

# **Strategies for Retaining CMMI Maturity Level 5 in v1.3**

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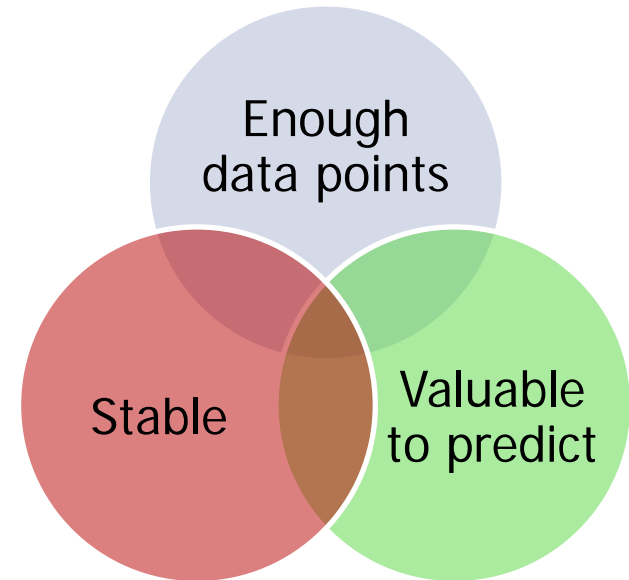
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# Factors Driving v1.3 Changes

- **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?

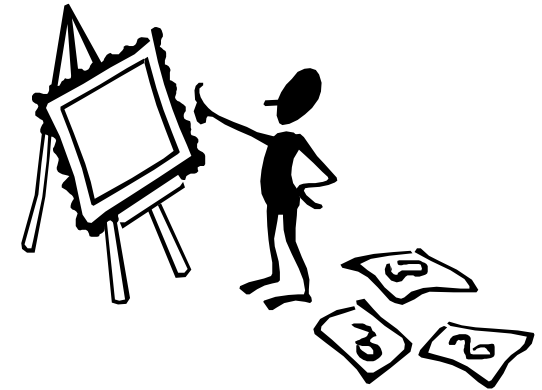
- **Some adopters viewed high maturity as “applying Statistical Process Control to something” (i.e., finding some stable subprocess with enough data points to be able to construct control charts)**



- **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 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
- Processes 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

