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Software Engineering Institute**

# **The Rational Unified Process<sup>®</sup> and the Capability Maturity Model<sup>®</sup> – Integrated Systems/Software Engineering**

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# Report Documentation Page

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## Topics



Goals and Purpose

CMMI Overview

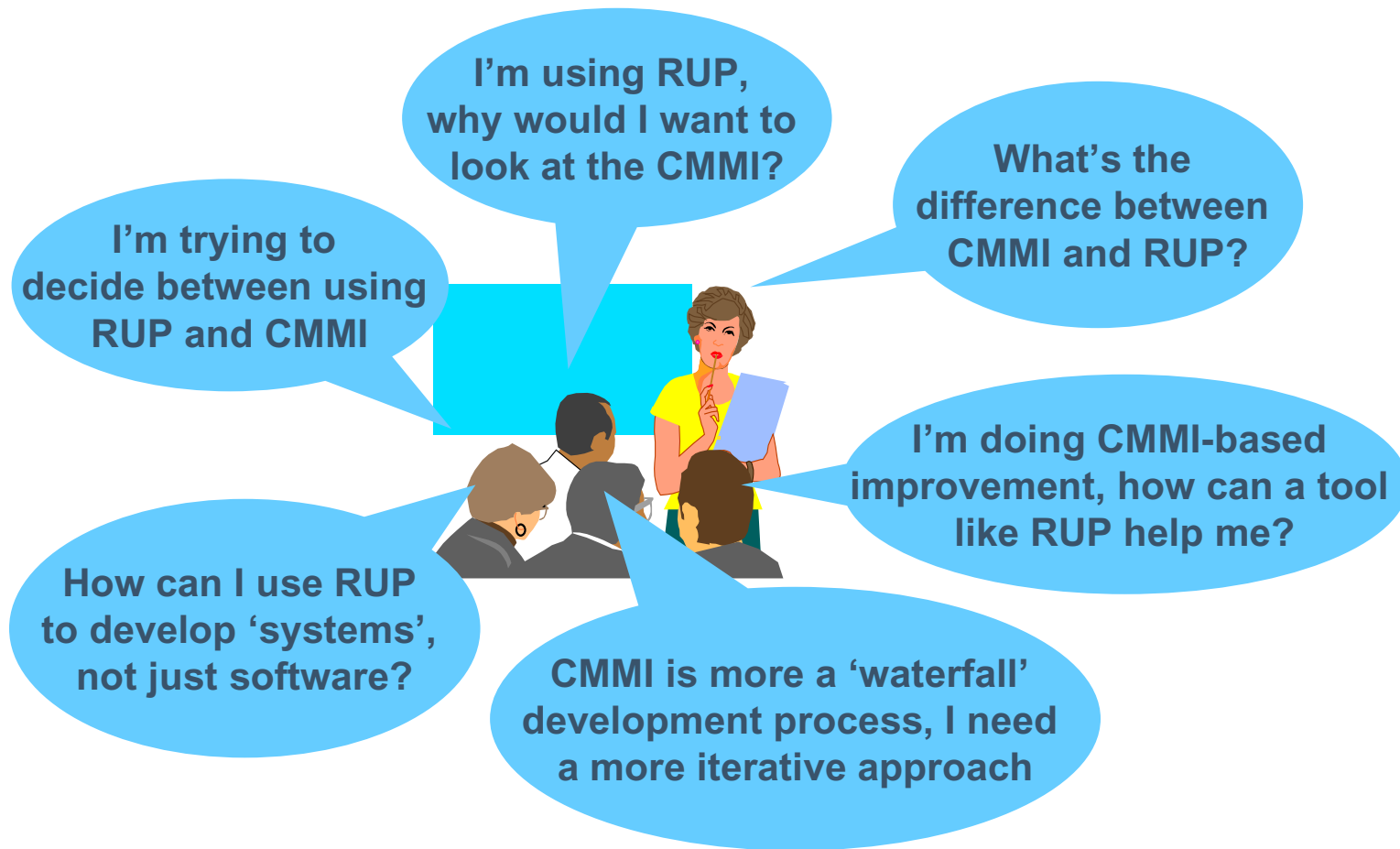
RUP Overview

RUP to CMMI Mapping

Lessons Learned



## What We've Heard





# Our Approach

- Plan
  - Set comparison objectives
  - Select review team
  - Identify the RUP/CMMI authoritative source and constituent elements to be used in the comparison
  - Determine comparison information to capture
- Train review team on CMMI
- Determine how RUP supports CMMI
- Determine how CMMI supports RUP
- Report the results
  - Develop this tutorial
  - Develop a detailed Technical Report (~Aug 01)



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# Tutorial Goals

Explore commonalities between RUP and CMMI

Identify differences between RUP and CMMI

Recommend improvements in RUP and CMMI to strengthen both



## **Intended Audience**

Organizations engaged in CMMI-based improvement considering using RUP

Organizations using RUP who are considering CMMI-based improvement

Appraisal teams using CMMI as a “yardstick” for organizations or projects using RUP



