CMMI® Version 1.2 and Beyond

SEPG 2007 Conference
March 26, 2007

Mike Phillips
Software Engineering Institute
Carnegie Mellon University

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With thanks to Denise Cattan, Sandra Cepeda, Pascal Rabbath, and Gary Wolf for contributions.
CMMI Today
Selected CMMI® Data (FY06)

17,630 Trained in Introduction to CMMI

Net increase of:
- 108 Authorized Introduction to CMMI Instructors
  ▪ 45 Authorized SCAMPI Lead Appraisers
  ▪ 84 Authorized SCAMPI B/C Team Leads

744 SCAMPI V1.1 Class A Appraisals conducted and reported to the SEI

417 Publicly Reported SCAMPI V1.1 Class A Appraisals on the SEI Web Site
Transition from V1.1 to V1.2 Status - 12-31-06

Introduction to CMMI Students
• Registered for Upgrade Training – 1275
• Upgrades Complete – 717

Lead Appraisers and Instructors
• Registered for Upgrade Training – 621
• Upgrade Training Complete – 419
CMMI Transition Status – 12/31/06

Training
Introduction to CMMI – 59,434 trained
Intermediate CMMI – 2,367 trained
Introduction to CMMI Instructors – 477
SCAMPI Lead Appraisers – 684 trained
SCAMPI B&C-Only Team Lead -- 33

Authorized
Introduction to CMMI V1.1 Instructors – 408
SCAMPI V1.1 Lead Appraisers – 455
SCAMPI B&C Team Leads -- 456
CMMI Adoption Trends

CMMI Web pages views in September 2006
- 360K/month
- Exceeded 24K/day

The following were the most downloaded files on the SEI Web site in September 2006:
- CMMI-DEV, V1.2 (PDF Version)
- CMMI V1.1 Overview Presentation
- CMMI V1.2 Overview Presentation
- CMMI-DEV, V1.2 (Word Version)
- CMMI V1.2 Model Changes Presentation

Average daily page views per quarter
Number of SCAMPI vX Class A Appraisals Conducted by Year by Representation*
Reported as of 31 December 2006
*Where Representation is reported

- Staged
- Continuous
Reporting Organizational Categories

- Commercial/In-house: 67.6%
- Contractor for Military/Government: 28.8%
- Military/Government Agency: 3.6%

Based on 1,377 organizations
Organization Size
Based on the total number of employees within the area of the organization that was appraised

<table>
<thead>
<tr>
<th>Organization Size</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 or fewer</td>
<td>9.8%</td>
</tr>
<tr>
<td>26 to 50</td>
<td>13.4%</td>
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<tr>
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<td>1001 to 2000</td>
<td>20.0%</td>
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<tr>
<td>1 to 100</td>
<td>43.0%</td>
</tr>
</tbody>
</table>

Based on 1,348 organizations reporting size data
Reporting Organizational Types

- Commercial/In-house: 64.0%
- Contractor for Military/Government: 31.3%
- Military/Government Agency: 4.7%

Based on 878 organizations

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Maturity Profile by All Reporting USA and Non-USA Organizations

Based on 498 USA organizations and 879 Non-USA organizations

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Countries where Appraisals have been Performed and Reported

Argentina  Australia  Austria  Bahrain  Belarus  Belgium  Brazil  Canada
Chile  China  Colombia  Czech Republic  Denmark  Dominican Republic  Egypt  Finland
France  Germany  Hong Kong  India  Indonesia  Ireland  Israel  Italy
Japan  Korea, Republic of Latvia  Malaysia  Mauritius  Mexico  Morocco  Netherlands
New Zealand  Pakistan  Philippines  Portugal  Russia  Singapore  Slovakia  South Africa
Spain  Sweden  Switzerland  Taiwan  Thailand  Turkey  Ukraine  United Kingdom

Red country name: New additions with this reporting

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# Number of Appraisals and Maturity Levels Reported to the SEI by Country

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of Appraisals</th>
<th>Maturity Level 1 Reported</th>
<th>Maturity Level 2 Reported</th>
<th>Maturity Level 3 Reported</th>
<th>Maturity Level 4 Reported</th>
<th>Maturity Level 5 Reported</th>
<th>Country</th>
<th>Number of Appraisals</th>
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<tr>
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<tr>
<td>Italy</td>
<td>10 or fewer</td>
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<td></td>
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<td>United States</td>
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<td>Yes</td>
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<td>Japan</td>
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<td>Vietnam</td>
<td>10 or fewer</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Disciplines Selected for Appraisals

Based on 1,581 appraisals

For more information about Allowable Models & Combinations, visit: http://www.sei.cmu.edu/cmmi/background/aspec.html

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Combined Appraisal Opportunities

Current ISO 9001
ISO 9001 IA

SCAMPI ‘A’ & ISO 9001

Rating letter & or certificate with scope indicating “... in accordance with Level X”

Visit Report

... continues to demonstrate compliance with ISO 9001:2000

... no behaviours inconsistent with operating at level X

Current CMMI
SCAMPI ‘A’

SCAMPI ‘A’ (Cat ‘C’ appraisal)

The possible options for assessment and surveillance

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Adoption: What Else Is Happening?

The Addison-Wesley SEI Series Book and:

• A Guide to the CMMI
• CMMI: A Framework …
• CMMI Assessments
• CMMI Distilled: Second Edition
• CMMI SCAMPI Distilled
• CMMI Survival Guide
• CMMI: Un Itinéraire Fléché
• De kleine CMMI
• Interpreting the CMMI
• Making Process Improvement Work
• Practical Insight into CMMI
• Real Process Improvement Using the CMMI
• Systematic Process Improvement Using ISO 9001:2000 and CMMI
• Balancing Agility and Discipline
How about SEI Publications?

Technical notes and special reports:
• Using CMMI-DEV for sourcing
• Interpreting CMMI:
  - for Operational Organizations
  - for COTS Based Systems
  - for Service Organizations
  - for Marketing
• Using CMMI with:
  - Earned Value Management
  - Product Line Practices
  - Six Sigma
• Supplementing CMMI for Safety Critical Development
• Demonstrating the Impact and Benefits of CMMI (and web pages – www.sei.cmu.edu/cmmi/results)
## Performance Results Summary

<table>
<thead>
<tr>
<th>Improvements</th>
<th>Median</th>
<th># of data points</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>34%</td>
<td>29</td>
<td>3%</td>
<td>87%</td>
</tr>
<tr>
<td>Schedule</td>
<td>50%</td>
<td>22</td>
<td>2%</td>
<td>95%</td>
</tr>
<tr>
<td>Productivity</td>
<td>61%</td>
<td>20</td>
<td>11%</td>
<td>329%</td>
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<tr>
<td>Quality</td>
<td>48%</td>
<td>34</td>
<td>2%</td>
<td>132%</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>14%</td>
<td>7</td>
<td>-4%</td>
<td>55%</td>
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<tr>
<td>Return on Investment</td>
<td>4.0 : 1</td>
<td>22</td>
<td>1.7 : 1</td>
<td>27.7 : 1</td>
</tr>
</tbody>
</table>

- N = 30, as of August 2006
- Organizations with results expressed as change over time
CMMI Today

Version 1.1 CMMI Product Suite was released January 2002.

