Panel: The Business Value Of CMMI ML 5

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Northrop Grumman

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SEI

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CMMI Maturity Level 5

• Describe CMMI ML 5 beyond OPP, QPM, OID and CAR

• How do you operationalize ML5

• What do you measure? What do you watch?

• What business value results:
  - For your customers
  - For your organization
Lockheed Martin
Integrated Systems & Solutions

CMMI Maturity Level 5 Foundation

M. Lynn Penn
Director Quality Systems & Process Management
Communication...Training...Communication...Training
IS&S Measurement Program

**Objective:** The IS&S Measurement Program provides the infrastructure, data, and analysis that
- facilitates program level quantitative management,
- establishes the organization’s process performance baselines,
- facilitates the alignment of organizational process performance with business objectives,
- identifies opportunities to improve program and/or organizational processes,
- models program performance to establish deployment initiatives, and
- facilitates cost, schedule, and quality estimation.

**Led by:** IS&S Measurement Coordinator

**Reports to:** Director, Quality Systems & Process Management, Mission Success

**Oversight:** Measurement Program Steering Committee
IS&S Approach to CMMI Measurement Requirements

Focus | CMMI Process Area | Command Media | Planning |
------|-------------------|---------------|----------|
Program | Quantitative Project Management | IPS0023 Quantitative Management | PPS 2.8 Quantitative Management |
          |                   |               |          |
Organizational | Organizational Process Performance | IBP0023 Measurement Program |
          |                   |               |          |
          |                   |               | Determine Information Needs |
          |                   |               | Select Indicators |
          |                   |               | Determine Decision Criteria |
          |                   |               | Collect Data Sets |
          |                   |               | Analysis |
          |                   |               | Determine Core Indicator Performance Objectives |
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Quantitative Project Management

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LOECKHEED MARTIN
Organizational Measurement Analysis

EMR: Engineering Measurement Report
PPD: Program Profile Database

Type
- Raw Data (Data Sets from Programs)
- Program Summary
- Cross Program Analysis

Residence
- IS&S Measurement Repository (IMR)
- PPD
- EMR

Access
- Measurement Program Proposals
- All IS&S

EMR: Engineering Measurement Report
PPD: Program Profile Database
World Class Processes...

IS&S Journey to CMMI L5

Program Performance

- 95.5% of programs > $50M have no serious problems.
- Improved Award Fee performance continues

Trends

Process Maturity

Software Productivity: Up 52%
Potential Additional Award Fee Achieved: 52.5%
SW Development Cost: Down 23%
Wrap Rate: Down 5.5%
Defect Find / Fix Cost: Down 21%

Historical CMMI L5 $ / LOC

LOC / Hour

$ / LOC

Historical CMMI L5

Historical CMMI L5

Defect Find / Fix cost down by 21%

Drive World Class Performance / Competitiveness
IS&S Benchmarking Maintenance

Initial Benchmark
• SCAMPI C 6-9 months after ATP

One year after Initial Benchmark:

SCAMPI B
• All programs over $X contract value
• Some programs between $X and $X
  – FFP, numerous subs, not co-located team, high risk, corporate or IS&S visibility

SCAMPI C
• Non-SCAMPI B programs between $X and $X
• All programs (>$X) that are following the “primes” or “customers” processes
  – A PPS mapping is required and this is done for process risk determination

REVISITS depend on “Process Risks” identified in previous benchmark – ALL PROGRAMS VISITED EVERY TWO YEARS
The Challenge

- 200+ programs
- Coast-to-coast locations
- 4 business units
- 15,000 technical employees

Process compliance
Process performance
Questions ?
Business Value of CMMI Level 5

CMMI Technology Conference & User Group
13-16 November 2006

Rick Hefner, Ph.D.
Director, Process Management
Northrop Grumman Corporation
Two Complimentary Approaches to Process Improvement

**Data-Driven (e.g., Lean Six Sigma)**
- Clarify what your customer wants (Voice of Customer)
  - Critical to Quality (CTQs)
- Determine what your processes can do (Voice of Process)
  - Statistical Process Control
- Identify and prioritize improvement opportunities
  - Causal analysis of data
- Determine where your customers/competitors are going (Voice of Business)
  - Design for Six Sigma

**Model-Driven (e.g., CMM, CMMI)**
- Determine the industry best practice
  - Benchmarking, models
- Compare your current practices to the model
  - Appraisal, education
- Identify and prioritize improvement opportunities
  - Implementation
  - Institutionalization
- Look for ways to optimize the processes
Lean Six Sigma Provides the Needed Tools to Implement CMMI High Maturity