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## Topics

Goals and Purpose



**CMMI Overview**

RUP Overview

RUP to CMMI Mapping

Lessons Learned

# What Is CMMI?

A **framework of the key process elements** for a system development

- structured collection of processes proven through experience

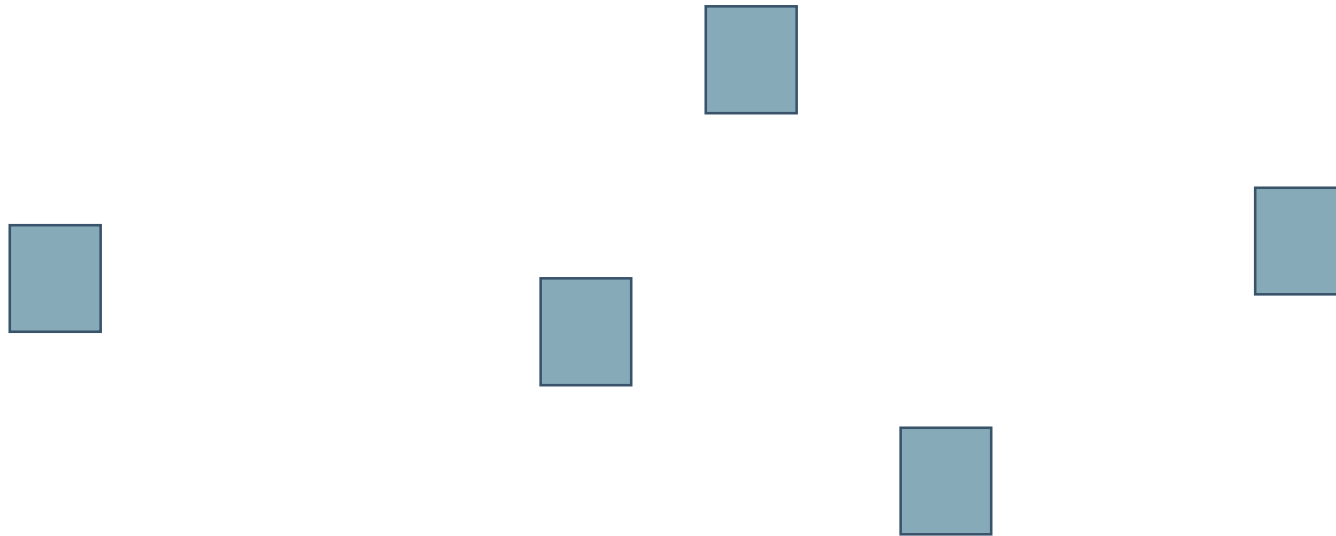
An **integrated view of process improvement** across multiple disciplines

- sets process improvement goals and priorities
- provides guidance for quality processes
- provides a yardstick for assessing current practices

Based on concepts and approaches pioneered by Crosby, Deming, Juran, Humphrey, et. al

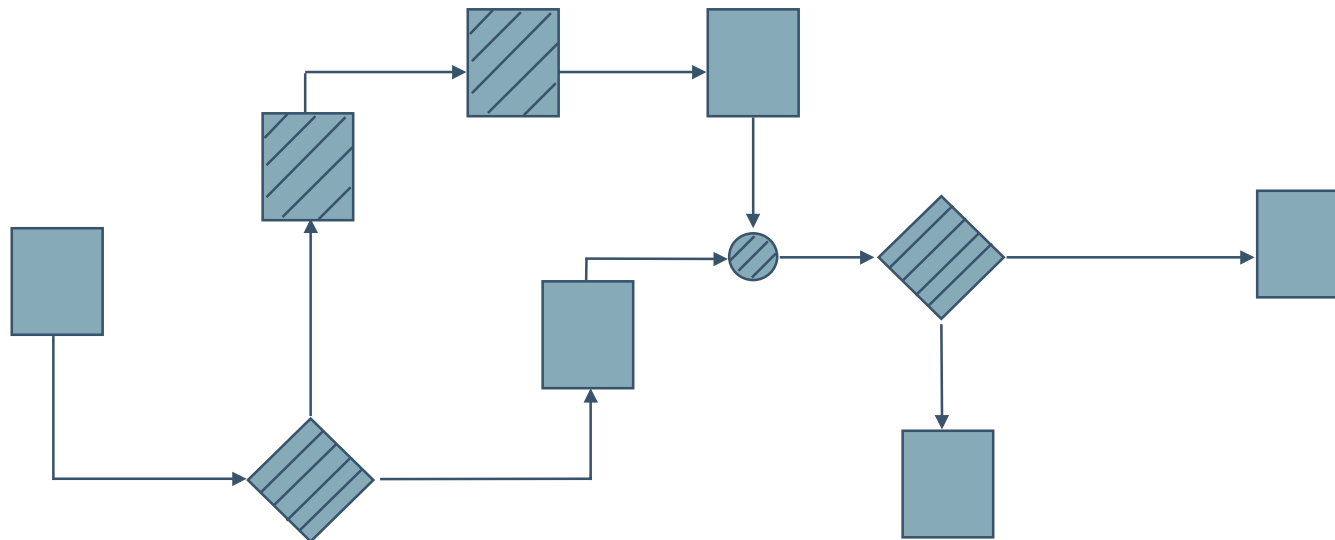


# Elements of an Effective Process -1



 = CMMI Key Elements

## Elements of an Effective Process -2



 = CMMI Key Elements

 = Your Project's Additional Elements



# Capability and Maturity

Process capability pertains to an individual process

- Knowing the process capabilities of a collection of processes has implications for organizational maturity

Organizational maturity pertains to a set of processes

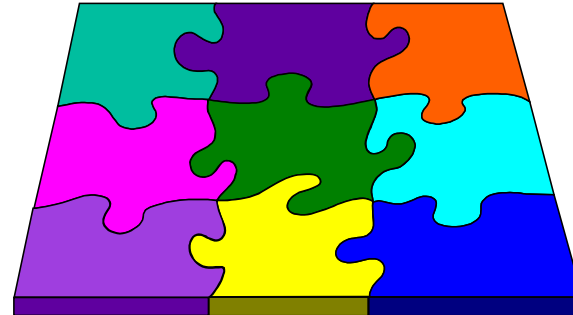
- Being at a particular level of organizational maturity has process capability implications for multiple processes