- CMMI Web site visits average over 12,000/day
- Over 58,000 people have been trained
- Almost 1600 “class A” appraisals have been reported to the SEI

Now we want to continuously improve…
CMMI V1.2…and Beyond
Major Themes

Reduce complexity & size
Increase coverage
Increase confidence in appraisal results
Reduced Model Complexity & Size

Eliminated the concepts of advanced practices and common features

Incorporated ISM into SAM; eliminated Supplier Sourcing (SS) addition

Consolidated and simplified the IPPD material

All definitions consolidated in the glossary

Adopted a single book approach (i.e., will no longer provide separate development models)

Report size reduced 15% from either predecessor; PAs reduced 12%
Increased Model Coverage

Added hardware amplifications

Added two work environment practices (i.e., one in OPD and one in IPM)

Added goal and two practices in OPF to emphasize importance of project startup

Updated notes (including examples) where appropriate so that they also address service development and acquisition of critical elements

Updated name to CMMI for Development (CMMI-DEV) to reflect the expanded coverage
Model Changes - Other

Improved the Overview section (Part One)

Improved clarity of how GPs are used

• Moved generic goals and practices to Part Two
• Added explanation of how process areas support the implementation of GPs
• Added GP elaborations for GP 3.2

Improved the glossary (e.g., higher level management, bidirectional traceability, subprocess)

Limited the process areas that can be considered “not applicable” to SAM.

Clarified material throughout the model based on over 1000 change requests
Integrated Product and Process Development (IPPD) Changes

IPPD material is being revised significantly.

- Organization Environment for Integration PA removed and material moved to Organizational Process Definition (OPD) PA.
- Integrated Teaming PA removed and material moved to Integrated Project Management (IPM) PA.
- IPPD goals have been consolidated.
  - “Enable IPPD Management” in OPD
  - “Apply IPPD Principles” in IPM
- Overall material condensed and revised to be more consistent with other PAs.
CMMI Model Combinations

V 1.1

Supplier Sourcing
Integrated Product and Process Development
SE Related Examples
SW Related Examples
CMMI Core

V 1.2

IPPD
Organizational Goal (OPD)
Project Goal (IPM)
SW Related Examples
SE Related Examples
HW Related Examples
CMMI Core (now includes SS)
IPPD Changes

V1.1

Process Mgt PAs

Support PAs

OEI

SG1

SG2

IPM

SG1

SG2

SG3

SG4

IT

SG1

SG2

V1.2

OPD

SG1

SG2

SG3 = Apply IPPD principles

SG2 = Enable IPPD principles

SG3 = Apply IPPD principles
Supplier Agreement Management

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
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<tbody>
<tr>
<td>Establish Supplier Agreements</td>
<td>1.1 – Determine Acquisition Type</td>
</tr>
<tr>
<td></td>
<td>1.2 – Select Suppliers</td>
</tr>
<tr>
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<td>1.3 – Establish Supplier Agreements</td>
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<tr>
<td>Satisfy Supplier Agreements</td>
<td>2.1 – Execute the Supplier Agreement</td>
</tr>
<tr>
<td></td>
<td>2.2 – Monitor Selected Supplier Processes</td>
</tr>
<tr>
<td></td>
<td>2.3 – Evaluate Selected Supplier Work Products</td>
</tr>
<tr>
<td></td>
<td>2.4 – Accept the Acquired Product</td>
</tr>
<tr>
<td></td>
<td>2.5 – Transition Products</td>
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</table>

v1.1 SP2.1 “Review COTS Products,” was eliminated. “Identify candidate COTS products that satisfy requirements” is a new subpractice under the Technical Solutions Process Area SP1.1, “Develop Alternative Solutions and Selection Criteria.”
Organizational Process Focus

<table>
<thead>
<tr>
<th>V1.1</th>
<th>V1.2</th>
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<tr>
<td><strong>SG1 – Determine Process Improvement Opportunities</strong></td>
<td><strong>SG1 – Determine Process Improvement Opportunities</strong></td>
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<tr>
<td>1.1 – Establish Organizational Process Needs</td>
<td>1.1 – Establish Organizational Process Needs</td>
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<td>1.2 – Appraise the Organization’s Processes</td>
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<td>1.3 – Identify the Organization’s Process Improvements</td>
<td>1.3 – Identify the Organization’s Process Improvements</td>
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<td><strong>SG2 – Plan and Implement Process Improvement Activities</strong></td>
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<td>2.2 – Implement Process Action Plans</td>
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<td>2.3 – Deploy Organizational Process Assets</td>
<td><strong>New</strong></td>
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<td>2.4 – Incorporate Process-Related Experiences into the Organizational Process Assets</td>
<td>3.1 – Deploy Organizational Process Assets</td>
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<td>3.2 -- Deploy Standard Processes</td>
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<td>3.3 -- Monitor Implementation</td>
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<td>3.4 -- Incorporate Process Related Experiences into the Organizational Process Assets</td>
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SCAMPI A Changes for V1.2

Method implementation clarifications
- interviews in “virtual” organizations
- practice characterization rules
- organizational unit sampling options

Appraisal Disclosure Statement (ADS) improvements
- reduce redundancy with other appraisal documents
- improve usability for sponsor and government
- Level 4,5 mapping to business objectives
- require sponsor’s signature on the ADS
- require all team members to show agreement on findings
- Both V1,1 and V1.2 ADS reflect these today

Appraisal team will have responsibility for determination of “applicability” for SAM

Maturity level and capability level shelf life – 3 years, given 1 year of V1.2 availability
Published Appraisal Results

List of Published SCAMPI Appraisal Results

**ORGANIZATION NAME:** Satyam Computer Services Ltd.
**SPONSOR NAME:** Nagaraj Chavour
**LEAD APPRAISER NAME:** Raghavan Nandyal
**SEI PARTNER:** STARA Technologies Pvt. Ltd.
**APPRAISAL END DATE:** 4/3/2004
**MATURITY LEVEL ASSIGNED:** 5

**APPRAISED ORGANIZATIONAL UNIT:**
- **Entity Name:** SRU-BE-GOC
- **Location(s):** Secunderabad, AP, India

**CMMI MODEL USED:** CMMI-SW/PPD, V1.1, Continuous
**APPRaised METHOD USED:** SCAMPI v1.1

**MODEL SCOPE & CAPABILITY RATINGS ASSIGNED:**

<table>
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<th>Project Management</th>
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<th>Support</th>
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<td>DAR</td>
</tr>
<tr>
<td>OID</td>
<td>RSKM</td>
<td>VER</td>
<td>OEL</td>
</tr>
<tr>
<td>IT</td>
<td>ISM</td>
<td>VAL</td>
<td>CAR</td>
</tr>
<tr>
<td>QPM</td>
<td>Not Rated</td>
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</tbody>
</table>
CMMI Training v1.2

Introduction to CMMI (Staged and Continuous)
• Editorial update released 9/05
• Updated v1.2 phased in this fall

Intermediate Concepts of CMMI
• Being updated for v1.2
• will better prepare students for SCAMPI training

CMMI Instructor Training
• Being updated to reflect v1.2 changes

“Delta” training from V1.1 to V1.2
• Available on-line for free
• More extensive upgrade course for fee
  - Appraisal Team members
  - Lead Appraisers, Instructors, candidates
CMMI V1.2 Schedules

Version 1.2 CMMI Product Suite release
V1.2 ADS required for all SCAMPIs
Last V1.1 Intro training
First expiration of V1.1 appraisals (3 year validity)
Last V1.1 appraisal
Full Certification for Lead Appraisers begins

August 25, 2006
November, 2006
December, 2006
August 25, 2007
August 31, 2007
October, 2007
Beyond V1.2

Improved architecture will allow post-V1.2 expansion.

