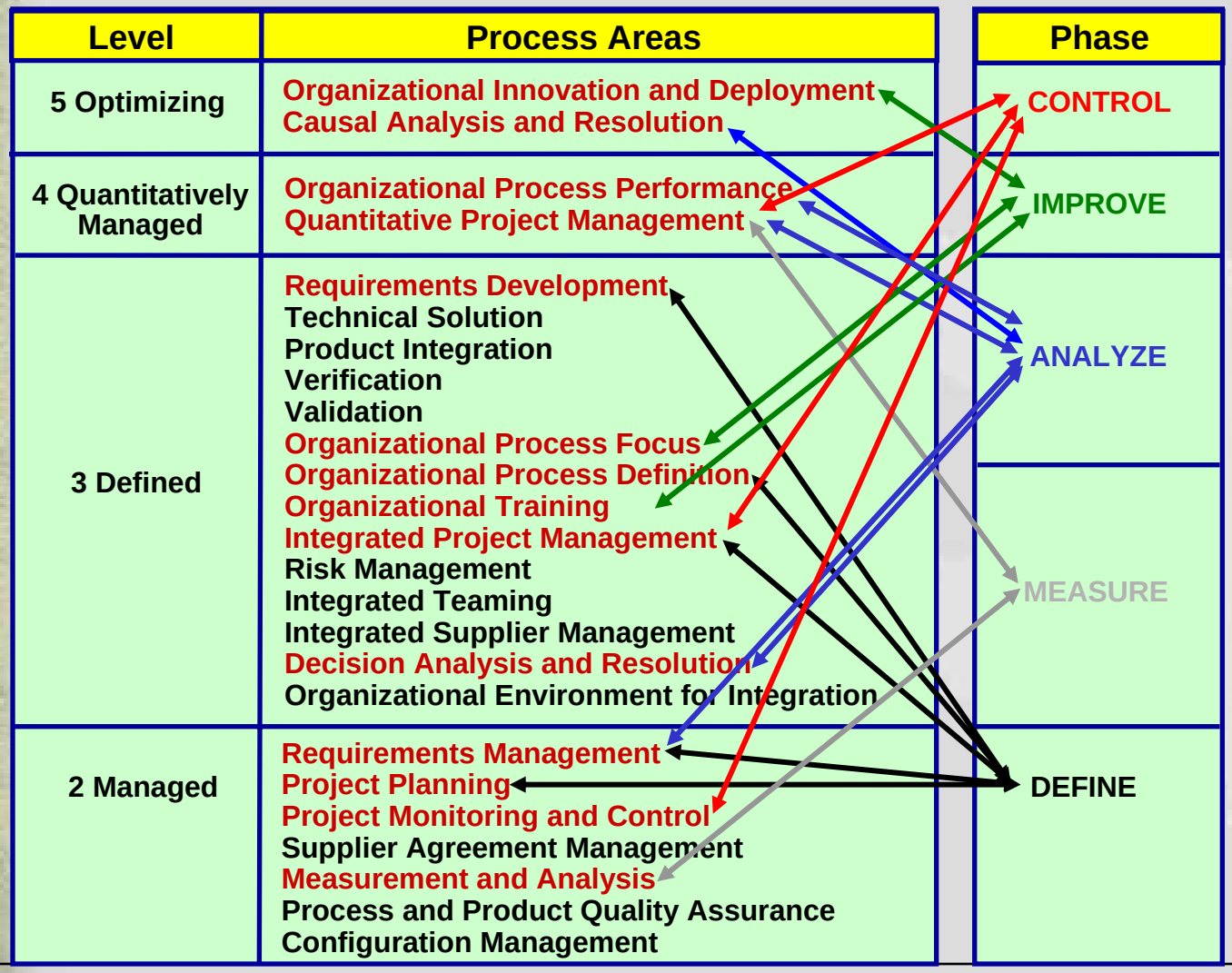
CMMI® Process Area/Six Sigma Relationships



Based upon **[2]**

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CMMI® Process Area/Six Sigma Relationships

What about the Generic Practices?