# CMMI Model Representations

Two approaches to process improvement

- process capability
- organizational maturity

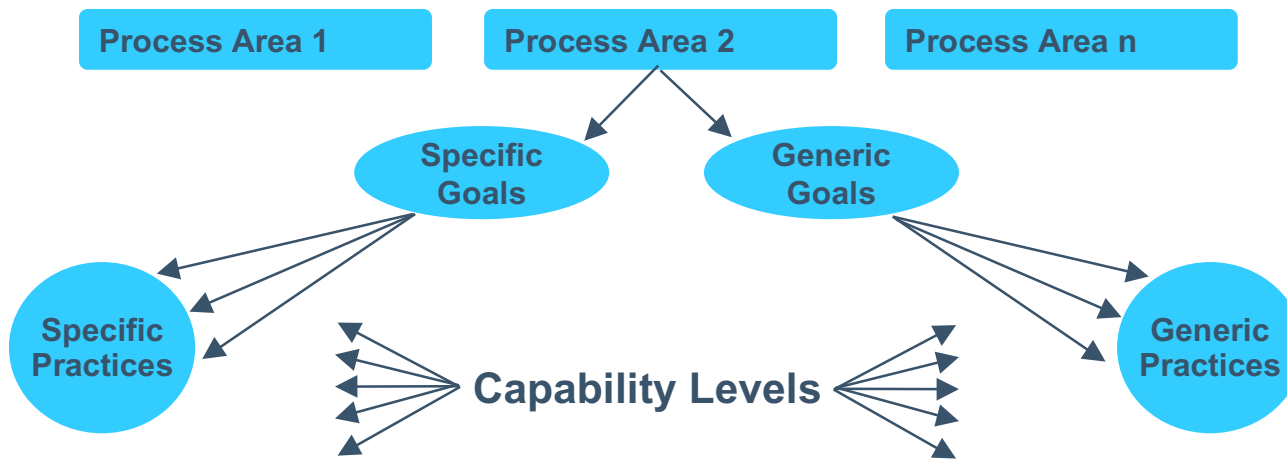


**CMMI models support each approach with a *representation***

- process capability approach ==> **continuous** representation
- organizational maturity approach ==> **staged** representation

**Which representation to use is based on the purpose of the improvement task**

# CMMI Model Components



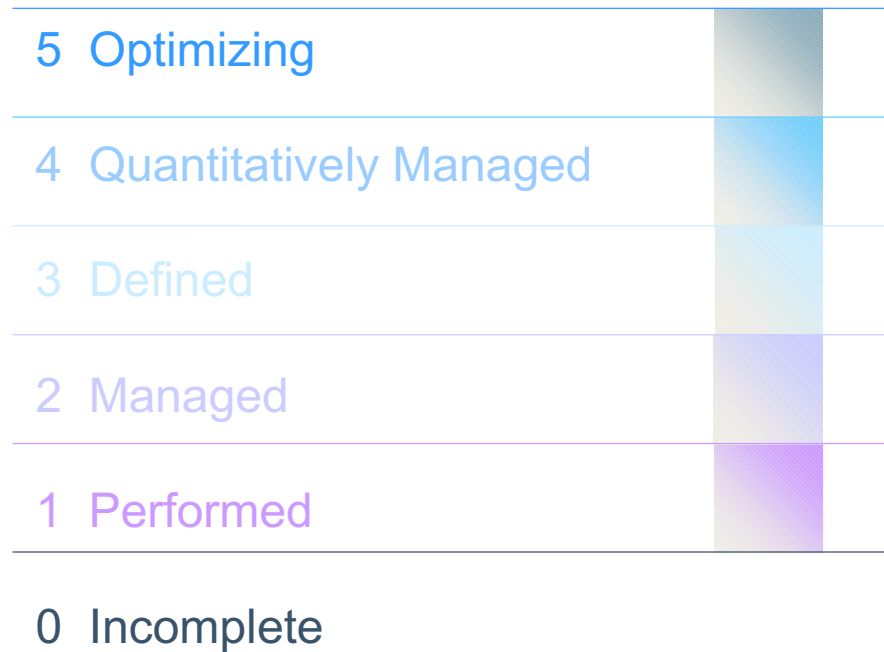
# Continuous Representation Structure



# Capability Levels

A capability level is

- A well-defined evolutionary plateau describing the capability of any Process Area
- A layer in the foundation for continuous process improvement





<b>Category</b>	<b>Process Areas</b>
<b>Process Management</b>	Organizational Process Focus Organizational Process Definition Organizational Training Organizational Process Performance Organizational Innovation and Deployment
<b>Project Management</b>	Project Planning Project Monitoring and Control Supplier Agreement Management Integrated Project Management Risk Management Quantitative Project Management
<b>Engineering</b>	Requirements Management Requirements Development Technical Solution Product Integration Verification Validation
<b>Support</b>	Configuration Management Process and Product Quality Assurance Measurement and Analysis Causal Analysis and Resolution Decision Analysis and Resolution

# Topics

Goals and Purpose

CMMI Overview



RUP Overview\*

RUP to CMMI Mapping

Lessons Learned

\*Material based on *The Rational Unified Process; An Introduction*,  
Philippe Kruchten, Second Edition. Addison-Wesley, 2000

## What is RUP?

A **software engineering process** based on best practices in modern software development

- A disciplined approach to assigning and managing tasks and responsibilities in a development organization
- Focused on high-quality software that meets the needs of its end users within a predictable schedule and budget

A **process framework** that can be tailored to specific organization or project needs

A **process product** developed and marketed by Rational Software with an interactive knowledge base integrated with tools

# Key Aspects of RUP

## Risk-driven process

- Risk management integrated into the development process
- Iterations are planned based on high priority risks

## Use-case driven development

- Use cases express requirements on the system's functionality and model the business as context for the system
- Use cases are defined for the intended system and are used as the basis of the entire development process

## Architecture-centric design activities

- Architecture is the primary artifact to conceptualize, construct, manage, and evolve the system
- Consists of multiple, coordinated views (or models) of the architecture



# RUP Basic Principles

## Develop Software Iteratively

- Driven by early risk identification and mitigation
- Each iteration results in an executable release

## Manage Requirements

- Requirements inherently dynamic across the system's life

## Use Component-Based Architecture

- Architectures that are resilient to change are essential

## Visually Model Software

- Promotes consistency and unambiguous communication of development information

## Continuously Verify Software Quality

- Identify defects early, objective measure of project status

## Control Changes to Software

- Create and release a tested baseline at the end of each iteration



# RUP Architecture

RUP produces a **software generation**

- A generation extends from idea to retirement of a **single** version of the system

