Accelerating CMMI Adoption Using Six Sigma: Northrop Grumman Case Study

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Mission Success Requires Multiple Approaches

- Risk Management
- Systems Engineering
- Independent Reviews
- Training, Tools, & Templates

Program Effectiveness

Mission Assurance

Process Effectiveness

Operations Effectiveness

- Dashboards for Enterprise-Wide Measurement
- Communications & Best-Practice Sharing
- Robust Governance Model (Policies, Processes, Procedures)

CMMI Level 5 for Software, Systems, and Services

ISO 9001 and AS-9100 Certification

Six Sigma
The Enterprise

Core Processes Drive the Key Business Measurement Criteria

Mission Systems Dashboard
- Used to manage the Core Business Processes
- Defined by Business Executives
- Owned by Business Executives

Division Dashboards

Results of Six Sigma Projects seen in improved business performance

- Productivity
- Profitable Growth

Core Processes
- Program Execution
- Business Development
- Portfolio Management
- Employee Management
- Technology/Product Development
- Relationship Management
- Subcontractor Management

Enabling Processes

Key Business Questions
- Sub Processes
- Gaps & Goals

- Productivity
- Profitable Growth
- Customer Satisfaction
- Operational Effectiveness

ROI Gate
Roles & Responsibilities

- **Champions** – Facilitate the leadership, implementation, and deployment
- **Sponsors** – Provide resources
- **Process Owners** – Responsible for the processes being improved
- **Master Black Belts** – Serve as mentors for Black Belts
- **Black Belts** – Lead Six Sigma projects
  - Requires 4 weeks of training
- **Green Belts** – Serve on improvement teams under a Black Belt
  - Requires 2 weeks of training
- **Money Belts** – Validate financial results
Organized Enterprise-Wide for Accomplishments

- 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.

**Mission Systems**
- Process Management staff
- Mission 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! Database
- Best Practice Sharing
Using CMM/CMMI with Six Sigma - 1

• For an individual process:
  – CMM/CMMI identifies what activities are expected in the process
  – Six Sigma identifies how they can be improved (efficient, effective)

SG 1 Establish Estimates
  SP 1.1 Estimate the Scope of the Project
  SP 1.2 Establish Estimates of Project Attributes
  SP 1.3 Define Project Life Cycle
  SP 1.4 Determine Estimates of Effort and Cost

SG 2 Develop a Project Plan
  SP 2.1 Establish the Budget and Schedule
  SP 2.2 Identify Project Risks
  SP 2.3 Plan for Data Management
  SP 2.4 Plan for Project Resources
  SP 2.5 Plan for Needed Knowledge and Skills
  SP 2.6 Plan Stakeholder Involvement
  SP 2.7 Establish the Project Plan

SG 3 Obtain Commitment to the Plan
  SP 3.1 Review Subordinate Plans
  SP 3.2 Reconcile Work and Resource Levels
  SP 3.3 Obtain Plan Commitment

Example –
  Project Planning in the CMMI
• Could fully meet the CMMI goals and practices, but still write poor plans
• Six Sigma can be used to improve the planning process and write better plans
Using CMM/CMMI with Six Sigma - 2

• For the organizational infrastructure:
  – Six Sigma identifies what activities are used for improvement (DMAIC, DMADV)
  – CMM/CMMI identifies how those activities might be implemented

Example – Organizational Process Focus in the CMMI

• Six Sigma doesn’t address:
  – Assessing overall capability
  – Selecting specific projects
  – Institutionalizing the improvements

• CMMI provides an approach to setting up the infrastructure

SG 1 Determine Process Improvement Opportunities
  SP 1.1 Establish Organizational Process Needs
  SP 1.2 Assess the Organization’s Processes
  SP 1.3 Identify the Organization’s Process Improvements

SG 2 Plan and Implement Process Improvement Activities
  SP 2.1 Establish Process Action Plans
  SP 2.2 Implement Process Action Plans
  SP 2.3 Deploy Process and Related Process Assets
  SP 2.4 Incorporate Process-Related Experiences into the Organization’s Process Assets

GG 3 Institutionalize a Defined Process
How Six Sigma Helps Process Improvement

- PI efforts often generate have little direct impact on the business goals
  - Confuses ends with means; results measured in activities implemented, not results
- Six Sigma delivers results that matter to managers (fewer defects, higher efficiency, cost savings, …)
- Six Sigma concentrates on problem solving in small groups, focused on a narrow issue
  - Allows for frequent successes (3-9 months)
- Six Sigma focuses on the customer’s perception of quality
How CMM/CMMI Helps Six Sigma Efforts

- CMM/CMMI focuses on organizational change
  - Provides guidance on many dimensions of the infrastructure

**Process Areas**
Organizational Process Focus
Organizational Process Definition
Organizational Training
Organizational Process Performance
Organizational Innovation and Deployment

**Generic Practices (all process areas)**
GP 2.1 Establish an Organizational Policy
GP 2.2 Plan the Process
GP 2.3 Provide Resources
GP 2.4 Assign Responsibility
GP 2.5 Train People
GP 3.1 Establish a Defined Process
GP 2.6 Manage Configurations
GP 2.7 Identify and Involve Relevant Stakeholders
GP 2.8 Monitor and Control the Process
GP 3.2 Collect Improvement Information
GP 2.9 Objectively Evaluate Adherence
GP 2.10 Review Status with Higher-Level Management
Barriers and Challenges

- Capturing the first, “low hanging fruit” makes Six Sigma implementation look easy...
  - Clearer problems, simpler solutions, bigger payoffs
  - Little need for coordination

...but later projects are tougher
  - Keeping projects appraised of similar efforts, past and current
  - Focusing on “the pain”, not the assumed solution

- Engineering process measurements are often difficult to analyze
  - Dirty (or no) data, human recording problems
  - May necessitate Define-Measure-Analyze-Measure-Analyze-etc.

- Must demonstrate the value of quantitative data to managers
  - Management style - reactive vs. proactive vs. quantitative
  - Less value in a chaotic environment
  - Must engage customers
Benefits

**Based on 12 Northrop Grumman CMMI Level 5 organizations**

- **Having multiple improvement initiatives helps encourage a change in behavior as opposed to “achieving a level”**
  - Reinforces that change (improvement) is a way of life

- **The real ROI comes in institutionalizing local improvements across the wider organization**
  - CMMI establishes the needed mechanisms

- **CMMI and Six Sigma compliment each other**
  - CMMI can yield behaviors without benefit
  - Six Sigma improvements based solely on data may miss innovative improvements (assumes a local optimum)

- **Training over half the staff has resulted in a change of language and culture**
  - Voice of Customer, data-driven decisions, causal analysis, etc.
  - Better to understand and use the tools in everyday work than to adopt the “religion”