GP2.7 – Identify and Involve Relevant Stakeholders

Both CMMI® and Six Sigma support identification of key stakeholders early in the process.

GP2.8 – Monitor and Control the Process

Monitoring and control are at the heart of the Control Phase in Six Sigma.

GP3.2 – Collect Improvement Information

The collection of improvement information from the performance of a process (particularly measurement data) is essential in Six Sigma (Measure Phase).

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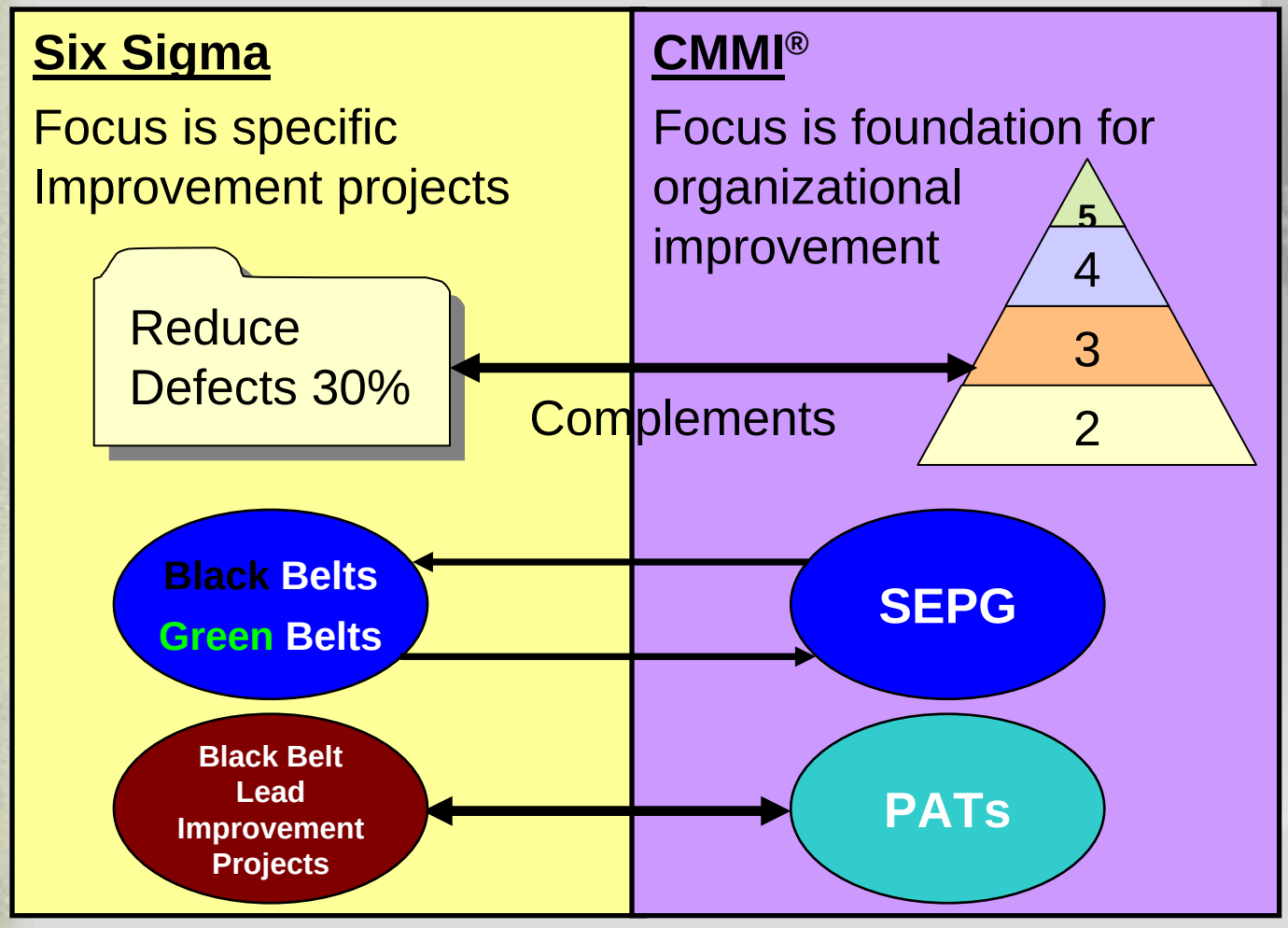
Sharing Process Improvement Infrastructure