## Static Structure

- Describes the process in terms of who is doing what, how, and when

## Dynamic Structure

- Describes the process in terms of how the process rolls out over time
- Expressed in terms of iterations, phases, and milestones



# Static Process Elements

## Worker (who)

A role that defines the individuals or a team that should carry out the work

## Activity (how)

Describes a piece of work a worker performs

## Artifact (what)

A piece of information that is produced, modified, or used by an activity

## Workflow (when)

Specifies when a set of related *activities* is performed, by which *workers*, producing some *artifact*, which provides some observable value to the project



# RUP Workflows - 1

## Project Management

- Plan an iterative process
- Decide duration and content of an iteration

## Business Modeling

- Understand the organization structure and dynamics in which a system is to be deployed

## Requirements

- Capture and manage requirements
- Design a user interface focused on users needs and goals

## Analysis and Design

- Translate requirements into a specification that describes how to implement the system



## RUP Workflows - 2

### Implementation

- Create, assemble, and integrate components and subsystem into an executable system

### Test

- Assess product quality

### Configuration and Change Management

- Track and maintain the integrity of evolving project assets

### Environment

- Support the development organization with processes and tools

### Deployment

- Turn the finished software product over to its users

# Additional Static Elements

## Guidelines

- Rules, recommendations, techniques, or heuristics to support activities and artifacts

## Templates

- Models of artifacts that can be used to create the artifact
- Usually associated with a tool

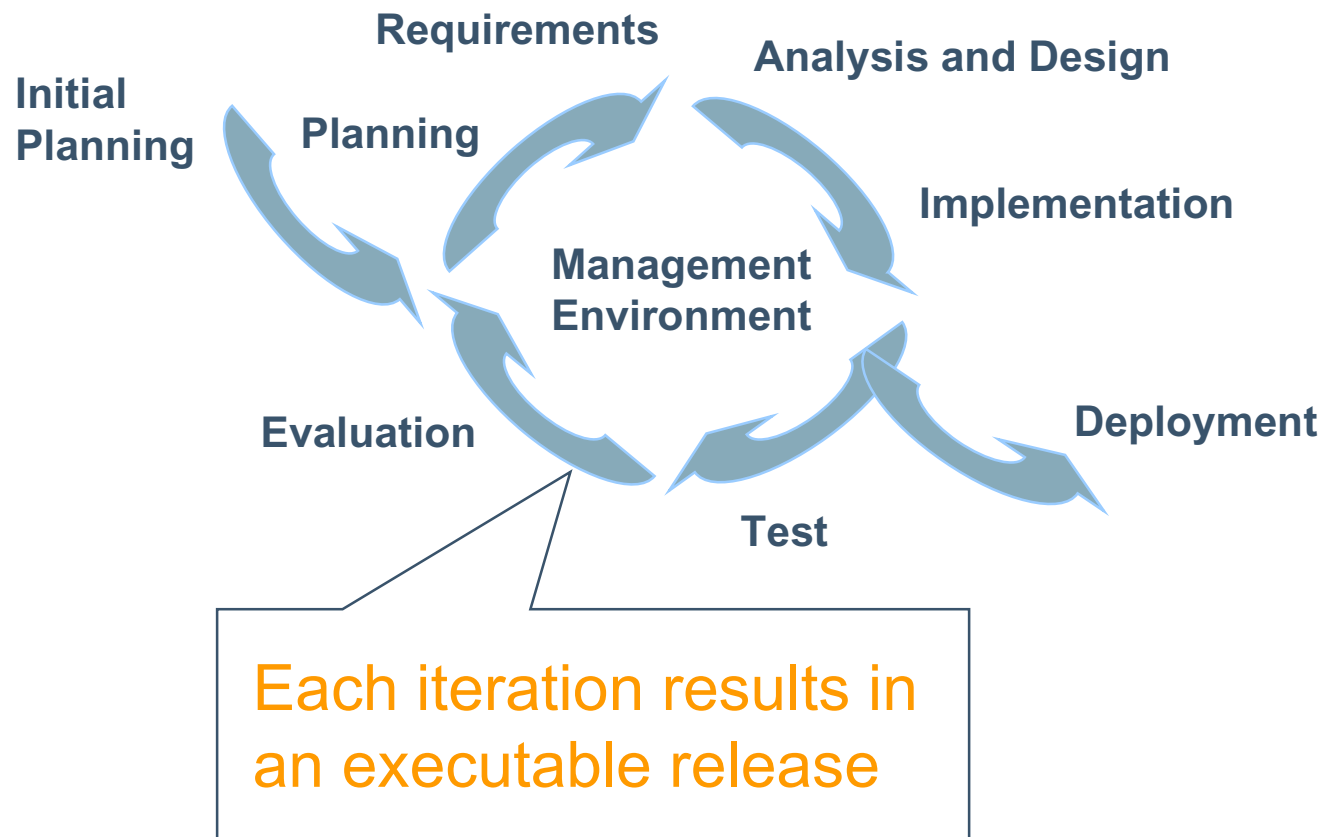
## Concepts

- Discussions on particular concepts (e.g., iteration, risk) associated with the process