- Extensions of the life cycle (Services, Outsourcing/Acquisition) could expand use of a common organizational framework:
  - allows coverage of more of the enterprise or potential partnering organizations
  - adapts model features to fit non-developmental efforts (e.g., CMMI Services, CMMI Acquisition)
Three Complementary Constellations

**CMMI-DEV**
provides guidance for measuring, monitoring, and managing development processes

**16 Core Process Areas**
used in all

**CMMI-SVC**
provides guidance for those providing services within organizations and to external customers

**CMMI-ACQ**
provides guidance to enable informed and decisive acquisition leadership
Architecture & Constellations

CMMI Framework

Core Foundation Model
Common PAs, Specific Practices, Generic Practices

Shared CMMI Material
Specific Practices, Additions, Amplifications

Development
Specific Materials

• Development Amplifications
• Development Additions
  • PA XX
  • PA ZZ
  • PA DEV

Acquisition
Specific Materials

• Acquisition Amplifications
• Acquisition Addition
  • PA YY
  • PA XX
  • PA ACQ

Services
Specific Materials

• Services Amplifications
• Services Additions
  • PA ZZ
  • PA YY
  • PA SRV
Beyond V1.2

First two new “constellations,” CMMI for Services and CMMI for Acquisition, have been “commissioned” by CMMI Steering Group. Development will be in parallel with V1.2 effort; publication sequenced after V1.2 rollout.

Northrop-Grumman is leading industry group for CMMI Services.

• Initial focus will be for organizations providing “DoD services” as well as internal IT:
  - System maintenance
  - Network Management, IT Services
  - IV&V
Beyond V1.2

SEI is coordinating development of CMMI-ACQ.

- Built upon draft created with General Motors for IT Sourcing
- Adds government acquisition perspectives from both DoD and civil agencies
  - Recognizes importance of acquisition requirements development (moved to level 2)
  - Adds perspectives for multiple suppliers to address systems of systems, customer agreements
Initial CMMI-ACQ Key Acquisition Processes*

*based on initial CMMI-ACQ model developed by General Motors/SEI
Planned Sequence of Models

- CMMI V1.1
- CMMI-AM
- SA-CMM
- GM IT Sourcing
- CMMI-DEV V1.2
- CMMI-ACQ
- CMMI-SVC
CMMI V1.2…and Beyond
…the details
Model Changes
Model Structure

Staged V1.1

Maturity Levels

Process Area 1

Specific Goals

Generic Goals

Specific Practices

Ability to Perform

Commitment to Perform

Directing Implementation

Verifying Implementation

Common Features

Staged V1.2

Maturity Levels

Process Area 1

Specific Goals

Generic Goals

Specific Practices

Note: no common features
The Model Is a Single Document

All representations, additions, and disciplines are in one document.

Users can choose to use:

- representation-specific content (i.e., continuous, staged)
- addition-specific content (i.e., IPPD)
- amplifications (i.e., hardware engineering, software engineering, systems engineering)
Added Hardware Amplifications and Examples

Six hardware amplifications were created to add emphasis on hardware engineering. Here is an example from TS.

SP 2.1 Design the Product or Product Component

Develop a design for the product or product component.

For Hardware Engineering
Detailed design is focused on product development of electronic, mechanical, electro-optical, and other hardware products and their components. Electrical schematics and interconnection diagrams are developed, mechanical and optical assembly models are generated, and fabrication and assembly processes are developed.

Hardware examples were also added to emphasize hardware engineering.
Added Work Environment Coverage

Work environment standards are established at the organizational level in OPD.

SP 1.6 Establish Work Environment Standards
Establish and maintain work environment standards.

The project’s work environment is established at the project level in IPM.

SP 1.3 Establish the Project’s Work Environment
Establish and maintain the project’s work environment based on the organization’s work environment standards.
Overview Section Improvements

The following improvements were made to the model overview (i.e., Part One):

- The chapter containing the generic goals and practices was moved to Part Two with the process areas.
- All definitions are consolidated into the glossary.
- Chapters were reordered into a more logical sequence.
- The Preface and Using CMMI Models chapter were rewritten and updated.
- Descriptions were updated to reflect the new CMMI architecture:
  - Added descriptions of constellations and additions
  - Removed descriptions of base and advanced practices and common features
Improved Generic Practices

Editorial changes were made to the generic practices. These slides highlight the changes that affect the content.

GP 1.1: Perform Specific Practices
The practice title and statement changed from “perform base practices” to “perform specific practices.”

GP 2.2: Plan the Process
The informative material was condensed to be consistent with the other generic practices.

GP 2.4: Assign Responsibility
In the informative material “and authority” was added.
Improved Generic Practices

GP 2.6: Manage Configurations
In the GP statement, “levels of configuration management” was changed to “levels of control.”

GP 2.9 Objectively Evaluate Adherence
Added informative material to emphasize work products also.

GP 5.2: Correct Root Causes of Problems
Added notes that the focus of this GP is on a quantitatively managed process, though root causes may be found outside of that process.
Explained Generic Practices Better

Moved generic goals and practices to Part Two with the process areas so that all normative elements of the model are consolidated in one place.

Added information about how process areas support the implementation of generic practices (GPs).

Added GP elaborations for GP 3.2.
“Not Applicable” Process Areas

The set of PAs evaluated to achieve a maturity level is an important variable when conducting an appraisal. In v1.1 it was not clear which PAs could be considered “not applicable.”

In v1.2, the guidance for appraisals exists in both SCAMPI\textsuperscript{SM} MDD Appendix A and SCAMPI A Appraisal Disclosure Statement (ADS):

- Only SAM can be declared not applicable.
- Decisions on PAs included in the appraisal must be made by the lead appraiser in conjunction with the appraisal sponsor.
- Rationale for declaring SAM to be “not applicable” must be provided in the Appraisal Disclosure Statement.
Glossary Changes

The following slides contain significant changes to glossary definitions. Definitions that only had editorial changes are not included.

