Strategies for Retaining CMMI Maturity Level 5 in v1.3

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Factors Driving v1.3 Changes

• Bring constellations (-DEV, -SVC, -ACQ) into harmony

• Simplify the model architecture

• Reflect modern engineering approaches (Agile, Lean Six Sigma, quality attributes, architectural methods, etc.)

• Clarify high maturity and enhance its value
Why Didn’t Customers See Value in ML5?

• Some adopters viewed high maturity as “applying Statistical Process Control to something” (i.e., finding some stable subprocess with enough data points to be able to construct control charts)

• Some organizations constructed process performance baselines and models with little relationship to project performance

• Some projects selected subprocesses to quantitatively manage that did not contribute significantly to their customer’s quality and process objectives
The Value of Level 4/5

• **The value of Level 4/5 is *insight***
  - Level 4/5 is 10-20% cheaper than Level 3 (even though more is being done)
  - Quantitative management establishes expected ranges of process performance
  - Process are stable and predictable – unusual process behaviors can be quickly identified, so effective corrective action can be taken

• **To realize the value of Level 4/5**
  - Processes have to be stable (performed consistently)
  - Processes under statistical control must support business objectives
  - Data has to be useful and clean
  - Analysis has to lead to actions
Understanding the Process

Managing by Variation

• How many errors are typically found in reviewing an interface specification?

• Useful in evaluating future reviews
  - Was the review effective?
  - Was the process different?
  - Is the work product different?

Corrective and preventative actions
Quantitative Project Management
Restructured SPs, clarified quantitative management

QPM V1.2

SG 1 Quantitatively Manage the Project
SP 1.1 Establish the Project’s Objectives
SP 1.2 Compose the Defined Process
SP 1.3 Select the Subprocesses that Will Be Statistically Managed
SP 1.4 Manage Project Performance

SG 2 Statistically Manage Subprocess Performance
SP 2.1 Select Measures and Analytic Techniques
SP 2.2 Apply Statistical Methods to Understand Variation
SP 2.3 Monitor Performance of the Selected Subprocesses
SP 2.4 Record Statistical Management Data

QPM V1.3

SG 1 Prepare for Quantitative Management
SP 1.1 Establish the Project’s Objectives
SP 1.2 Compose the Defined Process
SP 1.3 Select Subprocesses and Attributes
SP 1.4 Select Measures and Analytic Techniques

SG 2 Quantitatively Manage the Project
SP 2.1 Monitor the Performance of Selected Subprocesses
SP 2.2 Manage Project Performance
SP 2.3 Perform Root Cause Analysis
SP 1.3  Select Subprocesses and Attributes

Select subprocesses and attributes critical to evaluating performance and that help to achieve the project’s quality and process performance objectives.

Examples of criteria used to select subprocesses include the following:
- There is a strong correlation with performance results that are addressed in the project’s objectives.
- Stable performance of the subprocess is important.
- Poor subprocess performance is associated with major risks to the project.
- One or more attributes of the subprocess serve as key inputs to process performance models used in the project.
- The subprocess will be executed frequently enough to provide sufficient data for analysis.

Examples of product and process attributes include the following:
- Effort consumed to perform the subprocess
- The rate at which the subprocess is performed
- Cycle time for process elements that make up the subprocess
- Resource or materials consumed as input to the subprocess
- Skill level of the staff member performing the subprocess
- Quality of the work environment used to perform the subprocess
- Volume of outputs of the subprocess (e.g., intermediate work products)
- Quality attributes of outputs of the subprocess (e.g., reliability, testability)
Quantitatively Manage the Project

SP 2.2  Manage Project Performance

Monitor the project using statistical and other quantitative techniques to determine whether or not the project’s objectives for quality and process performance will be satisfied, and identify corrective action as appropriate.

1. Periodically review the performance of subprocesses.

Stability and capability data from monitoring selected subprocesses, as described in SP2.1, are a key input into understanding the project’s overall ability to meet quality and process performance objectives.

4. Use process performance models calibrated with project data to assess progress toward achieving the project’s quality and process performance objectives.

Process performance models are used to assess progress toward achieving objectives that cannot be measured until a future phase in the project lifecycle. Objectives can either be interim objectives or overall objectives.
Perform root cause analysis of selected issues to address deficiencies in achieving the project’s quality and process performance objectives.
Organizational Process Performance
Re-ordered SPs, projects can develop PPBs/PPMs

OPP V1.2

SG 1 Establish Performance Baselines and Models
SP 1.1 Select Processes
SP 1.2 Establish Process-Performance Measures
SP 1.3 Establish Quality and Process-Performance Objectives
SP 1.4 Establish Process-Performance Baselines
SP 1.5 Establish Process-Performance Models

OPP V1.3

SG 1 Establish Performance Baselines and Models
SP 1.1 Establish Quality and Process Performance Objectives
SP 1.2 Select Processes
SP 1.3 Establish Process Performance Measures
SP 1.4 Analyze Process Performance and Establish Process Performance Baselines
SP 1.5 Establish Process Performance Models
Establishing Process Performance Baselines

SP 1.4 Analyze Process Performance and Establish Process Performance Baselines

Establish Analyze the performance of the selected processes, and establish and maintain the organization's process performance baselines.