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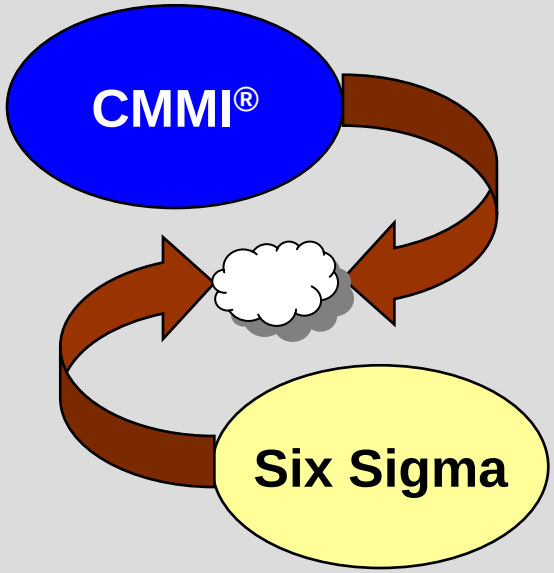
Sharing Process Improvement Infrastructure



Strategic Top-Down Institutionalization

Process Nirvana

Tactical Bottom-Up Improvements

- Establishes quantitative ROI data
- Provides shorter cycle times for improvement
- Shows bottom-line savings from the Infrastructure
- Secures support for future improvement efforts
- Select Six Sigma projects carefully

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Sharing Process Improvement Infrastructure

Some guidelines for selection of Six Sigma projects:

- Identify biggest problem areas / greatest bottom-line savings
- Areas containing systemic problems / major sources of pain for the organization
- Avoid minor improvements / little bottom-line savings
- Dedicate one of your best and brightest people

Based upon **[2]**

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Customer vs. Model Focus

Traditional "Process-Centric" approach:

- Achieve Maturity Level x
- Can result in O/H and wrapping "process" around business as usual
- False starts (we've all seen them) can kill support for process improvement efforts

"Customer-Centric" approach:

- Voice of the Customer (VOC)
- Focuses on Critical to Quality (CTQ)
- Quantifiable business goals which add value from customer's perspective

Based upon **[3]**

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CMMI®/Six Sigma Intersect Example

CMMI®

Requirements Development

SG 1 Develop Customer Requirements [PA157.IG101]
- SP 1.1 Elicit Needs
- SP 1.2 Develop the Customer Requirements

SG 2 Develop Product Requirements [PA157.IG103]
- SP 2.1 Establish Product and Product-Component Requirements
- SP 2.2 Allocate Product-Component Requirements
- SP 2.3 Identify Interface Requirements

SG 3 Analyze and Validate Requirements [PA157.IG102]
- SP 3.1 Establish Operational Concepts and Scenarios
- SP 3.2 Establish a Definition of Required Functionality
- SP 3.3 Analyze Requirements
- SP 3.4 Analyze Requirements to Achieve Balance
- SP 3.5 Validate Requirements with Comprehensive Methods

Six Sigma

Voice of the Customer

Quality Function Deployment (QFD)

“House of Quality”

[6]

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Six Sigma Tools and Techniques to Accelerate CMMI®

- Scatter plots/diagrams
- Affinity diagrams
- **Histograms**
- Pareto charts
- Run charts & **Control charts**
- SIPOC diagrams
- Cause and effect diagrams
- Design of Experiments
- Quality Function Deployment (QFD)
- Failure Mode and Effects Analysis (FMEA)

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Six Sigma Tools and Techniques to Accelerate CMMI®

Sample Tool: Histogram

- Takes a snapshot in time
- Can help keep track of variations
- Ask:

  Do measures distribute into a bell curve?