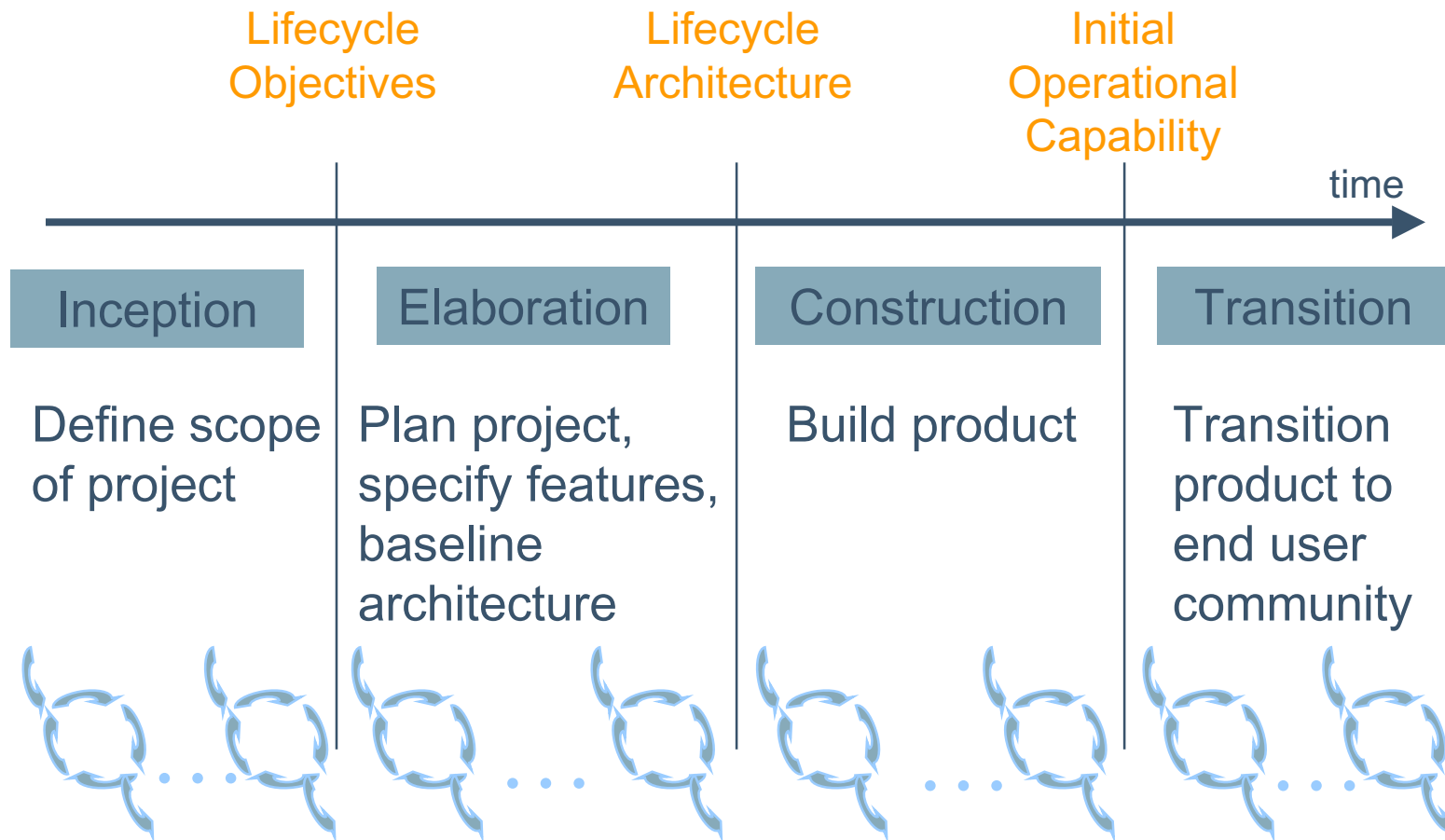
## Tool mentors

- Show how to perform a set of process steps using a specific tool

# Dynamic Element: Iterations



# Dynamic Elements: Phases and Milestones



# Static and Dynamic Process Structure

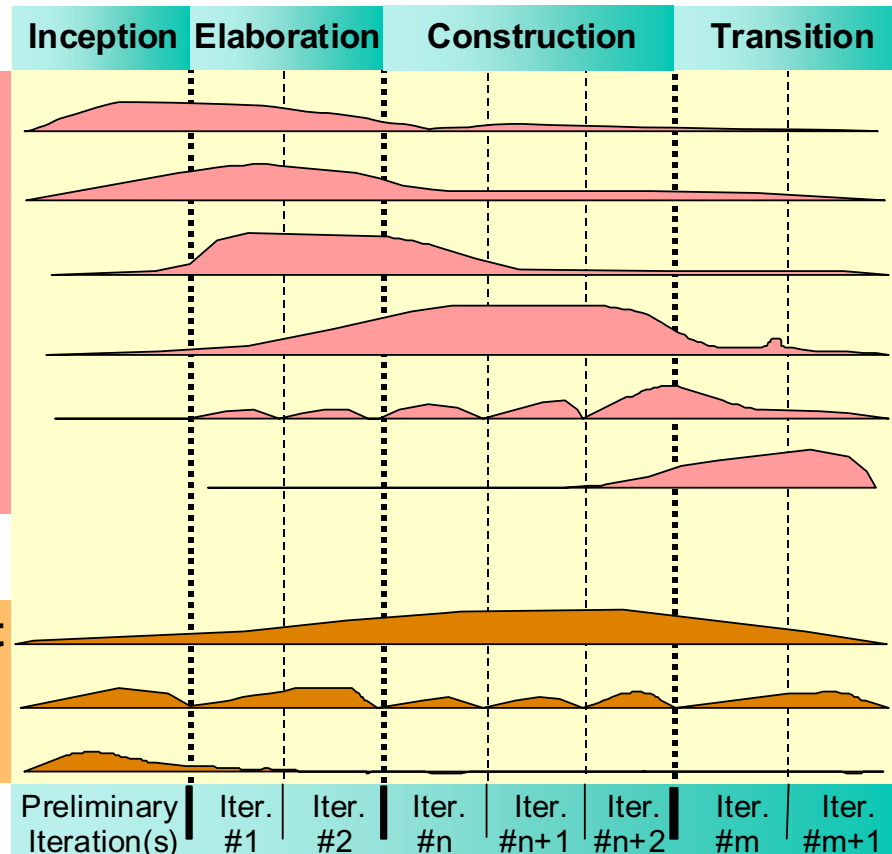
## Phases

### Core Workflows

Business Modeling  
Requirements  
Analysis & Design  
Implementation  
Test & Assessment  
Deployment