**New definitions:** addition, amplification, bidirectional traceability, customer requirement, data, functional configuration audit, hardware engineering, higher level management, physical configuration audit, project startup, and service.

**Revised definitions:** acquisition, appraisal, appraisal findings, appraisal scope, audit, capability evaluation, configuration audit, customer, data management, establish and maintain, generic goal, objective evidence, process element, product, product component, project, quality- and process-performance objectives, requirements traceability, shared vision, subprocess, traceability, and work product.
Definitions Deleted From the Glossary

Deleted definitions: ability to perform, advanced practices, agreement/contract requirements, appraisal tailoring, appraisal team leader, base practices, CMMI model tailoring, commitment to perform, directing implementation, discipline amplification, lead appraiser, process context, solicitation package, strength, verifying implementation, weakness

Many of these definitions were deleted because the term wasn’t used in the model or the overall concept was removed.
Process Area Improvements\textsuperscript{1}

Improvements were made to all process areas; some process areas changed more than others. Only the process areas that were changed significantly will be addressed.

Many of these changes were discussed earlier. However, these slides show you significant changes by process area.
Process Area Improvements

The following process areas were improved significantly:

- Integrated Project Management +IPPD (IPM+IPPD)
- Organizational Process Definition +IPPD (OPD+IPPD)
- Organizational Process Focus (OPF)
- Requirements Management (REQM)
- Requirements Development (RD)
- Supplier Agreement Management (SAM)
- Technical Solution (TS)
- Validation (VAL)
- Verification (VER)
## Integrated Project Management +IPPD

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the Project’s Defined Process</td>
<td>1.1 – Establish the Project’s Defined Process</td>
</tr>
<tr>
<td></td>
<td>1.2 – Use Organizational Process Assets for Planning Project Activities</td>
</tr>
<tr>
<td></td>
<td>1.3 – Establish the Project’s Work Environment</td>
</tr>
<tr>
<td></td>
<td>1.4 – Integrate Plans</td>
</tr>
<tr>
<td></td>
<td>1.5 – Manage the Project Using the Integrated Plans</td>
</tr>
<tr>
<td></td>
<td>1.6 – Contribute to the Organizational Process Assets</td>
</tr>
</tbody>
</table>

• Modified SP 1.1 from “Establish and maintain the project’s defined process” to “Establish and maintain the project’s defined process from project startup through the life of the project.”

• Added SP 1.3 “Establish the Project’s Work Environment.” (This practice is new to CMMI.)
Integrated Project Management +IPPD²

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
</table>
| Coordinate and Collaborate with Relevant Stakeholders | 2.1 – Manage Stakeholder Involvement  
2.2 – Manage Dependencies  
2.3 – Resolve Coordination Issues |
| Apply IPPD Principles | 3.1 – Establish the Project’s Shared Vision  
3.2 – Establish the Integrated Team Structure  
3.3 – Allocate Requirements to Integrated Teams  
3.4 – Establish Integrated Teams  
3.5 – Ensure Collaboration among Interfacing Teams |

- Reduced the IPPD Addition to one goal (SG3 “Apply IPPD Principles”) and its practices.
- To emphasize the IPPD Addition, the name of this process area is now “Integrated Project Management +IPPD” or “IPM +IPPD.”
## Organizational Process Definition +IPPD\(^1\)

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish Organizational Process Assets</td>
<td>1.1 – Establish Standard Processes</td>
</tr>
<tr>
<td></td>
<td>1.2 – Establish Lifecycle Model Descriptions</td>
</tr>
<tr>
<td></td>
<td>1.3 – Establish Tailoring Criteria and Guidelines</td>
</tr>
<tr>
<td></td>
<td>1.4 – Establish the Organization’s Measurement Repository</td>
</tr>
<tr>
<td></td>
<td>1.5 – Establish the Organization’s Process Asset Library</td>
</tr>
<tr>
<td></td>
<td>1.6 – Establish Work Environment Standards</td>
</tr>
</tbody>
</table>

- Added “and work environment standards” to the purpose statement.
- Added SP 1.6 “Establish Work Environment Standards.” (This practice is new to CMMI.)
## Organizational Process Definition +IPPD²

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable IPPD Management</td>
<td>2.1 – Establish Empowerment Mechanisms</td>
</tr>
<tr>
<td></td>
<td>2.2 – Establish Rules and Guidelines for Integrated Teams</td>
</tr>
<tr>
<td></td>
<td>2.3 – Balance Team and Home Organization Responsibilities</td>
</tr>
</tbody>
</table>

- Added an IPPD Addition to OPD (SG2 “Enable IPPD Management” and its practices).
- To emphasize the IPPD Addition, the name the process area is now “Organizational Process Definition +IPPD” or “OPD +IPPD.”
Organizational Process Focus

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine Process Improvement Opportunities</td>
<td>1.1 – Establish Organizational Process Needs</td>
</tr>
<tr>
<td></td>
<td>1.2 – Appraise the Organization’s Processes</td>
</tr>
<tr>
<td></td>
<td>1.3 – Identify the Organization’s Process Improvements</td>
</tr>
</tbody>
</table>

- Modified the purpose statement to emphasize deployment.
- SP 1.2 “Appraise the organization’s processes periodically and as needed to maintain an understanding of their strengths and weaknesses.” uses “organization’s processes” instead of “processes of the organization.”
Organizational Process Focus

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan and Implement Process</td>
<td>2.1 – Establish Process Action Plans</td>
</tr>
<tr>
<td>Improvements</td>
<td>2.2 – Implement Process Action Plans</td>
</tr>
</tbody>
</table>

- Modified SG2 from “Plan and Implement Process Improvement Activities” to “Plan and Implement Process Improvements.”
- Moved to a new SG3 and modified what were SP 2.3 and SP 2.4 in v1.1.
### Organizational Process Focus

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
</table>
| Deploy Organizational Process Assets and Incorporate Lessons Learned | 3.1 – Deploy Organizational Process Assets  
3.2 – Deploy Standard Processes  
3.3 – Monitor Implementation  
3.4 – Incorporate Process-Related Experiences into the Organizational Process Assets |

- Moved what were SP 2.3 and SP 2.4 in v1.1 to the new SG3 as SP 3.1 and SP 3.4.
- Added two new SPs: SP 3.2 “Deploy Standard Processes,” and SP 3.3 “Monitor Implementation.”
Requirements Management

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage Requirements</td>
<td>1.1 – Obtain an Understanding of Requirements</td>
</tr>
<tr>
<td></td>
<td>1.2 – Obtain Commitment to Requirements</td>
</tr>
<tr>
<td></td>
<td>1.3 – Manage Requirements Changes</td>
</tr>
<tr>
<td></td>
<td>1.4 – Maintain Bidirectional Traceability of Requirements</td>
</tr>
<tr>
<td></td>
<td>1.5 – Identify Inconsistencies Between Project Work and Requirements</td>
</tr>
</tbody>
</table>

