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

November 16, 2010

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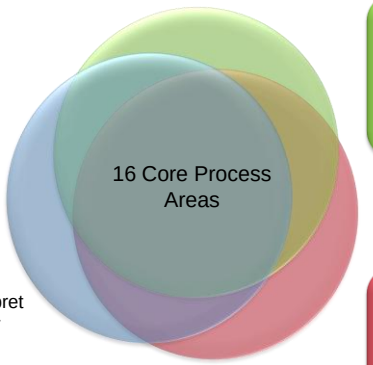
CMMI Models for Three Constellations

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



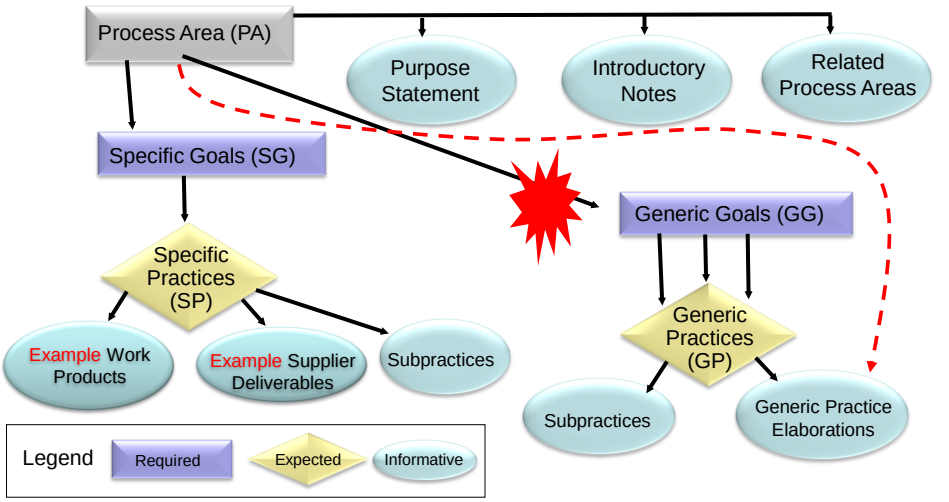
CMMI-SVC
CMMI-SVC provides guidance for those providing services within organizations and to external customers.

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

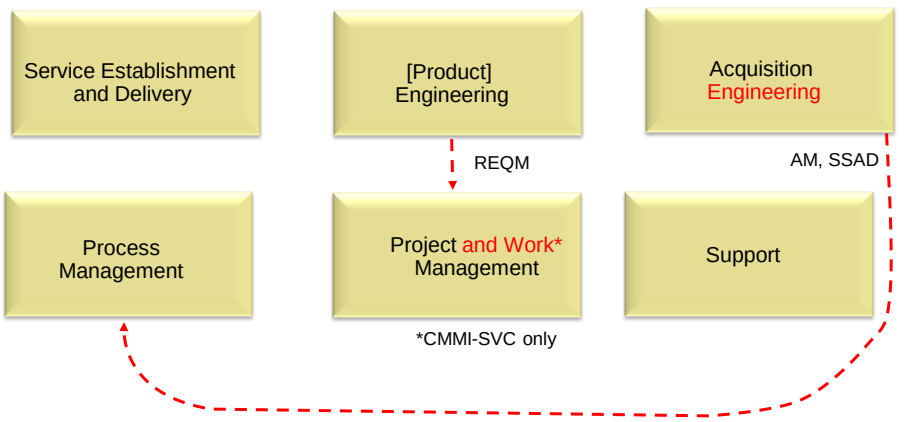
Core PAs appear in all CMMI models; however...

- 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).

Process Area Components



Continuous Representation: PAs by Categories (And Potentially Across Constellations)



Summary of Generic Goals and Practices

Generic Goals	Generic Practices
GG1: Achieve Specific Goals	GP 1.1: Perform Specific Practices
GG2: Institutionalize a Managed Process	GP 2.1: Establish an Organizational Policy GP 2.2: Plan the Process GP 2.3: Provide Resources GP 2.4: Assign Responsibility GP 2.5: Train People GP 2.6: Manage Configurations GP 2.7: Identify and Involve Relevant Stakeholders GP 2.8: Monitor and Control the Process GP 2.9: Objectively Evaluate Adherence GP 2.10: Review Status with Higher Level Management
GG3: Institutionalize a Defined Process	GP 3.1: Establish a Defined Process GP 3.2: Collect Improvement Information

Adapted from Cepeda Systems & Software Analysis, Inc.

~~CL 4-5, GGs 4-5, GP 4.* and GP 5.*~~

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$_1$

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.

Teaming Concepts$_2$

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"$_1$

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"$_2$

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"$_3$

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

CM: Clarified that CM can apply to hardware, equipment, and other **tangible assets**.

DAR: Added **guidance on preparing to use DAR** practices and communicating results.

MA: More clearly distinguished between information needs and objectives, measurement objectives, and business/project objectives. Included a **table of examples** (as in ACQ) for DEV and SVC.

Clarified that PPQA also applies to **organization** level activities and 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

Converted goal on IPPD or Integrated Teaming to a single practice (IPPD no longer an addition).

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

Expanded applicability to training delivery methods such as **self study, mentoring, and online training**.

Core PAs: Project and Work Management Category -1

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

Simplified SP 1.7 to replace "work products, measures, and documented experiences" with "**process-related experiences**."

Converted goal on IPPD or Integrated Teaming to a single practice (IPPD no longer an addition).

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

Added guidance for monitoring risks, data management, stakeholder involvement, project progress, and milestone reviews.

Project Planning
- establish and maintain plans that define project activities

Added guidance on determining project lifecycle and milestones.

Added subpractices on determining data rights and version control; and determining communication and other continuing resource needs.

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

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

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).

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$_3$

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.

Modernizing Development Practices$_4$

Example – New terms reflecting modern engineering

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$_1$

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

Addressing Agile$_2$

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$_3$

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

- Refining CMMI Framework Related Terminology
- Updating Model Architecture
- Harmonizing V1.2 Models
- Glossary
- Teaming Concepts
- The Term "Project"
- Process Related Experiences
- Providing "Appropriate" Phrasing in Practice Statements
- Generic Practices
- Addressing Agile
- Causal Analysis at Lower Levels of Maturity
- Customer Satisfaction
- Modernizing Development Practices
- Prioritized Customer Requirements
- Organization-Level Contracts
- Easing Translation
- Front Matter

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Questions