Strategies for Successfully Implementing CMMI and Six Sigma

Mike Sturgeon and Louise Mudd
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Topics

• Background
• Six Sigma and CMMI
• Process Hierarchy
• Process Management Responsibilities
• Summary
TRW Systems

• A leading global integrator of complex systems
  – Based on information technology and systems engineering expertise
  – Integrated solutions: architecture, development and sustainment

• Many customers and markets in transformation

• Six Sigma and CMMI – cornerstones of our transformation
Business Drivers

- Competitive advantage through lower costs and lower risks
  - Ability to predictably deliver on time and within schedule
  - Increased customer satisfaction and associated growth
- Better business management through management by data
  - Quantitatively understand performance and quality drivers
  - More strategic and less tactical
- Enterprise approach to process improvement
  - Ability to capitalize on knowledge from all across the organization
  - Common infrastructure for all improvement initiatives
  - Common policies, processes, and training
ICBM’s Form Backbone of U.S. Strategic Deterrence

- **Minuteman**
  - Continued operational need through 2020

- **Peacekeeper**
  - To be eliminated under START II
The ICBM Program Is a Team Effort

System Engineering and Technical Assistance

1950’s
- Atlas 1st Launch (1957)
- Thor 1st Launch (1957)
- Titan 1st Launch (1959)

1960’s
- MM I 1st Launch (1961)
- MM II 1st Launch (1964)
- MM III 1st Launch (1968)

1970’s
- PK Go-Ahead (1972)

1980’s
- PK 1st Launch (1983)
- SICBM Go-Ahead (1983)
- PKRG Go-Ahead (1986)
- SICBM 1st Launch (1989)
- ICBM Prime Award (1997)

1990’s
- REACT
- GRP
- PRP
- MMP
- PSRE
- ECS
- Field Upgrades

2000+

ICBM Prime

Associate Contractors

TRW
Program Management, Systems Engineering and Integration

Boeing
Guidance Systems, Ground Systems, Systems Support

Lockheed Martin
Ground Systems, RS/RV, PK IFSS

Thiokol/CSD
Joint Venture Propulsion

Aerojet
General Dynamics
Logicon
Northrop
Allied Signal
C.S. Draper Labs
Honeywell
Litton
Raytheon
ARC
Veridian
M-L Technologies
Dav-Lear
SAIC
PrimeTech

Integration Across Programs
Accountability for System Performance
Efficiency Through Consolidation

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2nd Annual NDIA/SEI CMMI Technology Conference
“Program” (Contract) is a Set of Related Programs/Projects

- Weapon System Assessment - Proactive
- Sustaining Engineering - Reactive

Identify Problem and Outline Mitigation

Air Force Decision to “fix” or “not fix” Problem because additional resources required

- Do Not “fix”

- “fix”

- New Program
- Deploy “fix”

CMMI Initiative
Standardize processes
Projects demonstrate processes
Projects do not develop new processes

Systems Engineering Services

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Six Sigma and CMMI
ISO 9001 provides the quality management discipline for all project and functional areas
Six Sigma provides a comprehensive framework for ensuring process improvements support corporate goals
CMMI ensures the use of industry best practices in software and systems engineering
What is Six Sigma?

A Process Improvement Methodology
Like BPR, TQM, ISO 9000, CMM, etc.

Has Three Major Elements

1. Decision Making with Empirical Data
2. Voice of the Customer
3. Cultural Transformation
4. Business Cases

Linked to Business Strategy

Sigma  DPMO
1  680,000
2  298,000
3  67,000
4  6,000
5  400
6  3.4
History of Six Sigma

1950
W. Edwards Deming introduces quality management to Japanese manufacturing

1960
Joseph Juran publishes *Managerial Breakthrough*

1970
Philip Crosby introduces concept of zero defects

1979
Motorola starts Six Sigma program

1980
Ford adopts quality management

1983

1990
IBM

1995
GE
Allied Signal

1997+
Lockheed Martin
Sony
Polaroid
JP Morgan
J&J
Raytheon
TRW

Six Sigma

A best-in-class change strategy for accelerating improvements in processes, products, and services
How Six Sigma Compliments CMMI

