CMMI® V1.3: The Rest of the Story: Model Changes at CL/ML 1-3

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CMMI Models for Three Constellations

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

Core PAs appear in all CMMI models; however...
• These PAs are not identical across all models.
• Informative material can be different so that users interpret goals and practices for their area of interest.
• Material that is the same is called CMMI Model Foundation (CMF).
• Sometimes practices can be different in one model from another (i.e., PP & PMC).
• There is one Shared PA (SAM).

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

CMMI-ACQ
CMMI-ACQ provides guidance to enable informed and decisive acquisition leadership.
Process Area Components

Continuous Representation: PAs by Categories (And Potentially Across Constellations)
Summary of Generic Goals and Practices

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<th>Generic Practices</th>
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<td>GG3: Institutionalize a Defined Process</td>
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<td>GP 3.2: Collect Improvement Information</td>
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</table>

(Cepeda Systems & Software Analysis, Inc.)

Harmonizing V1.2 Models

The Problem
As V1.2 models were created and released, they became out of synch with one another. Improvements made in one model were not made in others simply because of differences in release schedules.

Overview of Solution
Analyzed differences among the three models (ACQ, DEV, SVC) to identify opportunities to improve all three while improving commonality. Examples of improvements include the following:

- GGs, GPs, and GP elaborations consolidated into one location (DEV)
- Improved measurement, supplier, and agreement terminology (DEV)
- Improved definitions of terms related to products and services (DEV, ACQ)
- Increased emphasis on customer satisfaction (all three)
- Improved examples, example work products, and notes (all three)

Many of the specific changes made to the model are due to harmonization and are covered in the PA Changes modules of Upgrade Training.
Teaming Concepts

The Problem
Teams are clearly relevant to product development. How teams are established in an organization has a lot to do with whether or not they are successful. However, there are no specific practices addressing rules for and establishing teams in DEV, instead there is the Integrated Process and Product Development (IPPD) addition, which is optional. Fewer than 5% of recent appraisals have included IPPD.

For acquisitions of complex systems, integrated teaming is not an option but a necessity. Thus, ACQ has, instead of an addition for IPPD, expected material that covers integrated teaming derived from generalizing and simplifying the IPPD material in DEV.

SVC adopted the ACQ approach, but in many service contexts “integrated teams” were not the key differentiator for success and the concept also proved to be problematic in some contexts.

Thus to harmonize the models, a different approach was needed.

Overview of Solution
Replaced the concepts of integrated teaming and IPPD with a more general concept of teaming, thereby eliminating the IPPD addition and making the approach to teaming consistent in all three models (By making the three constellations common, teaming can be part of the CMF.)

Replaced the glossary definition of “integrated team” with a definition of “team”

In the glossary definition, placed emphasis on what enables superior team performance:

A team establishes and maintains a process that identifies roles, responsibilities, and interfaces; is sufficiently precise to enable the team to measure, manage, and improve their work performance; and enables the team to make and defend their commitments.
The Term “Project”\textsubscript{1}

The Problem
In V1.2 models, the word “project” was used in all three CMMI models, especially in the core process areas. “Project” was almost implicitly understood by product developers and acquirers.

However, service providers found it difficult to interpret goals and practices containing the word, often misinterpreted the models practices, and sometimes believed that model content containing the word “project” did not apply to them.

Although some users (probably familiar with development environments) could adjust, others had great difficulty and asked many questions.

The Term “Project”\textsubscript{2}

Overview of Solution
Kept the word “project” in the DEV and ACQ models, but replaced it with alternate terms in the CMMI-SVC model. Depending on its implied meaning, the word “project” was generally either (1) simply removed, (2) replaced with the word “work,” or (3) replaced with the word “work group.”

These changes included changes to process area names (e.g., Project Planning becomes Work Planning). The process area category Project Management also became Project and Work Management.

Although the wording of some model material is different in SVC than in DEV and ACQ, if the only difference is the replacement of the word “project,” the material is still considered CMF.