- V1.2 REQM SP 1.4 practice statement now reads, “Maintain bidirectional traceability among the requirements and work products.”
- Project plans are no longer mentioned in this SP statement.
- The description of bidirectional traceability is improved as is its definition in the glossary.
## Requirements Development

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop Customer Requirements</td>
<td>1.1 – Elicit Needs</td>
</tr>
<tr>
<td></td>
<td>1.2 – Develop the Customer Requirements</td>
</tr>
<tr>
<td>Develop Product Requirements</td>
<td>2.1 – Establish Product and Product Component Requirements</td>
</tr>
<tr>
<td></td>
<td>2.2 – Allocate Product Component Requirements</td>
</tr>
<tr>
<td></td>
<td>2.3 – Identify Interface Requirements</td>
</tr>
</tbody>
</table>

- Former base practice “Collect Stakeholder Needs” is eliminated and former advanced practice, “Elicit Needs” is kept.
- Informative text is added to the introductory notes about applying RD to maintenance projects.
## Requirements Development

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyze and Validate Requirements</td>
<td>3.1 – Establish Operational Concepts and Scenarios</td>
</tr>
<tr>
<td></td>
<td>3.2 – Establish a Definition of Required Functionality</td>
</tr>
<tr>
<td></td>
<td>3.3 – Analyze Requirements</td>
</tr>
<tr>
<td></td>
<td>3.4 – Analyze Requirements to Achieve Balance</td>
</tr>
<tr>
<td></td>
<td>3.5 – Validate Requirements</td>
</tr>
</tbody>
</table>

- Material from V1.1 TS SP 1.2, “Evolve Operational Concepts and Scenarios,” is incorporated into RD SP 3.1.
- Material from V1.1 RD SP 3.5-1, “Validate Requirements,” and RD SP 3.5-2, “Validate Requirements with Comprehensive Methods” were consolidated into a single practice.
## Supplier Agreement Management

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish Supplier Agreements</td>
<td>1.1 – Determine Acquisition Type</td>
</tr>
<tr>
<td></td>
<td>1.2 – Select Suppliers</td>
</tr>
<tr>
<td></td>
<td>1.3 – Establish Supplier Agreements</td>
</tr>
<tr>
<td>Satisfy Supplier Agreements</td>
<td>2.1 – Execute the Supplier Agreement</td>
</tr>
<tr>
<td></td>
<td>2.2 – Monitor Selected Supplier Processes</td>
</tr>
<tr>
<td></td>
<td>2.3 – Evaluate Selected Supplier Work Products</td>
</tr>
<tr>
<td></td>
<td>2.4 – Accept the Acquired Product</td>
</tr>
<tr>
<td></td>
<td>2.5 – Transition Products</td>
</tr>
</tbody>
</table>

- V1.1 SAM SP2.1 “Review COTS Products,” was eliminated. “Identify candidate COTS products that satisfy requirements” is a new subpractice under the Technical Solutions Process Area SP1.1, “Develop Alternative Solutions and Selection Criteria.”

- SP2.2 and SP2.3 were added because ISM was eliminated.

- The purpose of SAM was also updated.
## Technical Solution

### Specific Goal

<table>
<thead>
<tr>
<th>Select Product-Component Solutions</th>
</tr>
</thead>
</table>

### Specific Practice

<table>
<thead>
<tr>
<th>1.1 – Develop Alternative Solutions and Selection Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 – Select Product-Component Solutions</td>
</tr>
</tbody>
</table>

- V1.1 TS SP 1.1-1, “Develop Alternative Solutions and Selection Criteria,” and TS SP 1.1-2, “Develop Detailed Alternative Solutions and Selection Criteria” are consolidated into a single practice.
- “Identify candidate COTS products that satisfy requirements” is a new subpractice under SP1.1.
- V1.1 TS SP 1.2 “Evolve Operational Concepts and Scenarios” is incorporated into RD SP 3.1, “Establish Operational Concepts and Scenarios.”
## Technical Solution

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop the Design</td>
<td>2.1 – Design the Product or Product Component</td>
</tr>
<tr>
<td></td>
<td>2.2 – Establish a Technical Data Package</td>
</tr>
<tr>
<td></td>
<td>2.3 – Design Interfaces Using Criteria</td>
</tr>
<tr>
<td></td>
<td>2.4 – Perform Make, Buy, or Reuse Analyses</td>
</tr>
<tr>
<td>Implement the Product Design</td>
<td>3.1 – Implement the Design</td>
</tr>
<tr>
<td></td>
<td>3.2 – Develop Product Support Documentation</td>
</tr>
</tbody>
</table>

- V1.1 TS SP 2.3-1, “Establish Interface Descriptions,” and TS SP 2.3-3, “Design Interfaces Using Criteria” are consolidated into a single practice.
Validation

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepare for Validation</td>
<td>1.1 – Select Products for Validation</td>
</tr>
<tr>
<td></td>
<td>1.2 – Establish the Validation Environment</td>
</tr>
<tr>
<td></td>
<td>1.3 – Establish Validation Procedures and Criteria</td>
</tr>
<tr>
<td>Validate Product or Product Components</td>
<td>2.1 – Perform Validation</td>
</tr>
<tr>
<td></td>
<td>2.2 – Analyze Validation Results</td>
</tr>
</tbody>
</table>

- Notes were added to VAL to stress that validation activities are performed incrementally and involve relevant stakeholders.
- The phrase “and identify issues” was deleted from the statement of SP 2.2 “Analyze Validation Results” to maintain parallelism with VER SP 3.2 “Analyze Verification Results.”
## Verification

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepare for Verification</td>
<td>1.1 – Select Work Products for Verification</td>
</tr>
<tr>
<td></td>
<td>1.2 – Establish the Verification Environment</td>
</tr>
<tr>
<td></td>
<td>1.3 – Establish Verification Procedures and Criteria</td>
</tr>
<tr>
<td>Perform Peer Reviews</td>
<td>2.1 – Prepare for Peer Reviews</td>
</tr>
<tr>
<td></td>
<td>2.2 – Conduct Peer Reviews</td>
</tr>
<tr>
<td></td>
<td>2.3 – Analyze Peer Review Data</td>
</tr>
</tbody>
</table>

- No changes to SG1, SG2, or their practices.
## Verification

<table>
<thead>
<tr>
<th>Specific Goal</th>
<th>Specific Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify Selected Work Products</td>
<td>3.1 – Perform Verification</td>
</tr>
<tr>
<td></td>
<td>3.2 – Analyze Verification Results</td>
</tr>
</tbody>
</table>

• The phrase “and identify corrective action” was deleted from both the title and statement of SP 3.2 “Analyze Verification Results. (Corrective action is handled in PMC SG2, “Manage Corrective Action to Closure.”)
Summary

Many changes were made to the CMMI models to improve quality. The major changes include

• name changed to “CMMI for Development”
• both representations in one document
• amplifications improved; added hardware amplifications
• common features and advanced practices eliminated
• SS addition eliminated; ISM brought into SAM
• guidelines for “not applicable” process areas clarified
• overview and glossary improved
• work environment material added to OPD and IPM
• IPPD material simplified and consolidated
• process deployment strengthened in IPM and OPF
SCAMPI A V1.2 Major Themes

Reduce complexity and ambiguity
Provide additional guidance where needed
Strengthen appraisal planning and conduct
Strengthen appraisal reporting
Define appraisal validity period
Strengthen lead appraiser requirements
Revision Process

The CMMI Steering Group provided a long-term strategy and the upgrade criteria for v1.2.