These baselines are used to determine the expected results of the process or subprocess when used on a project under a given set of circumstances.

Process performance baselines are compared to the organization’s quality and process performance objectives to determine if the quality and process performance objectives are being achieved.

The process performance baselines are a measurement of performance for the organization’s set of standard processes at various levels of detail:

- Sequence of connected processes
- Processes that cover the entire life of the project
- Processes for developing individual work products
Causal Analysis & Resolution

Outcomes can be positive

**CAR V1.2**

SG 1 Determine Causes of Defects
SP 1.1 Select Defect Data for Analysis
SP 1.2 Analyze Causes

SG 2 Address Causes of Defects
SP 2.1 Implement the Action Proposals
SP 2.2 Evaluate the Effect of Changes
SP 2.3 Record Data

**CAR V1.3**

SG 1 Determine Causes of Selected Outcomes
SP 1.1 Select Outcomes for Analysis
SP 1.2 Analyze Causes

SG 2 Address Causes of Selected Outcomes
SP 2.1 Implement Action Proposals
SP 2.2 Evaluate the Effect of Implemented Actions
SP 2.3 Record Causal Analysis Data
Selecting Outcomes for Analysis

SP 1.1 Select Outcomes for Analysis

*Select outcomes for analysis.*

Examples of when to perform causal analysis include the following:
- When a stable subprocess does not meet its specified quality and process performance objectives, or when a subprocess needs to be stabilized
- During the task, if and when problems warrant a causal analysis meeting
- When a work product exhibits an unexpected deviation from its requirements
- When more defects than anticipated escape from earlier phases to the current phase
- When process performance exceeds expectations
- At the start of a new phase or task
Organizational Performance Management

Added SG1, generalized piloting

OPM V1.2

SG 1 Select Improvements
SP 1.1 Collect and Analyze Improvement Proposals
SP 1.2 Identify and Analyze Innovations
SP 1.3 Pilot Improvements
SP 1.4 Select Improvements for Deployment

SG 2 Deploy Improvements
SP 2.1 Plan the Deployment
SP 2.2 Manage the Deployment
SP 2.3 Measure Improvement Effects

OPM V1.3

SG 1 Manage Business Performance
SP 1.1 Maintain Business Objectives
SP 1.2 Analyze Process Performance Data
SP 1.3 Identify Potential Areas for Improvement

SG 2 Select Improvements
SP 2.1 Elicit Suggested Improvements
SP 2.2 Analyze Suggested Improvements
SP 2.3 Validate Improvements
SP 2.4 Select and Implement Improvements for Deployment

SG 3 Deploy Improvements
SP 3.1 Plan the Deployment
SP 3.2 Manage the Deployment
SP 3.3 Evaluate Improvement Effects
SG 1  Manage Business Performance

The organization’s business performance is managed using statistical and other quantitative techniques to understand process performance shortfalls, and to identify areas for process improvement.

SP 1.1 Maintain Business Objectives

Maintain business objectives based on an understanding of business strategies and actual performance results.

SP 1.2 Analyze Process Performance Data

Analyze process performance data to determine the organization’s ability to meet identified business objectives.

SP 1.3 Identify Potential Areas for Improvement

Identify potential areas for improvement that could contribute to meeting business objectives.
NGC Business Goals and Performance Objectives

Strategic Objectives

- Meet our commitments
- Vigorous pursuit of new business
- Quality and process improvement
- Cross-sector collaboration
- Compete and perform as a Tier 1 player

Quality & Process Performance Objectives

- Increase understanding of product quality across wider range of project processes and decrease variation
- Develop understanding of process performance across wider range of project processes and decrease variation

Organizational strategic goals flow down annually
Organizational staff develop proposed organizational quantitative quality and process performance objectives based on the strategic goals
The proposed quantitative goals are reviewed with the Divisions and adjusted as needed
OPM Validation

SP 2.3 Validate Improvements

Validate selected improvements.

Examples of validation methods include the following:

- Discussions with stakeholders, perhaps in the context of a formal review
- Prototype demonstrations
- Pilots of suggested improvements
- Modeling and simulation

Pilots can be conducted to evaluate significant changes involving untried, high-risk, or innovative improvements before they are broadly deployed. Not all improvements need the rigor of a pilot.
How Does Level 4 & 5 Benefit the Customer?

<table>
<thead>
<tr>
<th>Category</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational Process Performance</td>
<td>More accurate estimates</td>
</tr>
<tr>
<td>Quantitative Project Management</td>
<td>Problem behaviors are recognized faster, enabling quicker resolution</td>
</tr>
<tr>
<td>Organizational Performance Management</td>
<td>The organization and projects benefit from improvements found and proven on other projects</td>
</tr>
<tr>
<td>Causal Analysis and Resolution</td>
<td>The project fixes the source of defects to prevent future defects</td>
</tr>
</tbody>
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Better Products and Services Produced Faster And Cheaper

Adapted from “How Does High Maturity Benefit the Customer?”, R. Hefner, Systems & Software Technology Conference, 2005