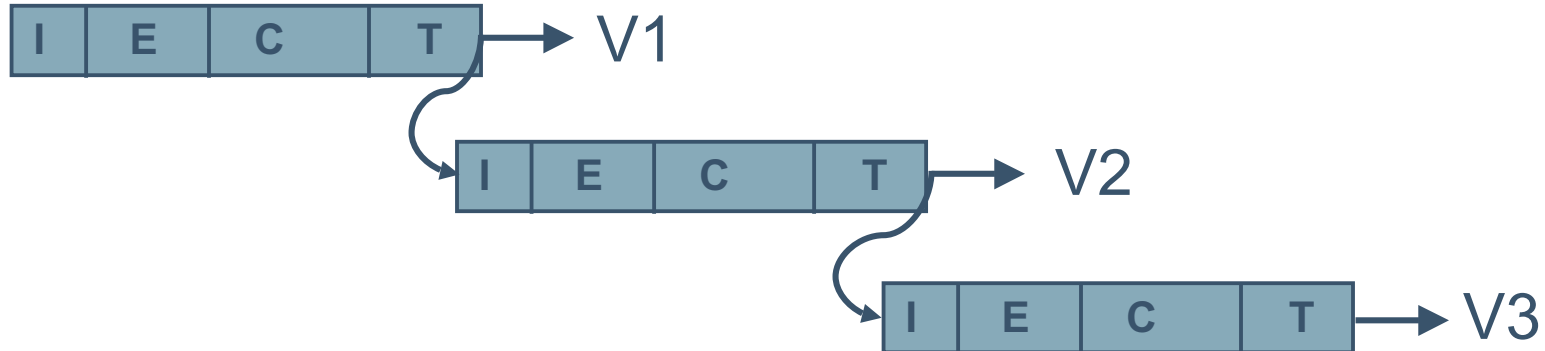
### Supporting Workflows

Configur. & Change Mgmt  
Project Management  
Environment



# System Evolution

- Four phases form one *development cycle* and produce a *generation* of the system
- Significant user enhancement, business or mission changes, or technology changes trigger a new generation





## Topics

Goals and Purpose

CMMI Overview

RUP Overview

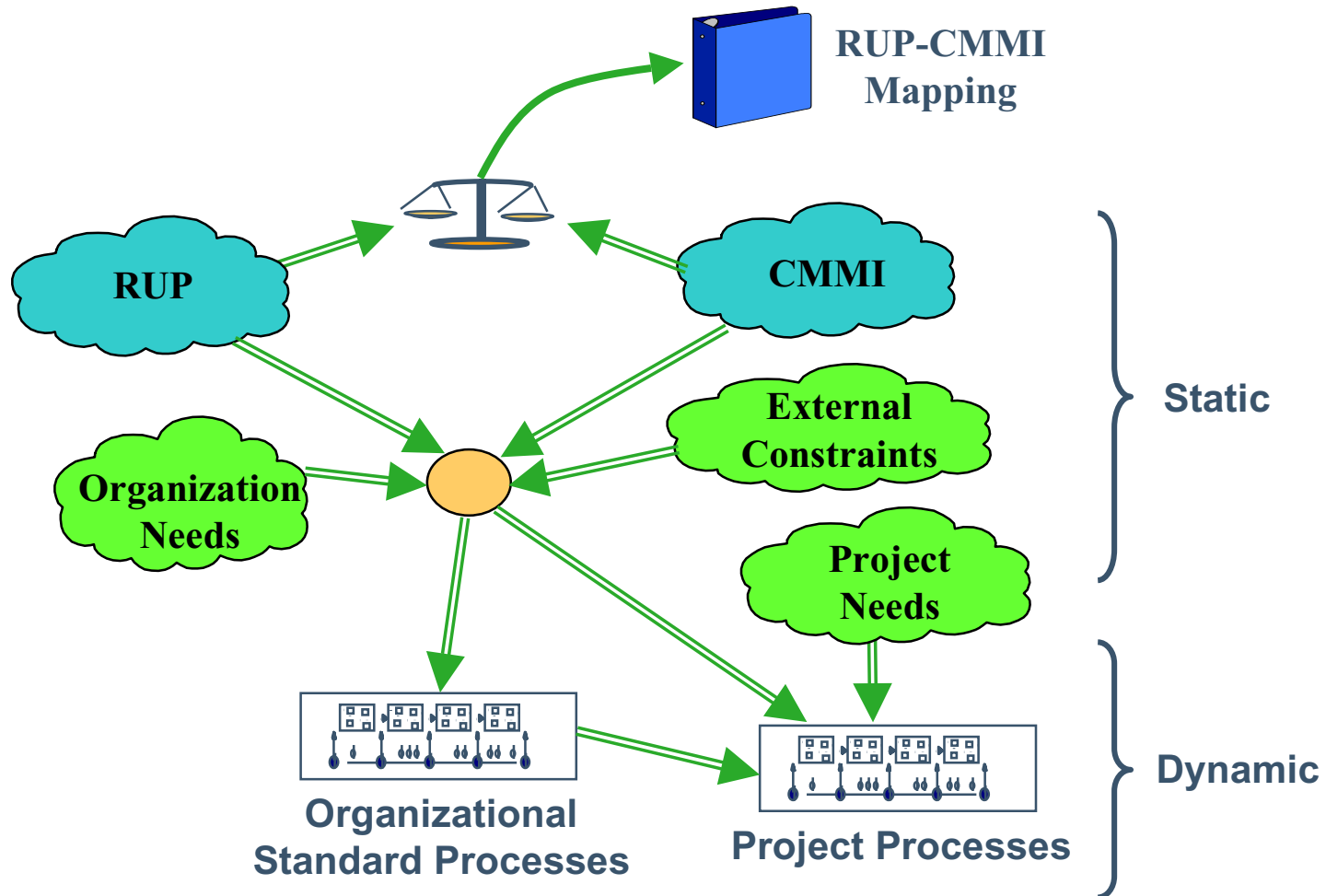


**RUP to CMMI Mapping**

- Project Management
- Engineering
- Support
- Process Management
- Generic Practices

