Measuring Economic Benefits of Process Improvement in CMMI Level 1 Organizations

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ABB Overview

- Leader in power and automation technologies
- Enable utility and industry customers to improve performance while lowering environmental impact
- ABB’s products help operate Utilities, process industries, manufacturing plants, and other industries

- Present in over 120 countries and employs 110,000 people
- First company in the world to sell 100,000 robots
- A vast majority of ABB products have software & hardware components
ABB’s Organizational Structure

- Corporate Research
- Power Products
- Power Systems
- Automation Products
- Process Automation
- Robotics
ABB’s Products

- Power Products
- Power Systems
ABB’s Products

- Automation Products
- Process Automation
- Robotics
ABB Software Process Initiative (ASPI) acts as the Corporate Engineering Process Group

ASPI is composed of members from 2 ABB Corporate Research Centers (CRCs):
- United States: Raleigh
- Sweden: Vasteras

Responsible for:
- Initiation activities
- Performance of appraisals
- Development of improvement methodologies,
- Evaluation and deployment of pilots within ABB for CMMI transition, PSP/TSP, etc.
- Assisting units in establishing improvement plans and acting
- Collect lessons learned from process improvement activities
ABB Corporate EPG Support

Product Development Units in ABB Globally in all Divisions

Support ABB Development Units in their Continuous Improvement Efforts to establish a culture of product development excellence
Continuous Process Improvement Cycle

- Initiate Improvement activity
  - Define Medium/Long-term Strategic Improvement Plan (SIP) and identify organization’s business goals
- Conduct internal CMMI Appraisal (Class B)
- Develop Process Improvement Plan (PIP)
  - Prioritize process improvement activities using Business Objectives
- Implement PIP and monitor
- Lessons learned
- Re-Initiate
Primary customers of ABB are commercial organizations (Utilities, petrochemical industries, pharmaceutical, automotive, chemical plants, etc.)

Motivation to improve is driven by business reasons

When Maturity Level is not a business objective, prioritization of improvement activities is paramount
Results of Internal ABB Class B CMMI Appraisal

- Establishes a baseline in the organization
- Serves as a basis to identify process improvement activities
- Recommended to include the Measurement and Analysis Process Area
Measurement and Analysis

- Two Types of metrics:
  - Metrics associated with the product
  - Metrics associated with the development process
Typical Process-related MA in a CMMI Level 1 Organization

- Measurement Objectives for Process Improvement not clearly defined
  - Information needs and objectives are not consistently defined and documented
  - Measurement objectives are not consistently defined
  - Measurement objectives are not consistently aligned with information needs

- Specify Measures for Process Improvement
  - Quantifiable measures are not consistently traceable to measurement objectives
  - No clear definition between base and derived measures

- Collection and storage of specific measurement data associated with process improvement is not consistently defined

- Analysis and reporting of measurement data for process improvement is not consistently specified
Goal-Questions-Metrics Paradigm

- GQM presents a systematic approach for integrating goals to models of the software processes, products and quality perspectives of interest based upon the specific needs of the project and the organization. (Basili et al, 1994).
GQM Definitions

- Define major goals of the process improvement activity

- Questions derived from goals that must be answered to determine if the goals are achieved

- Measurements that provide the most appropriate information for answering the identified questions
Example of GQM for Process Measurement

Goals
- Decrease Development Costs
- Improve Quality of Products
- Ensure on-time Delivery
- Decrease Risks in Projects

Questions
- How many defects products have?
- Where are defects introduced?
- In which modules are defects introduced?
- What is the severity of defects?

Metrics
- Number of defects found in released products in first three months, by month
- Module(s) responsible for defect(s)
- Severity rating for each defect
Product Development Process Metrics

- Typically associated with:
  - Consumption of resources during a process
  - Process control
  - Errors or faults associated with a particular process
Example of Development Process Metrics

- Management control metrics
  - Deviation between actual and estimates
  - Deviation from promised final delivery

- Test coverage metrics
  - Number of defects introduced
  - Cost of reducing defects
  - Where defects are introduced
  - Error distribution by cause

- Effort
  - Person/time metrics (not elapsed but actual)

- Time
  - Time to market metrics

- Productivity
  - Software output per unit of input
Discussion of an Example at ABB

Please refer to Handouts to follow specific Example discussion
Lessons Learned

- A CMMI appraisal provides the foundation for process improvement
- Using the GQM approach is a useful way to establish a metrics program for process improvement
- Establish Goals from business objectives
- Business objectives should be employed to prioritize process improvement activities after appraisal has been conducted
- Use the CMMI Measurement and Analysis process area practices to establish metrics for process improvement
- Process improvement should include the MA process area together with any other improvement to ensure meaningful measurements are obtained
- Start small and simple