  What is the average?

  Do we meet specifications?
- They do not provide information about patterns over time

[4]

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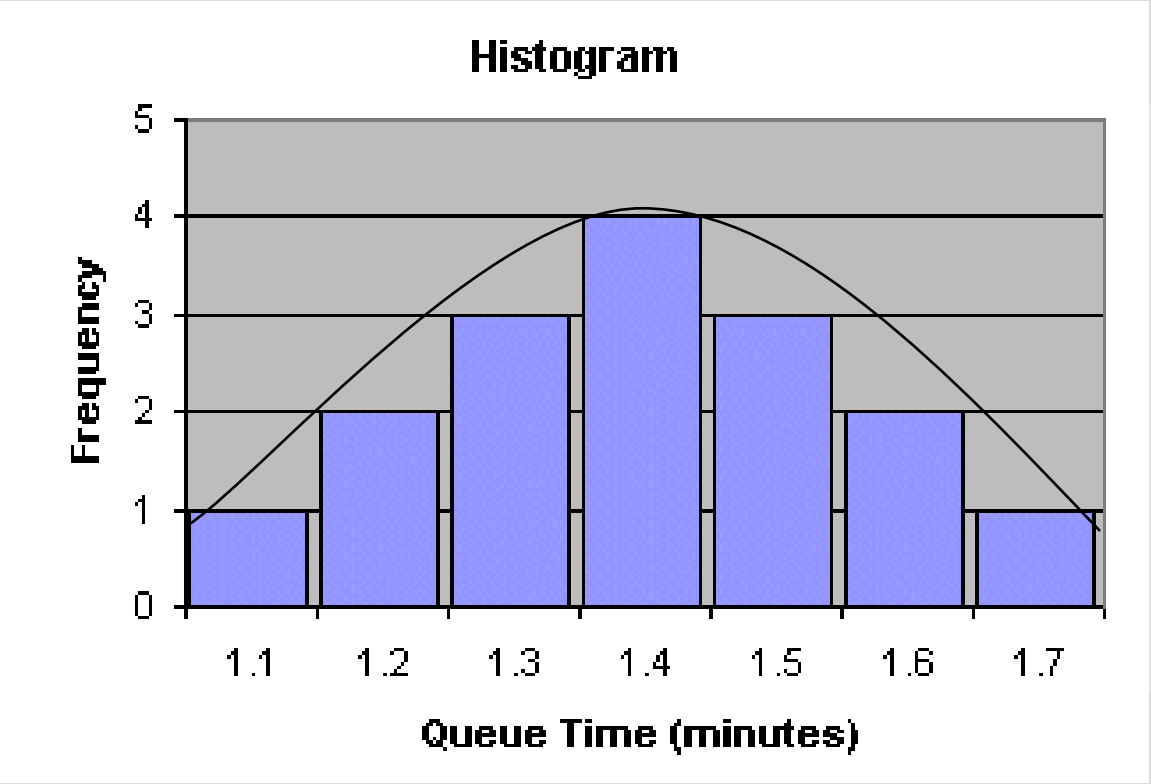
Six Sigma Tools and Techniques to Accelerate CMMI®



Sample Histogram

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Six Sigma Tools and Techniques to Accelerate CMMI®

Sample Tool: Control Chart

- Enables visibility into:
  - when the process is running satisfactorily
  - when something is different than expected and may need correction
  - patterns over time
- Measurements to learn capability must be collected over reasonable time period to include variations from all sources, e.g. 30 days
- Capability may change over long-term, so control charts should be revised periodically

[4]