For an individual process:

– CMM/CMMI identifies what activities are expected (industry best-practice)
– Six Sigma identifies how activities might be improved (more efficient, more effective, …)

Example – Project Planning in CMMI

Could fully meet CMMI goals and practices, but still write poor plans

Six Sigma can be used to make planning process more efficient and yield better plans

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<th>SG 1</th>
<th>Establish Estimates</th>
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<td>SP 1.1</td>
<td>Estimate the Scope of the Project</td>
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<td>SP 1.2</td>
<td>Establish Estimates of Project Attributes</td>
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<td>SP 1.3</td>
<td>Define Project Life Cycle</td>
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<td>Determine Estimates of Effort and Cost</td>
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<th>Develop a Project Plan</th>
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<td>Identify Project Risks</td>
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<td>SP 2.3</td>
<td>Plan for Data Management</td>
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<td>Plan for Project Resources</td>
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<td>SP 2.5</td>
<td>Plan for Needed Knowledge and Skills</td>
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<td>SP 2.6</td>
<td>Plan Stakeholder Involvement</td>
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<td>SP 2.7</td>
<td>Establish the Project Plan</td>
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<th>SG 3</th>
<th>Obtain Commitment to the Plan</th>
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<td>Review Subordinate Plans</td>
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<td>SP 3.2</td>
<td>Reconcile Work and Resource Levels</td>
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<td>SP 3.3</td>
<td>Obtain Plan Commitment</td>
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How CMMI Compliments Six Sigma

For the organizational infrastructure:

- Six Sigma identifies *what* activities are used for improvement (DMAIC, DFSS)
- CMM/CMMI identifies *how* those activities might be implemented (Process Groups, Training Offices)

**Example – Organizational Process Focus in CMMI**

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<th>Determine Process Improvement Opportunities</th>
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<td>Establish Organizational Process Needs</td>
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<td>SP 1.2</td>
<td>Assess the Organization’s Processes</td>
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<td>SP 1.3</td>
<td>Identify the Organization's Process Improvements</td>
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<th>SG 2</th>
<th>Plan and Implement Process Improvement Activities</th>
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<td>SP 2.1</td>
<td>Establish Process Action Plans</td>
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<td>SP 2.2</td>
<td>Implement Process Action Plans</td>
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<td>SP 2.3</td>
<td>Deploy Process and Related Process Assets</td>
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<tr>
<td>SP 2.4</td>
<td>Incorporate Process-Related Experiences into the Organization’s Process Assets</td>
</tr>
</tbody>
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**Six Sigma doesn’t assess overall organizational capability**

**CMMI provides an approach to setting up the infrastructure**
Process Hierarchy
CMMI Process Area Relationships

Organizational responsibility
(TRW Systems and IPIC)

empower

Process Management
Organizational Process Focus
Organizational Process Definition
Organizational Training
Organizational Process Performance
Organizational Innovation and Deployment

standardize processes

Project Management
Project Planning
Project Monitoring and Control
Supplier Agreement Management
Integrated Project Management
Risk Management
Quantitative Project Management

Risk Management

Support
Configuration Management
Process and Product Quality Assurance
Measurement and Analysis
Decision Analysis and Resolution
Causal Analysis and Resolution

analyze

analyse

Engineering
Requirements Development
Requirements Management
Technical Solution
Product Integration
Verification
Validation

measure & assist

employ
Our approach supports continual process improvement
Highlights of Our Approach

**Enterprise-Wide Institutionalization**
- Policy & Requirements Manual
- Training

**Six Sigma Teams**
- DMAIC/DFSS
- Tools & methods

**Six Sigma projects:**
- Fill CMMI gaps
- Improve CMMI processes
- Applies Six Sigma methods and tools to Levels 4 and 5