Added terms and revised definitions in the glossary that use the word “project” to ensure that the glossary more broadly fit all CMMI models.
The Term “Project”

Example – Process Area Content

**Project Planning (ACQ & DEV)**

**Purpose:** The purpose of Project Planning (PP) is to establish and maintain plans that define project activities.

**SG 2 Develop a Project Plan**

*A project plan is established and maintained as the basis for managing the project.*

**Work Planning (SVC)**

**Purpose:** The purpose of Work Planning (WP) is to establish and maintain plans that define work activities.

**SG 2 Develop a Work Plan**

*A work plan is established and maintained as the basis for managing the work.*

Core PAs: Support Category

**Configuration Management**

establish and maintain the integrity of work products using configuration identification, configuration control, configuration status accounting, and configuration audits

**Decision Analysis and Resolution**

analyze possible decisions using a formal evaluation process that evaluates identified alternatives against established criteria

**Measurement and Analysis**

develop and sustain a measurement capability used to support management information needs

**Process and Product Quality Assurance**

provide staff and management with objective insight into processes and associated work products
Core PAs: Process Management Category

Organizational Process Definition
establish and maintain a usable set of organizational process assets, work environment standards, and rules and guidelines for teams

Organizational Process Focus
plan, implement, and deploy organizational process improvements based on a thorough understanding of current strengths and weaknesses of the organization’s processes and process assets

Organizational Training
develop skills and knowledge of people so they can perform their roles effectively and efficiently

Core PAs: Project and Work Management Category

Integrated Project Management
establish and manage the project and the involvement of relevant stakeholders according to an integrated and defined process that is tailored from the organization’s set of standard processes

Project Monitoring and Control
provide an understanding of the project’s progress so that appropriate corrective actions can be taken when the project’s performance deviates significantly from the plan

Project Planning
establish and maintain plans that define project activities

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Core PAs: Project and Work Management Category - 2

Requirements Management
manage requirements of the project’s products and product components and to identify inconsistencies between those requirements and the project’s plans and work products

Risk Management
identify potential problems before they occur so that risk-handling activities can be planned and invoked as needed across the life of the product or project to mitigate adverse impacts on achieving objectives

Changed the focus of SP 1.5 so that it now reads “Ensure that project plans and work products remain aligned with the requirements.”

Included examples related to: selected architecture, use of industry standards to identify risks, FMEA, and consequence monetization.

Provided guidance on maintaining risk parameters thru life of the project.

SAM – the Shared PA

SG 1: Establish Supplier Agreements
SP 1.1 Determine Acquisition Type
SP 1.2 Select Suppliers
SP 1.3 Establish Supplier Agreements

Clarified the applicability of SAM practices.

Added the concept “products and processes of significant value to the project” to help determine what to monitor.

Demoted SP 2.2 and SP 2.3 to subpractices of SP 2.1 and renumbered the remainder of the practices.

Revised SP 2.5 to allow its applicability to times when the product or service is delivered directly to the customer or end user from the supplier (SVC and DEV only).

SG 2: Satisfy Supplier Agreements
SP 2.1 Execute the Supplier Agreement
SP 2.2 Accept the Acquired Product
SP 2.3 Ensure Transition of Products

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Principles of Architecture-Centric Practices

1. Regardless of scale, architecture is the **appropriate abstraction** for reasoning about business/mission goal satisfaction.

2. **Quality attributes** have a dominant influence on a system’s architecture.

3. Architectural prescriptions must be demonstrably satisfied by the **implementation**.

Users Need Both Functions and Qualities

- Required capability
- Low learning threshold
- Ease of use
- Predictable behavior
- Dependable service
- Timely response
- Timely throughput
- Protection from unintended intruders and viruses

Software system/mission goals should address user needs.
User needs often translate to quality attribute requirements.
Scenarios are a powerful way to characterize quality attributes and represent user and other stakeholder views.
Modern Development Practices in CMMI - 1

For Version 1.3, CMMI provides better guidance in support of architecture-centric practices
- creating the business case for the system (partially in RD)
- understanding the requirements (RD)
- creating and/or selecting the architecture (TS)
- documenting and communicating the architecture (RD, TS)
- analyzing or evaluating the architecture (RD, TS, VAL, VER)
- implementing the system based on the architecture (TS; A/PL notes)
- ensuring that the implementation conforms to the architecture (VER)
- evolving the architecture so that it continues to meet business and mission goals (implicit in the phrase “establish and maintain”)

For a more detailed mapping of CMMI-DEV V1.3 to the above, see the slides from the half-day tutorial, “CMMI V1.3 and Architecture” (session 11203).