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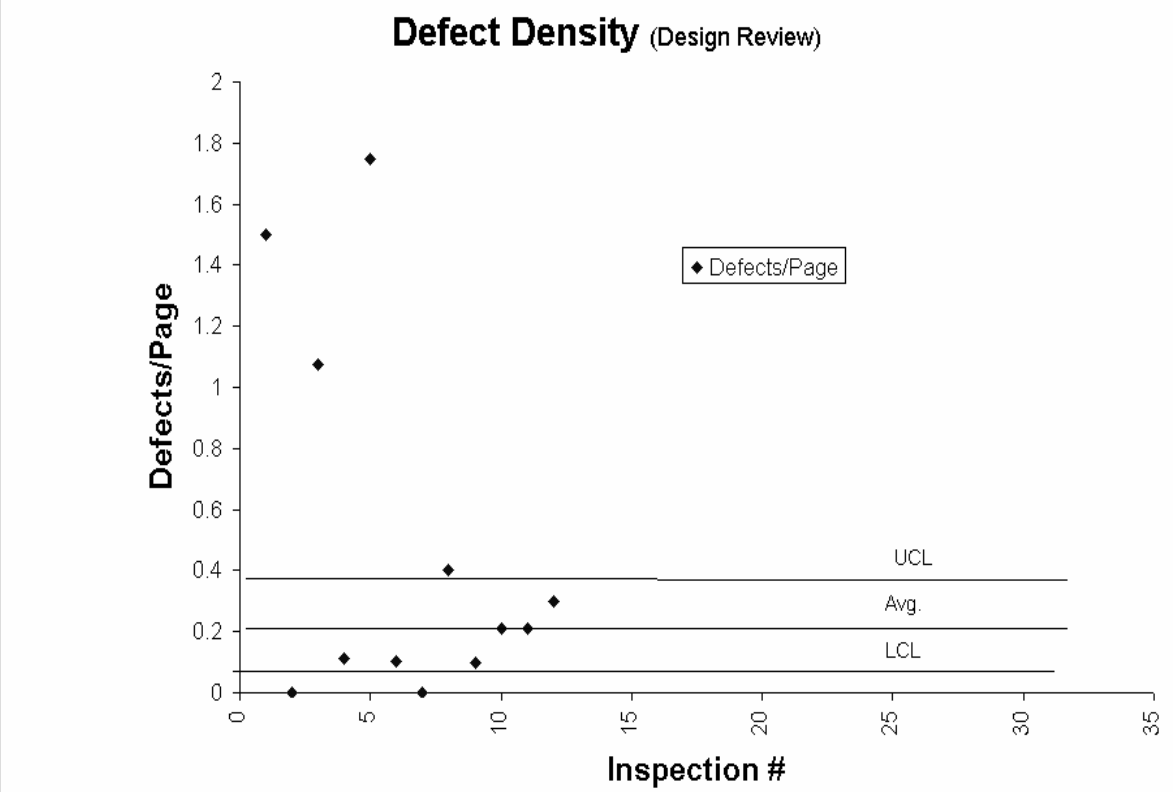
Six Sigma Tools and Techniques to Accelerate CMMI®



Sample Control Chart

[4]

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Summary of CMMI® and Six Sigma Synergies

- Sharing infrastructure between CMMI® and Six Sigma benefits both initiatives
- Good measurements are essential to successful Six Sigma implementation and support CMMI® goals
- DMAIC and DFSS have strong ties to specific and generic practices within CMMI®
- Six Sigma can help accelerate CMMI® implementation at ALL levels of maturity
- Six Sigma provides business focused bottom-line savings for the process improvement program
- Six Sigma strengths complement CMMI® weaknesses, CMMI® strengths complement Six Sigma weaknesses

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[1] iSixSigma, www.software.isixsigma.com

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[4] Madachy, Ray: "MBASE and CMMI® II", University of Southern California, Center for Software Engineering, April 7, 2003.

[5] Lockheed Martin Corporation, Green Belt Training Program, 2001.

[6] CMMI® Product Development Team, "CMMI® for Systems Engineering/Software Engineering/Integrated Product and Process Development, and Supplier Sourcing, Version 1.1, Staged Representation", CMU/SEI-2002-TR-012, March 2002.

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