**Quantitatively Measured**
- Metrics Manual
- Measurement repository

**Projects**

**CMMI Assessments**
- Self-Assessment Tool
- Internal/external formal assessments

**CMMI/Six Sigma Synergy**
- Project Reviews/Summits
- Integrated strategies
IPIC Process Requirements Hierarchy

ISO 2000

TRW Systems Policies

TRW Systems Processes and Tailoring Guidance

CMMI

AF Manuals

IPIC Contract

IPIC IMP

IPIC Process Set

- Policy Compliance Report
- Tailored System’s Processes
- Program Management Plan
- Configuration Management Plan
- Assessment Plan
- Others – HR, Security, F&B, Contracts, etc.
Working Level Architecture

IPIC Processes

TRW Unique

Administer IPIC Contract

Acquire and Execute New Work

Monitor/Report/Correct

Sustaining Engineering

System Engineering

Make it easy for the employees
Process Management Responsibilities
We leverage our Six Sigma efforts off our successful CMMI infrastructure:

- **Common Process Management program office and reporting structure**
- **Shared staff with skills in both areas**
- **Information sharing from Enterprise to Division to Project**

**TRW Systems**
- Process Management staff
- TRW Systems Process Group
- Office of Cost Estimation
- Six Sigma Training Office
- Dashboards

**Divisions**
- Division Champions
- Division Process Groups
- Training Offices (engineering, management)

**Projects**
- Self-Assessment Tool
- Corrective Action System

**Six Sigma Projects**
- Startit! Data base
- Best Practice Sharing
Making it Stick

Design **New Products and Processes** that Meet Customer Needs

**D** - Each Project Must Have a Business Case and Sponsor

**M** - “You can’t manage what you don’t measure.”

**A** - “Solve the problem, not the symptoms.”

**I** - Push for Innovations, Breakthrough Thinking

**C** - Who Is Accountable for Making the Fix Stick?

Improve **Existing Processes** so that Their Outputs Meet Customer Requirements

Control and Manage **Cross-Functional Processes** to Meet Business Goals
IPIC Process Roles and Responsibilities

**Process Leader**
- Monitors Process Continually
- Influences resources executing the process
- Trains process
- Documents the process
- Responsible for stakeholder management of the process
- Reports to process reviewer the health of the process
- Integrates with integrating process leaders and functional managers
- Responsible to maintain/implement changes

**Process Reviewer**
- Reviews status of the process as deemed necessary with the process leader – generally 1 per week to 1 per month
- Assists the process leader with stakeholder management
- Assists the process leader with endorsement of roles and responsibilities within the process
- Understands interfaces between this process and other processes and functions
- Maintains “vision” of the process

**Highly Matrixed Organization – Typical “Process Owner” did not apply**
Additional Process Roles and Responsibilities

**Process Implementer**
- Executes the process
- Examples –
  - PM and PMT execute the Acquisition Strategy process
  - Hiring Manager executes the staffing process
  - PM/PMTs execute the design and development process
  - TO team executes the TO process

**Process Auditor**
- Independently assess compliance to the process and quality of the product

**Upper Management Reviewer**
- Reviews process and product metrics of selected processes (leader, reviewer and auditor may be asked questions)
- 1x per month to 1x per quarter

**Supplier**
- Provides data or material into process

**Customer**
- Receives data or material from process

**Stakeholders**
- Determined by the process leader with the process reviewer
- Includes all the above and may extend from supplier of suppliers to customer of customer
Summary of Key Strategies

• Establish an enterprise approach
  – Process improvement
  – Process management
• Leverage initiatives to obtain goals
  – Six Sigma is a great set of tools to support CMMI implementation
• Don’t expect projects to be able to implement everything
  – Some things are better implemented at an organizational level
• Make it easy for the employees
• Document process roles and responsibilities early
• Process improvements are sustained by process management
  – Six Sigma Control
  – CMMI Generic Practices
• Overall approach supports continual process improvement