Lessons Learned

# Comparing Static Representations



# Caveats

We are not assessing the Rational Unified Process

A project or organization is expected to tailor RUP to meet specific project needs

We are not comparing the results of tailoring either RUP or CMMI for an actual project or organization

Tailoring decisions could augment or deteriorate the results of our comparison

These comparisons are subjective: reasonable people may come to different conclusions



## Sources for Our Comparison

Rational Unified Process, version 2000.02.10

- all process elements (workflows, workflow details, activities, artifacts, guidelines, templates)

Capability Maturity Model – Integrated for Systems and Software Engineering (CMMI-SE/SW), Continuous Representation, Version 1.02, December 2000

- all Process Areas
- Specific Goals within each Process Area
- Specific Practices within each goal
- Generic Practices

# Capturing our Results

## RUP to CMMI

- **HIGH:** reviewers found a high degree of synergy between CMMI practices and RUP
- **MEDIUM:** reviewers were able to find some support for the CMMI practice
- **LOW:** reviewers had to stretch what we saw in RUP to support the CMMI practice, there were no mechanisms to support the practice, or the practice was outside the scope of RUP

## CMMI to RUP

- To be provided in a technical report (approximately ~Aug 01)



## Topics

Goals and Purpose

CMMI Overview

RUP Overview

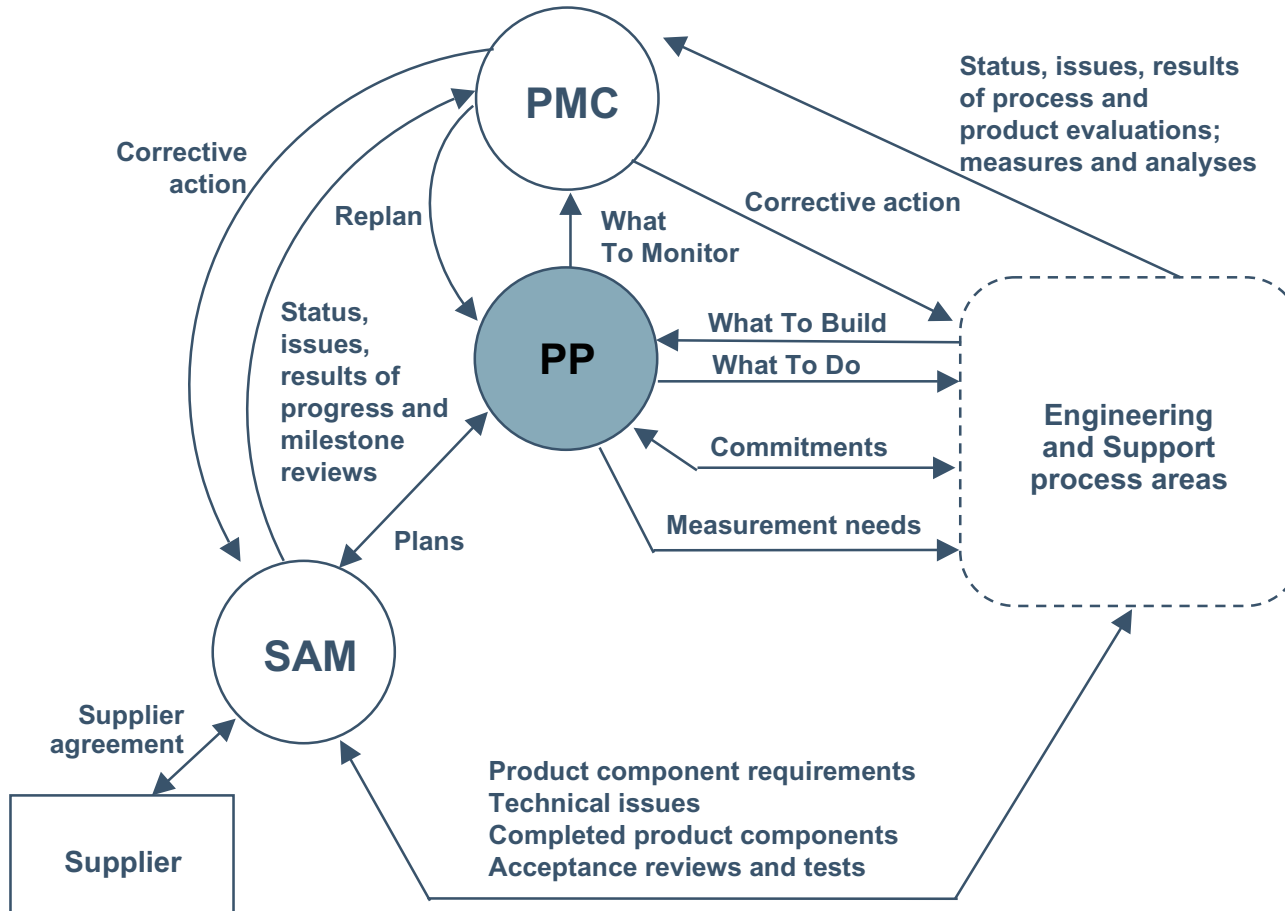
RUP to CMMI Mapping



- Project Management
- Engineering
- Support
- Process Management
- Generic Practices

Lessons Learned

# CMMI Basic Project Management





# Project Planning: Overview

## CMMI

### Purpose

Establish and maintain plans that define project activities.

## RUP

### Workflow

Project Management, Environment

### Synergy

- RUP provides adequate support mechanisms
- RUP does not provide assistance in sizing non-software project attributes (e.g., labor, machinery, materials)



# Project Planning: Mapping -1

## CMMI

### 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.

## RUP

**Workflow:** Project Management

WD: Conceive New Project

WD: Develop Software Development Plan

**Workflow:** Project Management

WD: Conceive New Project

WD: Develop Software Development Plan

**Workflow:** Environment

WD: Prepare Environment for Project  
WD: Prepare Environment for an Iteration

# Project Planning: Mapping -2

## CMMI

SG 3: Obtain Commitment to the Plan

Commitments to the project plan are established and maintained.