The SCAMPI Upgrade Team (SUT) reviewed change requests to identify possible changes for the v1.2 appraisal method documents: Appraisal Requirements for CMMI (ARC) and Method Definition Document (MDD).

The CMMI Steering Group served as the configuration control board for v1.2 changes to the ARC and MDD.

The SUT developed a draft of the ARC and MDD for review by lead appraisers in May 2006.

The ARC and MDD were released as part of the v1.2 CMMI Product Suite.
Reduce Complexity¹

The requirement for instruments (e.g., questionnaires) was removed.

Only two types of objective evidence are now required:
- documents
- interviews

The following sections in MDD were revised:
- switched 2.2 Verify and Validate Objective Evidence and 2.3 Document Objective Evidence so that the order of tasks reflects the natural order of conducting an appraisal
- separated Verify Objective Evidence and Validate Preliminary Findings to better describe each process
Reduce Complexity$^2$

The use of the term instantiation was changed:

- Instantiation is now defined as “the implementation of a model practice used in the appropriate context within the boundaries of an organizational unit.”

- The word “instantiation” for project and organizational-wide entities was replaced with “project” or “support group.”
Reduce Ambiguity

The rating Not Rated was clarified:

- Process areas outside of the model scope are rated as Out of Scope. For example, for a maturity level 3 appraisal, maturity level 4 and 5 process areas are rated as Out of Scope.
- For process areas that have insufficient data to be rated, the rating is Not Rated.
- Process areas in the model scope, but outside the organizational scope are rated as Not Applicable. The only process area that can be Not Applicable is SAM (as determined by the appraisal team).

The practice characterization tables were revised:

- clarified the use of virtual versus live interviews
- changed “face-to-face interviews” to “oral interviews”
Provide Additional Guidance

Guidance for readiness reviews was revised to include team and logistical readiness.

Additional guidance was provided for using virtual methods (e.g., for interviews and briefings).

Additional guidance was provided for using alternative practices (i.e., Appendix C: Alternative Practice Identification and Characterization Guidance).
Strengthen Appraisal Planning and Conduct

Organizational unit sampling was revised to*
  • strengthen parameters and limits for organizational sampling (e.g., identifying a minimum number of focus projects)
  • include additional criteria for reporting sampling decisions

The Conduct Appraisal Phase must now be complete within 90 days.

Appraisal team members are now required to sign final findings.

*Changes to address sampling were extensive. Refer to the MDD for details.
Strengthen Appraisal Reporting

The Appraisal Disclosure Statement (ADS) now requires the following information.

Organizational sampling criteria and decisions (e.g., projects included, projects excluded, percentage of organization represented)

Basis for maturity/capability level 4 and 5 appraisal results
  • subprocesses statistically managed
  • mapping of these subprocesses to quality and process-performance objectives

Signatures of both the lead appraiser and sponsor
  • The lead appraiser affirms that the appraisal scope is representative of the organizational unit.
  • The sponsor affirms the accuracy of the ADS and authorizes the SEI to conduct any audits deemed necessary.
Define Appraisal Validity Period

V1.2 appraisal results are valid for a maximum of 3 years from the date of the ADS.

V1.1 appraisals will expire on August 31, 2007 or 3 years after the date the appraisal was conducted, whichever is later.
Strengthen Lead Appraiser Requirements

Prior to conducting a v1.2 SCAMPI appraisal, the following must occur:

• Current candidate and authorized lead appraisers and team leaders must complete CMMI v1.2 Upgrade Training.
• Candidate and authorized lead appraisers must attend SCAMPI Face-to-Face Training.
• Those who want to conduct v1.2 SCAMPI level 4 or 5 appraisals must be certified. Certification requirements address the following:
  - education, training, and experience in level 4 and 5 concepts
  - completion of an oral exam
Summary

The SCAMPI A appraisal method was revised based on change requests received to

• reduce complexity and ambiguity
• provide additional guidance where needed
• strengthen appraisal planning and conduct
• strengthen appraisal reporting
• define the appraisal validity period
• strengthen lead appraiser requirements

The changes are intended to make appraisals more accurate, reliable, and efficient.
Training
SEI Training for CMMI

- Introduction to CMMI
- Intermediate Concepts of CMMI
- Upgrade Training
- SCAMPI Lead Appraiser℠ Training
- SCAMPI℠ B and C Team Leader Training
- Instructor Training
CMMI Training Changes

The following courses have all been updated to address change requests and CMMI Product Suite v1.2 changes:

- Introduction to CMMI
- Intermediate Concepts of CMMI
- CMMI Instructor Training
- SCAMPI Lead Appraiser Training
- SCAMPI B and C Team Leader Training

CMMI v1.2 Upgrade Training was also developed to help users move from v1.1 to v1.2, an online course with potential SEI Partner assistance
Examinations

The construction and format of examinations have changed. v1.1 tests were largely short answer tests that were the same for all students.

For v1.2, tests will be generated from an item bank and now will be multiple choice. CMMI v1.2 Upgrade Training for Instructors, Lead Appraisers, and Team Leaders is the first course to use this approach. The Intermediate Concepts of CMMI and Instructor Training will follow.
Multiple Choice Examinations

This new approach, using an item bank and multiple choice questions, allows multiple versions of examinations that can be constructed more easily:

- The sequence of multiple choice responses can vary from test to test.
- The order of questions can vary from test to test.
- The selection of questions can vary from test to test, but cover the same categories.

This new approach allows us to

- add, modify, and delete questions from the test more easily
- better evaluate the student’s knowledge
Related Work
Applying CMMI in Small Settings

Where are we with our work in small settings?
• completed technical feasibility pilots in Huntsville, Alabama with two small companies in the US Army supply chain
• posted the toolkit from this pilot for review:
  - http://www.sei.cmu.edu/ttp/publications/toolkit
• chartered a project to further research in and evolve guidance for CMMI in Small Settings (CSS)

Where are we going?
• International Research Workshop for Process Improvement in Small Settings held October 19-20, 2005
• call for Interest in CSS project is posted on SEI web:
  - http://www.sei.cmu.edu/cmmi/acss/participation.html
Acquisition Improvement is needed....

Acquirers cannot ensure that mature processes are applied to their programs.

Acquirers need more internal process focus.

MLs usually apply processes based upon appraisals of THESES... but your project is HERE or HERE.