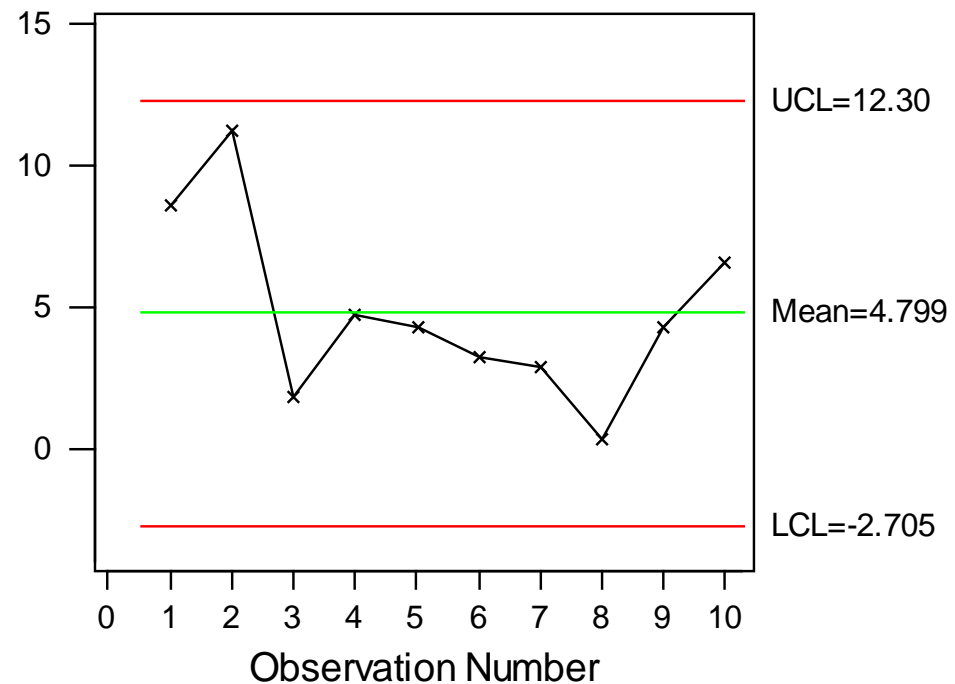
## Managing by Variation

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

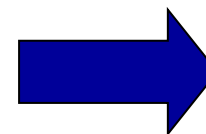
Expected  
Variation

Average

Individual Value



- 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)

## SP 2.2 Manage Project Performance

~~Monitor~~Manage 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.



## **SP 2.3 Perform Root Cause Analysis**

*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

## 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

## 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

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### 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

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### 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.*

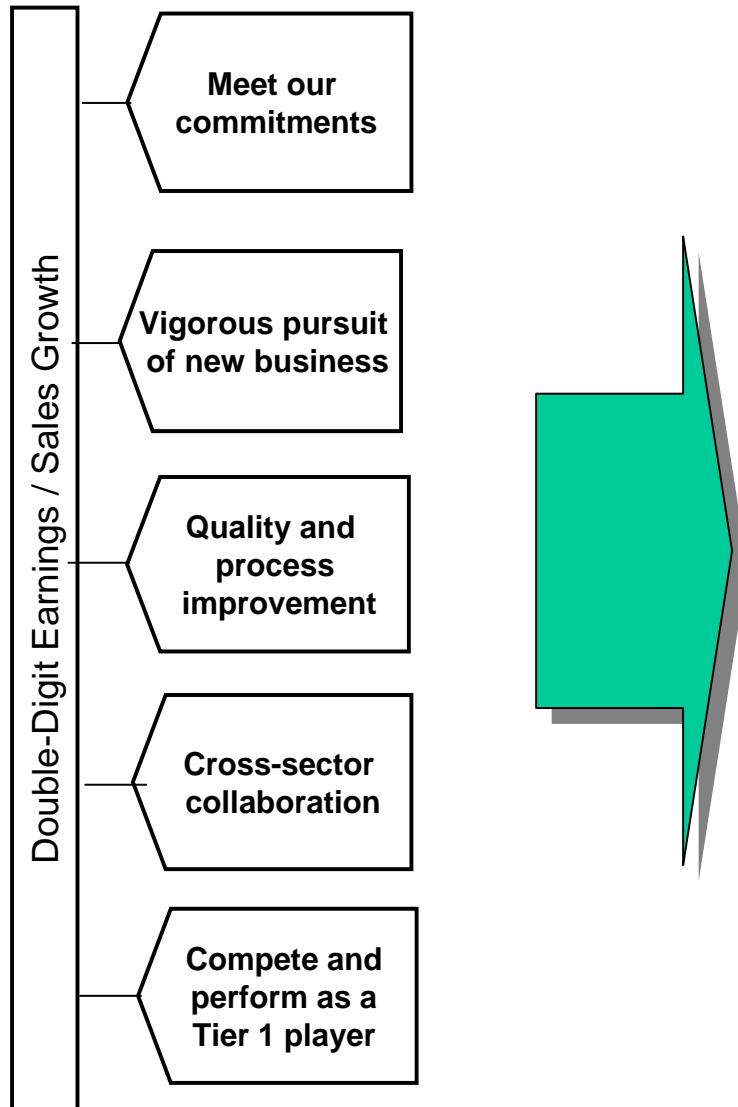
### **SP 1.2 Analyze Process Performance Data**