Level 4
- Understand project’s **process capabilities** based on process performance baselines
- **Control process variation** (remove “assignable causes”)
- **Predict results** using process performance models
- **Manage to achieve goals**

Level 5
- **Base improvement goals** on future business needs
- **Eliminate problem and defect causes** (“common causes”)
- **Select, predict, and measure improvements** to **change the process performance baselines** - shift the mean; tighten the variance
- **Manage change**
Barriers and Challenges

- Engineering process measurements are often difficult to analyze
  - Inherent process variations when human creativity is involved
  - Dirty (or no) data
  - Vague measurement definitions, human recording errors
  - Infrequent measurements
  - Non-normal data
  - Need for stratification/aggregation

- Must demonstrate the value of quantitative data to managers
  - Management style - reactive vs. proactive vs. quantitative
  - Less value in a chaotic environment
  - Must involve customers
Launch Workshop Strategy

Prerequisite
2 week Six Sigma Green Belt training

Launch 1
Intro to Quantitative Management
- Finalize project goals
- Obtain measurement data for the subprocesses the project will put under SPC analysis
- Become familiar with Northrop Grumman Mission Systems QPM process
- Definition of related six sigma project(s)
- Incorporate and measure progress against the Level 4/5 plan tasks

Launch 2
Statistical Process Control
- Collect relevant project historical data, review it and perform initial “clean up”
- Collect data from project subprocesses and put on SPC charts
- Complete project profile
- Review business issues for clarity
- Identify Quantitative Measurement Plan data
- Measure progress against the Level 4/5 plan tasks

Launch 3
Quantitative Monitoring & Management
- Finish building models
- Begin tracking to models
- Draft Quantitative Measurement Plan
- Draft QPM evidence
- Measure progress against the Level 4/5 plan tasks

Launch 4
CMMI Level 5 (OID &CAR)
- Develop project CAR plan
- Start project CAR activities
- Submit improvements to support OID (when applicable)
- Measure progress against the Level 4/5 plan tasks

Launch Workshop Strategy
STM 925.1-Exec, Rev 01, 05-05-04

Launch 0
Executive Overview

Executive Overview
Prerequisite
2 week Six Sigma Green Belt training
How Does Level 4 & 5 Benefit the Customer?

- Organizational process performance
- Quantitative project management
- Organizational innovation and deployment
- Causal analysis

- More accurate estimates
- Problem behaviors are recognized faster, enabling quicker resolution
- The project benefits from improvements found and proven on other projects
- The project fixes the source of defects to prevent future defects

Level 5 reduces costs and improves quality (so we implement it on all projects)

Lessons Learned

Based on over 20 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

- 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)

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

- Training the staff as Six Sigma Green Belts has resulted in a change of language and culture
  - Voice of Customer, data-driven decisions, causal analysis, etc.
  - Better to use the tools in everyday work than to adopt the “religion”
Ogden Air Logistics Center

309 SMXG

Business Value of High Maturity

CMMI Technology Conference

Denver, CO
November 2006

BE AMERICA’S BEST
Who We Are

- 309th Software Maintenance Group, Hill AFB, Utah
- Approximately 700 engineering personnel
- Develop and maintain software for Air Force and other DoD customers
  - F-16 Block 30 OFPs
  - Mission Planning software
  - Aircraft and Missile Automatic Test Systems
  - Command and Control Software
  - IT software
- Majority of work is software maintenance
- 3 product lines--containing 40+ projects total
Our High Maturity Strategy

Customers → Needs → Input → Goals → Measures → Metrics Implementation Guide

Product Lines
- Standard Processes
- Quantitative Goals
- Models
- Baselines

309 SMXG Strategic Plan

Provides focus for what we want to measure

Automatic Test Systems
Weapon Systems Software
Operational Flight Software

BE AMERICA’S BEST
In addition to an organization-level SEPG we have Extended SEPGs (ESEPGs) in each product line.

ESEPG leads are:
- Accomplished Project Managers
- Responsible for mentoring new and less experienced PMs
- Responsible for leading process improvement in the product-line
  - Establishment of process baselines, and models and ensuring their use
  - Collection of measures
  - Leading CAR teams

ESEPG members typically made up of PMs and project leads from within the product line.
Benefits 1

- Improved Customer Relationships
  - Some customers were not initially supportive of our process improvement efforts
  - Now many customers can quantify their expectations to us
  - They are comfortable with reviewing project data and even understand it
  - They have more realistic expectations
  - They can see that they are getting more product for their dollar than in the past
Benefits 2

Three fold reduction in defect density while increasing Productivity by 60% (OFP)

417% increase in productivity (GTACS)

Cycle time reduced from 120 days to less than 60 days in past 2 years. (ATE)
Contact Information

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