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
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
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”
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.”
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
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.
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
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.
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]
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.
### Six Sigma Methods and the CMMI®

<table>
<thead>
<tr>
<th>Six Sigma</th>
<th>CMMI®</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFINE</td>
<td>PP(L2), REQM(L2), RD(L3), OPD(L3), IPM(L3)</td>
</tr>
<tr>
<td>MEASURE</td>
<td>MA(L2), QPM(L4)</td>
</tr>
<tr>
<td>ANALYZE</td>
<td>REQM(L2), DAR(L3), QPM(L4), OPP(L4), CAR(L5)</td>
</tr>
<tr>
<td>IMPROVE</td>
<td>OT(L3), OPF(L3), OID(L5)</td>
</tr>
<tr>
<td>CONTROL</td>
<td>PMC(L2), IPM(L3), QPM(L4)</td>
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</tbody>
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Based upon [2]
### CMMI® Process Area/Six Sigma Synergy

#### CMMI® Process Areas

<table>
<thead>
<tr>
<th>Level</th>
<th>Process Areas</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Optimizing</td>
<td>Organizational Innovation and Deployment, Causal Analysis and Resolution</td>
<td>CONTROL</td>
</tr>
<tr>
<td>4 Quantitatively Managed</td>
<td>Organizational Process Performance, Quantitative Project Management</td>
<td>IMPROVE</td>
</tr>
<tr>
<td>2 Managed</td>
<td>Requirements Management, Project Planning</td>
<td>MEASURE</td>
</tr>
</tbody>
</table>

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).
Sharing Process Improvement Infrastructure

**Six Sigma**
Focus is specific Improvement projects

- Reduce Defects 30%

**CMMI**
Focus is foundation for organizational improvement

- Complements

- Black Belts
- Green Belts
- Black Belt Lead Improvement Projects
- SEPG
- PATs

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Sharing Process Improvement Infrastructure

- 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

CMMI® and Six Sigma Synergy

CMMI®

Six Sigma

Strategic Top-Down Institutionalization

Process Nirvana

Tactical Bottom-Up Improvements

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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]
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]
### CMMI®/Six Sigma Intersect Example

**CMMI®**

**Requirements Development**

<table>
<thead>
<tr>
<th>SG 1 Develop Customer Requirements [PA/37/G10]</th>
</tr>
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<tbody>
<tr>
<td>SP 1.1 Elicit Needs</td>
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<tr>
<td>SP 1.2 Develop the Customer Requirements</td>
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<table>
<thead>
<tr>
<th>SG 2 Develop Product Requirements [PA/37/G10]</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 2.1 Establish Product and Product-Component Requirements</td>
</tr>
<tr>
<td>SP 2.2 Allocate Product-Component Requirements</td>
</tr>
<tr>
<td>SP 2.3 Identify Interface Requirements</td>
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</tbody>
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<table>
<thead>
<tr>
<th>SG 3 Analyze and Validate Requirements [PA/37/G10]</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 3.1 Establish Operational Concepts and Scenarios</td>
</tr>
<tr>
<td>SP 3.2 Establish a Definition of Required Functionality</td>
</tr>
<tr>
<td>SP 3.3 Analyze Requirements</td>
</tr>
<tr>
<td>SP 3.4 Analyze Requirements to Achieve Balance</td>
</tr>
<tr>
<td>SP 3.5 Validate Requirements with Comprehensive Methods</td>
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</table>

**Six Sigma**

**Voice of the Customer**

**Quality Function Deployment (QFD)**

“House of Quality”
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)
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
Six Sigma Tools and Techniques to Accelerate CMMI®

Sample Histogram
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
Six Sigma Tools and Techniques to Accelerate CMMI®

Sample Control Chart

Defect Density (Design Review)

- Defects/Page
- UCL
- Avg.
- LCL

Inspection #
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
References


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