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

Dashboards for Enterprise-Wide Measurement

Communications & Best-Practice Sharing

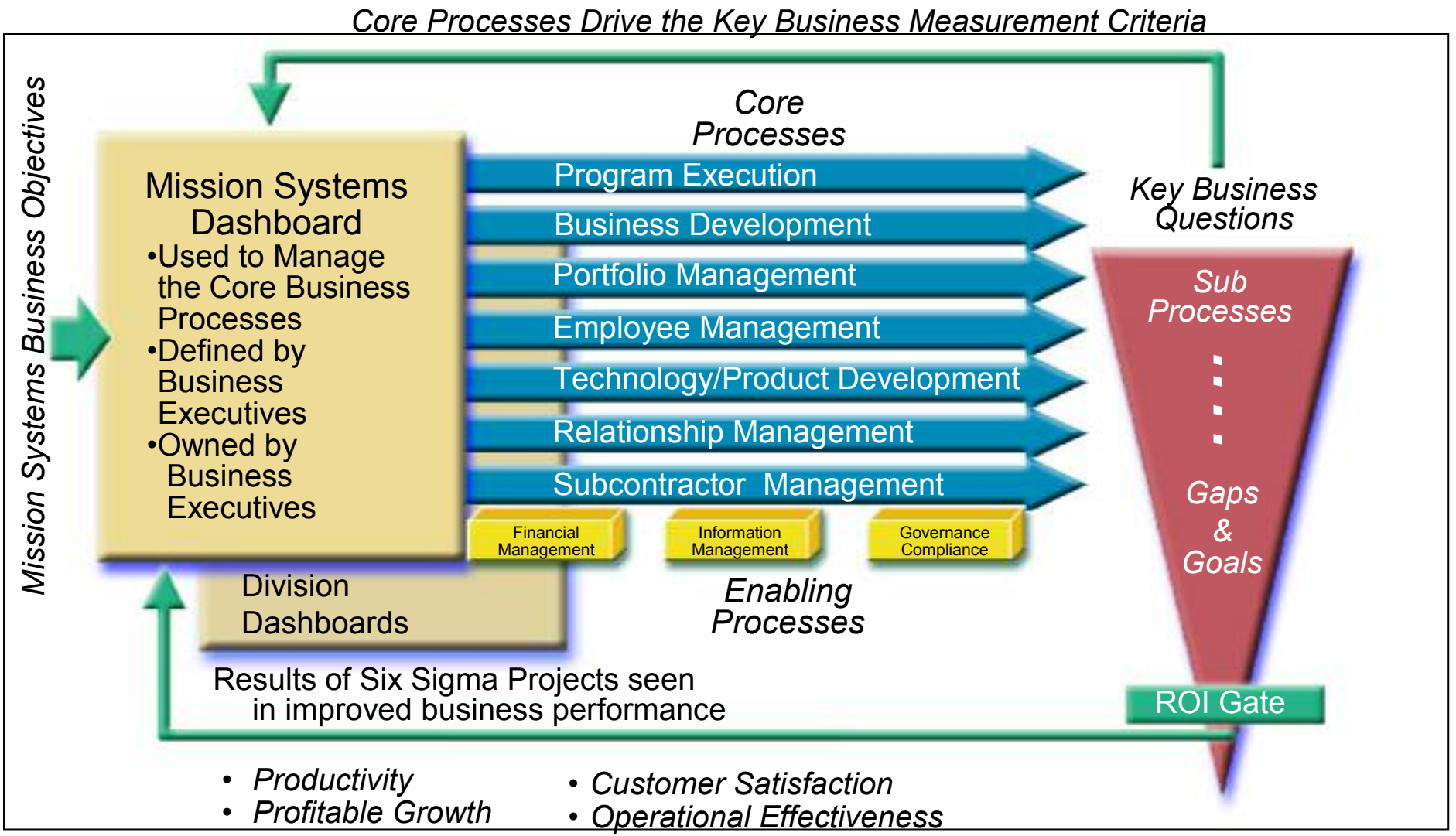
Robust Governance Model (Policies, Processes, Procedures)

CMMI Level 5 for Software, Systems, and Services

ISO 9001 and AS-9100 Certification

Six Sigma

The Enterprise

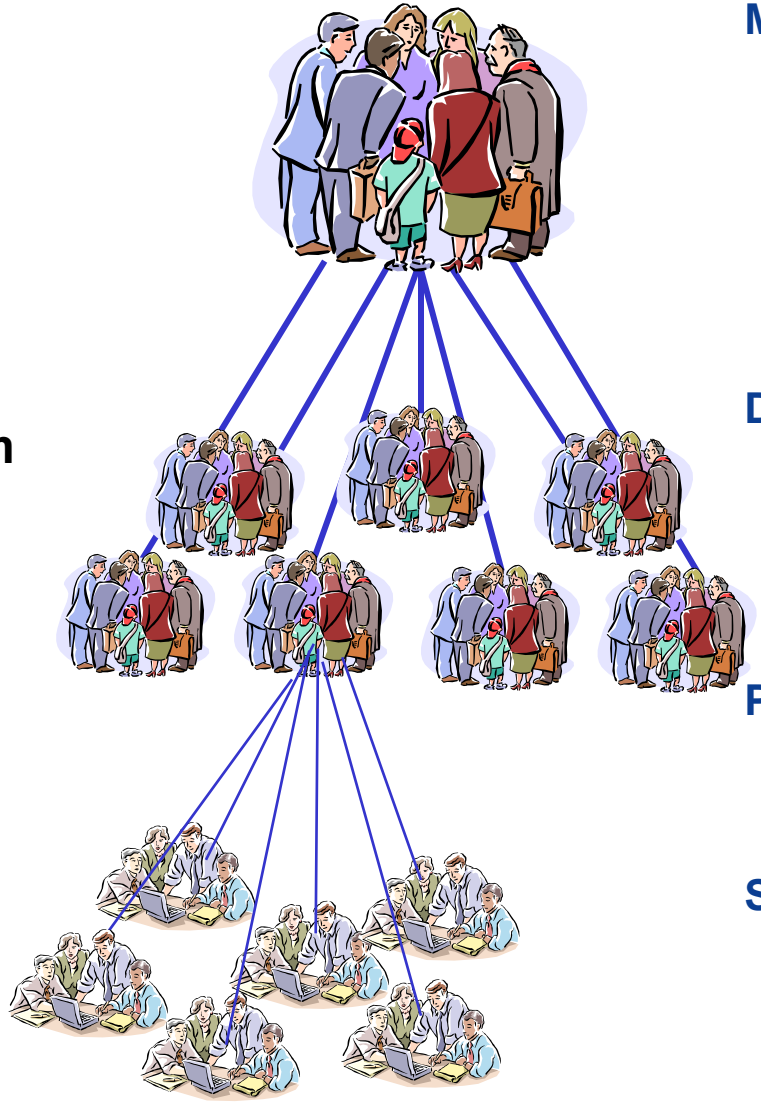


Roles & Responsibilities

- ***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

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

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

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"