**Mismatch**
- Mature acquirer mentors low maturity supplier
- Outcome not predictable

**Matched**
- Acquirer and supplier are both high maturity
- Highest probability of success

**Disaster**
- No discipline
- No process
- No product

**Mismatch**
- Less mature acquirer derails mature supplier; encourages short cuts
- Supplier compromises processes

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Guidebook Concept

Provide a toolbox for the acquirer to aid in ensuring that the current project benefits from the application of mature processes

• Include practical guidance on how to recognize the real practitioners and identify the abusers
• Encourage the use of capability and maturity profiles, and discourage the use of the "single level" approach
• Improve acquisition organizations' understanding of the meaning of high maturity (levels 4 and 5) and equivalent staging
But what about the rest of the model?

Some may wish a refresher
Others may need the basics, as well as the changes
These next charts attempt to fill the gaps....
Model Basics
Critical Distinctions Among Processes

performed vs. managed
the extent to which the process is planned; performance is managed against the plan; corrective actions are taken when needed

managed vs. defined
the scope of application of the process descriptions, standards, and procedures (i.e., project vs. organization)

defined vs. quantitatively managed
the predictability of process performance

quantitatively managed vs. optimizing
whether the process is continually improved by addressing common causes of process variation
### Summary of Generic Goals and Practices

<table>
<thead>
<tr>
<th>Generic Goals</th>
<th>Generic Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>GG1: Achieve Specific Goals</td>
<td>GP 1.1: Perform Specific Practices</td>
</tr>
<tr>
<td>GG2: Institutionalize a Managed Process</td>
<td>GP 2.1: Establish an Organizational Policy</td>
</tr>
<tr>
<td></td>
<td>GP 2.2: Plan the Process</td>
</tr>
<tr>
<td></td>
<td>GP 2.3: Provide Resources</td>
</tr>
<tr>
<td></td>
<td>GP 2.4: Assign Responsibility</td>
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<tr>
<td></td>
<td>GP 2.5: Train People</td>
</tr>
<tr>
<td></td>
<td>GP 2.6: Manage Configurations</td>
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<td></td>
<td>GP 2.7: Identify and Involve Relevant Stakeholders</td>
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<td></td>
<td>GP 2.8: Monitor and Control the Process</td>
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<td></td>
<td>GP 2.9: Objectively Evaluate Adherence</td>
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<td></td>
<td>GP 2.10: Review Status with Higher Level Management</td>
</tr>
<tr>
<td>GG3: Institutionalize a Defined Process</td>
<td>GP 3.1: Establish a Defined Process</td>
</tr>
<tr>
<td></td>
<td>GP 3.2: Collect Improvement Information</td>
</tr>
<tr>
<td>GG4: Institutionalize a Quantitatively Managed Process</td>
<td>GP 4.1: Establish Quantitative Objectives for the Process</td>
</tr>
<tr>
<td></td>
<td>GP 4.2: Stabilize Subprocess Performance</td>
</tr>
<tr>
<td>GG5: Institutionalize an Optimizing Process</td>
<td>GP 5.1: Ensure Continuous Process Improvement</td>
</tr>
<tr>
<td></td>
<td>GP 5.2: Correct Root Causes of Problems</td>
</tr>
</tbody>
</table>

Adapted from Cepeda Systems & Software Analysis, Inc.
## Continuous Representation: PAs by Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Process Areas</th>
</tr>
</thead>
</table>
| **Process Management** | Organizational Process Focus  
Organizational Process Definition +IPPD  
Organizational Training  
Organizational Process Performance  
Organizational Innovation and Deployment |
| **Project Management** | Project Planning  
Project Monitoring and Control  
Supplier Agreement Management  
Integrated Project Management +IPPD  
Risk Management  
Quantitative Project Management |
| **Engineering**      | Requirements Management  
Requirements Development  
Technical Solution  
Product Integration  
Verification  
Validation |
| **Support**          | Configuration Management  
Process and Product Quality Assurance  
Measurement and Analysis  
Decision Analysis and Resolution  
Causal Analysis and Resolution |
# Staged Representation: PAs by Maturity Level

<table>
<thead>
<tr>
<th>Level</th>
<th>Focus</th>
<th>Process Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Optimizing</td>
<td>Continuous Process Improvement</td>
<td>Organizational Innovation and Deployment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Causal Analysis and Resolution</td>
</tr>
<tr>
<td>4 Quantitatively</td>
<td>Quantitative Management</td>
<td>Organizational Process Performance</td>
</tr>
<tr>
<td>Managed</td>
<td></td>
<td>Quantitative Project Management</td>
</tr>
<tr>
<td>3 Defined</td>
<td>Process Standardization</td>
<td>Requirements Development</td>
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<tr>
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<td>Technical Solution</td>
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<td>Verification</td>
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<td>Integrated Project Management +IPPD</td>
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<td>Risk Management</td>
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<tr>
<td></td>
<td></td>
<td>Decision Analysis and Resolution</td>
</tr>
<tr>
<td>2 Managed</td>
<td>Basic Project Management</td>
<td>Requirements Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project Planning</td>
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<td></td>
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<td>Project Monitoring and Control</td>
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<tr>
<td></td>
<td></td>
<td>Supplier Agreement Management</td>
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<tr>
<td></td>
<td></td>
<td>Measurement and Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Process and Product Quality Assurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Configuration Management</td>
</tr>
<tr>
<td>1 Initial</td>
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</tbody>
</table>

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Understanding Levels

Levels are used in CMMI to describe an evolutionary path for an organization that wants to improve the processes it uses to develop and maintain its products and services.

CMMI supports two improvement paths:

- **continuous** - enabling an organization to incrementally improve processes corresponding to an individual process area (or set of process areas) selected by the organization
- **staged** - enabling the organization to improve a set of related processes by incrementally addressing successive predefined sets of process areas
Achieving Capability Levels (CL) for a Process Area

- **CL0** Not performed, incomplete
  - A few GPs or SPs may be implemented

- **CL1** Performed
  - Perform the work

- **CL2** Managed
  - Adhere to policy; follow documented plans and processes, apply adequate resources; assign responsibility and authority; train people, apply configuration management, monitor, control, and evaluate process; identify and involve stakeholders; review with management

- **CL3** Defined
  - Project's process is tailored from organization’s standard processes; understand process qualitatively; process contributes to the organizations assets

- **CL4** Quantitatively Managed
  - Measure process performance, stabilize process, control charts, deal with causes of special variations

- **CL5** Optimizing
  - Defect prevention, proactive improvement, innovative technology insertion and deployment
Achieving Maturity Levels

- **ML1**
  - Initial Processes are ad hoc and chaotic
  - GP2.1 through GP2.10
  - All ML2, ML3, ML4, and ML5 PAs

- **ML2**
  - Managed
  - Adhere to policy; follow documented plans and processes; apply adequate resources; assign responsibility and authority; train people; apply CM; monitor, control, and evaluate process; identify and involve stakeholders; review with management
  - GP2.1 through GP3.2
  - All ML2, ML3, and ML4 PAs

- **ML3**
  - Defined
  - Tailor the project's process from organization's standard processes; understand processes qualitatively; ensure that projects contribute to organization assets
  - GP2.1 through GP3.2
  - All ML2, ML3, and ML4 PAs