*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.*

## Strategic Objectives



## 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



## SP 2.3 Validate Improvements

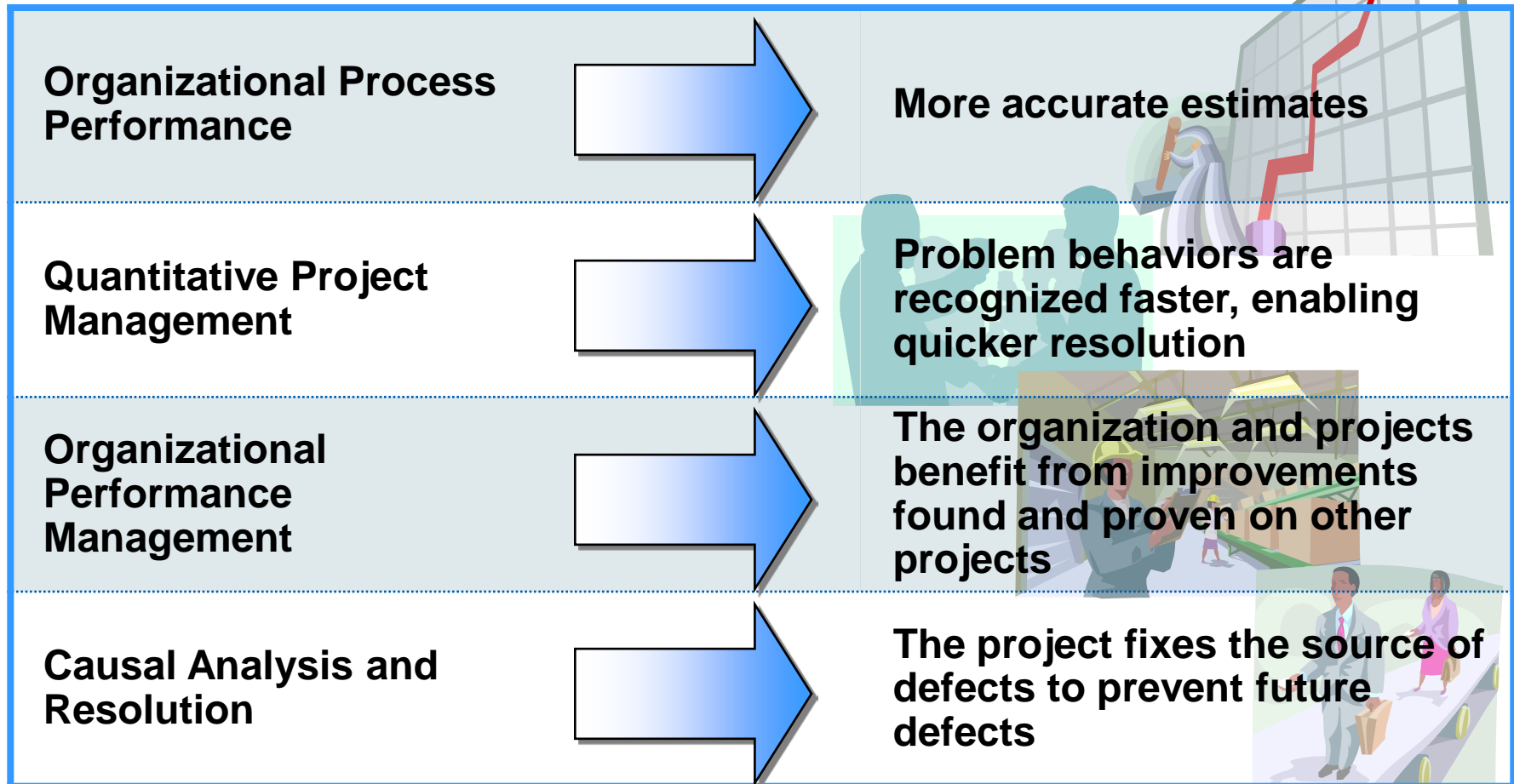
*Validate selected improvements.*

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?



***Better Products and Services Produced Faster And Cheaper***

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

***NORTHROP GRUMMAN***