Modern Development Practices in CMMI - 2

CMMI V1.3 provides improved terminology to support architecture-centric practices
- Updated the glossary to include new terms (and modified some old terms)
- Updated the informative material (especially ARD and ATM in ACQ; RD, TS, and VER in DEV; and SSD in SVC) to:
  - make use of the new terms
  - bring more emphasis to quality attributes and thus strike a better balance between functional and non-functional requirements
- Replaced selected uses of overloaded terms such as “performance” with an appropriate qualifying phrase.
Modernizing Development Practices

Example – New terms reflecting modern engineering

**quality attribute**

A property of a product or service by which its quality will be judged by relevant stakeholders. Quality attributes are characterizable by some appropriate measure.

Quality attributes are non-functional, such as timeliness, throughput, responsiveness, security, modifiability, reliability, and usability. They have a significant influence on the architecture.

**architecture**

The set of structures needed to reason about a product. These structures are comprised of elements, relations among them, and properties of both.

In a service context, the architecture is often applied to the service system. Note that functionality is only one aspect of the product. Quality attributes, such as responsiveness, reliability, and security, are also important to reason about. Structures provide the means for highlighting different portions of the architecture. (See also “functional architecture.”)
Requirements Development

SG 1: Develop Customer Requirements
   SP 1.1 Elicit Needs
   SP 1.2 Transform Stakeholder Needs into Customer Requirements

SG 2: Develop Product Requirements
   SP 2.1 Establish Product and Product Component Requirements
   SP 2.2 Allocate Product Component Requirements
   SP 2.3 Identify Interface Requirements

SG 3: Analyze and Validate Requirements
   SP 3.1 Establish Operational Concepts and Scenarios
   SP 3.2 Establish a Definition of Required Functionality and Quality Attributes
   SP 3.3 Analyze Requirements
   SP 3.4 Analyze Requirements to Achieve Balance
   SP 3.5 Validate Requirements

Added that requirements can be monitored through development based on their criticality to the customer or end user.

Revised the terminology used from a strong emphasis on "operational scenarios" to a more balanced "scenarios (operational, sustainment, and development)."

Added "quality attributes" as properties of products and services in addition to "functionality," which resulted in changes to SG3 and SP 3.2.

Product Integration

SG 1: Prepare for Product Integration
   SP 1.1 Establish an Integration Strategy
   SP 1.2 Establish the Product Integration Environment
   SP 1.3 Establish Product Integration Procedures and Criteria

SG 2: Ensure Interface Compatibility
   SP 2.1 Review Interface Descriptions for Completeness
   SP 2.2 Manage Interfaces

SG 3: Assemble Product Components and Deliver the Product
   SP 3.1 Confirm Readiness of Product Components for Integration
   SP 3.2 Assemble Product Components
   SP 3.3 Evaluate Assembled Product Components
   SP 3.4 Package and Deliver the Product or Product Component

Revised the purpose statement to ensure proper behavior instead of proper function, thereby including quality attributes.

Changed emphasis on integration sequence to an emphasis on integration strategy.

Described an integration strategy and how it relates to an integration sequence.
Addressing Agile

The Problem
Developers that use Agile methods sometimes resist using CMMI because they can’t see how CMMI practices can complement or improve the effectiveness of Agile methods.

Overview of Solution
Added guidance to the appropriate PAs to do the following:

- Help users interpret the practices in a context where Agile methods are used
- Reinforce the applicability of the practices in an Agile environment
- Send the message that CMMI is a robust best practice framework meant to be used in Agile environments as well as other development environments

Solution
Added a new section to DEV Chapter 5 entitled “Interpreting CMMI When Using Agile Approaches”

- This section describes how CMMI practices can apply in a variety of development environments. It also provides interpretive guidance in selected PAs that explains how the PA can be used in Agile environments.
- A reference to this new section appears in the SSD intro notes of SVC.

Added interpretive guidance to the following PAs:

- In DEV: CM, REQM, PP, RD, TS, PI, VER, PPQA, and RSKM
- In ACQ: AM, ATM, PMC, and PP
- In SVC: SSD

Added in DEV and SVC (SSD only) Agile-related examples (as bullets)
### Addressing Agile

An example of a note added to DEV is the following one for PP:

> "In Agile environments . . . Teams plan, monitor, and adjust plans during each iteration as often as it takes (e.g., daily). Commitments to plans are demonstrated when tasks are assigned and accepted during iteration planning, user stories are elaborated or estimated, and iterations are populated with tasks from a maintained backlog of work. (See “Interpreting CMMI When Using Agile Approaches” in Part I.)"

### Summary of Global Changes, CMMI Version 1.3

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