- **ML4**
  - Quantitatively Managed
  - Measure process performance; stabilize process and control charts; deal with causes of special variations
  - GP2.1 through GP3.2
  - All ML2, ML3, ML4, and ML5 PAs

- **ML5**
  - Optimizing
  - Prevent defects; proactively improve; insert and deploy innovative technology
  - GP2.1 through GP3.2
  - All ML2, ML3, ML4, and ML5 PAs

- **ML1**
  - Initial
  - Processes are ad hoc and chaotic
  - GP2.1 through GP2.10
  - All ML2 PAs
Interaction Between OPD and IPM

- Organization’s Set of Standard Processes
- Lifecycle Model Descriptions
- Process Architectures
- Work Environment Standards
- Organization’s Measurement Repository
- Organization’s Process Asset Library
- Tailoring Guidelines
- Organizational Assets
- Project A’s Defined Process
- Project B’s Defined Process
- Project C’s Defined Process
- Project A’s Project Plan
- Project B’s Project Plan
- Project C’s Project Plan

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Process definition inputs

- Strategic Plans, Goals, Objectives
- Policies
- Process Descriptions, Procedures, Instructions
- Asset Library
- Measurement Repository

Process Architecture

Process Needs

Process Scope
Causal Analysis and Resolution

Goals

SG 1: Determine Causes of Defects
Root causes of defects and other problems are systematically determined.

SG 2: Address Causes of Defects
Root causes of defects and other problems are systematically addressed to prevent their future occurrence.

The process area also has generic goals to support institutionalization.

Note relationship with Causal Analysis and Resolution GP 5.2
The other Process Areas….

- In the earlier segments, we covered the nine Process Areas changed for V1.2
  - IPM, OPD, OPF, RD, REQM, SAM, TS, VAL, VER
- Following are the remaining 13 without significant change….
  - CAR, CM, DAR, MA, OID, OPP, OT, PI, PMC, PP, PPQA, QPM, RSKM
Configuration Management Goals

SG 1: Establish Baselines
Baselines of identified work products are established.

SG 2: Track and Control Changes
Changes to the work products under configuration management are tracked and controlled.

SG 3: Establish Integrity
Integrity of baselines is established and maintained.

The process area also has generic goals to support institutionalization.

Note relationship with Configuration Management ↔ GP 2.6
Decision Analysis and Resolution Goals

SG 1: Evaluate Alternatives
Decisions are based on an evaluation of alternatives using established criteria.

The process area also has generic goals to support institutionalization.
Measurement and Analysis Goals

SG 1: Align Measurement and Analysis Activities
Measurement objectives and activities are aligned with identified information needs and objectives.

SG 2: Provide Measurement Results
Measurement results that address identified information needs and objectives are provided.

The process area also has generic goals to support institutionalization.
Organizational Innovation and Deployment Goals

SG 1: Select Improvements
Process and technology improvements that contribute to meeting quality and process-performance objectives are selected.

SG 2: Deploy Improvements
Measurable improvements to the organization’s processes and technologies are continually and systematically deployed.

The process area also has generic goals to support institutionalization.

Note relationship with Organizational Innovation and Deployment GP 5.1
Organizational Process Performance Goals

SG 1: Establish Performance Baselines and Models
Baselines and models that characterize the expected process performance of the organization’s set of standard processes are established and maintained.

The process area also has generic goals to support institutionalization.

Note relationship with
Organizational Process Performance GP 4.1
OPP Context

Select Processes

Organizational Process-Performance Baselines

Establish Process-Performance Measures

Establish Process-Performance Baselines

Organization’s Quality and Process-Performance Objectives

Selected Subprocesses from Org. Std. Processes

Process-Performance Models

Establish Process-Performance Models

Organization’s Set of Standard Processes

The shaded SPs inter-relate and may need to be performed iteratively.
Organizational Training Goals

SG 1: Establish an Organizational Training Capability
A training capability that supports the organization’s management and technical roles is established and maintained.

SG 2: Provide Necessary Training
Training necessary for individuals to perform their roles effectively is provided.

The process area also has generic goals to support institutionalization.

Note relationship with Organizational Training GP 2.5
Product Integration Goals

SG 1: Prepare for Product Integration
Preparation for product integration is conducted.

SG 2: Ensure Interface Compatibility
The product component interfaces, both internal and external, are compatible.

SG 3: Assemble Product Components and Deliver the Product
Verified product components are assembled and the integrated, verified, and validated product is delivered.

The process area also has generic goals to support institutionalization.
Project Monitoring and Control 

Goals

SG 1: Monitor Project Against Plan  
Actual performance and progress of the project are monitored against the project plan.

SG 2: Manage Corrective Action to Closure  
Corrective actions are managed to closure when the project’s performance or results deviate significantly from the plan.

The process area also has generic goals to support institutionalization.

Note relationship with Project Monitoring and Control GP 2.8
Project Planning Goals

SG 1: Establish Estimates
Estimates of project planning parameters are established and maintained.

SG 2: Develop a Project Plan
A project plan is established and maintained as the basis for managing the project.

SG 3: Obtain Commitment to the Plan
Commitments to the project plan are established and maintained.

The process area also has generic goals to support institutionalization.

Note relationship with Project Planning ↔ GP 2.2, GP 2.7
Process and Product Quality Assurance Goals

SG 1: Objectively Evaluate Processes and Work Products
Adherence of the performed process and associated work products and services to applicable process descriptions, standards, and procedures is objectively evaluated.

SG 2: Provide Objective Insight
Noncompliance issues are objectively tracked and communicated, and resolution is ensured.

The process area also has generic goals to support institutionalization.

Note relationship with Process and Product Quality Assurance ↔ GP 2.9
Quantitative Project Management Goals

SG 1: Quantitatively Manage the Project
The project is quantitatively managed using quality and process-performance objectives.

SG 2: Statistically Manage Subprocess Performance
The performance of selected subprocesses within the project’s defined process is statistically managed.

The process area also has generic goals to support institutionalization.

Note relationship with
Quantitative Project Management ↔ GP 4.1, GP 4.2
Risk Management Goals

SG 1: Prepare for Risk Management
Preparation for risk management is conducted.

SG 2: Identify and Analyze Risks
Risks are identified and analyzed to determine their relative importance.

SG 3: Mitigate Risks
Risks are handled and mitigated, where appropriate, to reduce adverse impacts on achieving objectives.

The process area also has generic goals to support institutionalization.
For More Information…

For more information about CMMI
• http://www.sei.cmu.edu/cmmi/ (main CMMI site)

Other Web sites of interest include
• http://seir.sei.cmu.edu/seir/ (Software Engineering Information Repository)
• http://dtic.mil/ndia (annual CMMI Technology Conferences)
• http://seir.sei.cmu.edu/pars (publicly released SCAMPI appraisal summaries)
• https://bscw.sei.cmu.edu/pub/bscw.cgi/0/79783

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