## RUP

Workflow: Project Management  
WD: Develop Software Development Plan



# Project Planning: Synergy

## Specific Goal

## Specific Practice

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### Establish Estimates

- Estimate the Scope of the Project (H)
- Establish Estimates of Project Attributes (M)
- Define Project Life Cycle (H)
- Determine Estimates of Effort and Cost (H)

---

### Develop a Project Plan

- Establish the Budget and Schedule (H)
- Identify Project Risks (H)
- Plan for Data Management (M)
- Plan for Project Resources (M)
- Plan for Needed Knowledge and Skills (H)
- Plan Stakeholder Involvement (H)
- Establish the Project Plan (H)

---

### Obtain Commitment to the Plan

- Review Subordinate Plans (H)
- Reconcile Work and Resource Levels (M)
- Obtain Plan Commitment (H)



## Project Planning: Detail Example

**SP1.2-1:** Establish and document estimates of the attributes of the work products and tasks.

### RUP Elements:

Workflow: Project Management

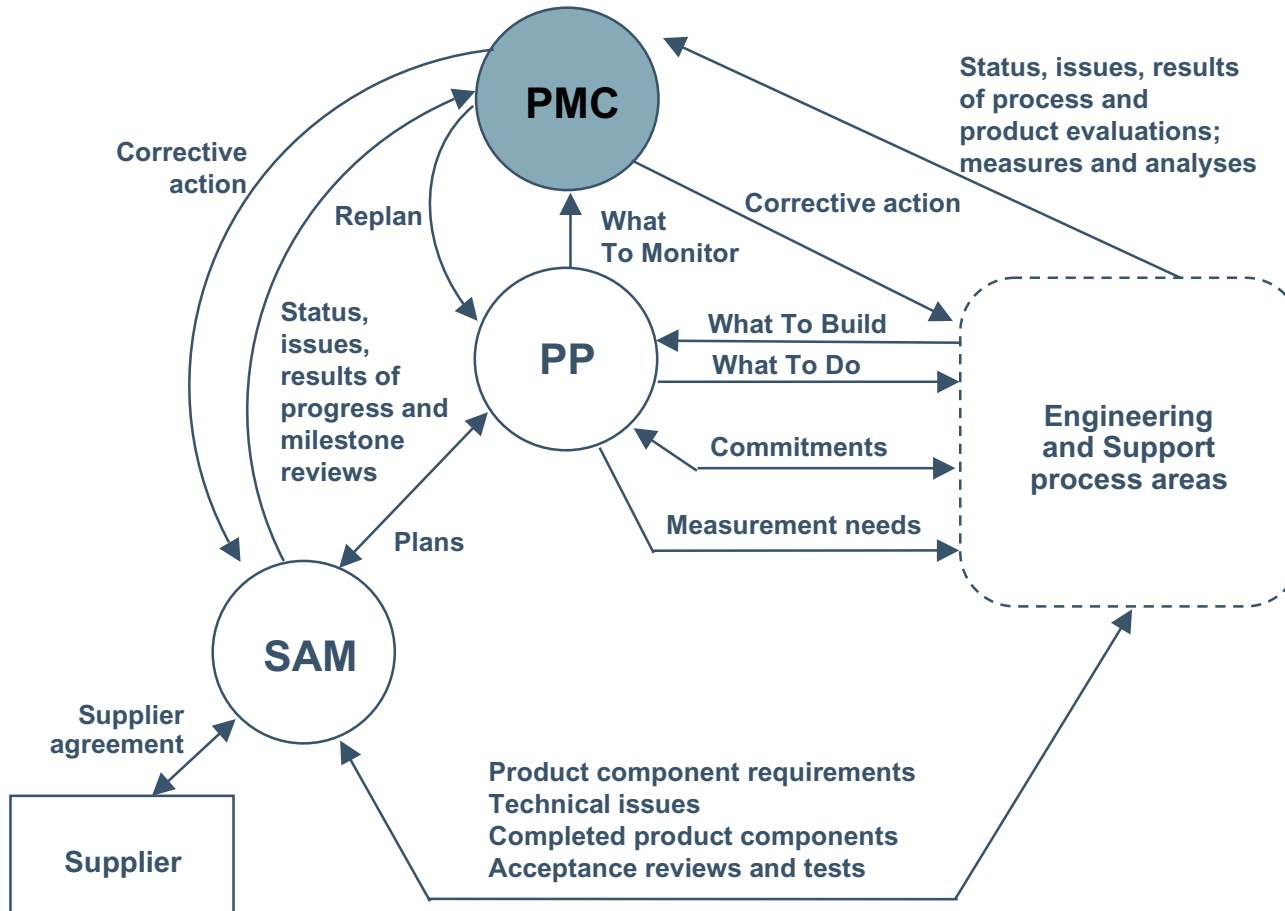
Workflow Detail: Develop Software Development Plan

Activity: Plan Phases and Iterations

**Comments:** RUP provides guidance on sizing a software effort. Sizing by analogy and sizing by analysis is discussed. RUP does not provide assistance in sizing non-software project attributes (i.e. labor, machinery, materials, and methods that will be required by the project).

**Degree of Synergy:** **Medium**

# CMMI Basic Project Management



# Project Monitor and Control: Overview

## CMMI

### Purpose

Provide understanding into the project's progress so that appropriate corrective actions can be taken when the project's performance deviates significantly from the plan.

## RUP

### Workflow

Project Management

### Synergy

- RUP provides strong mechanisms to help monitor a project
- Project's using RUP should make sure data management is explicitly addressed

# Project Monitor and Control: Mapping

## CMMI

### SG 1: Monitor Project Against Plan

Actual performance and progress of the project is 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.

## RUP

**Workflow:** Project Management

**WD:** Monitor and Control Project

**Workflow:** Configuration Management

**Workflow:** Project Management

**WD:** Monitor and Control Project



# Project Monitor and Control: Synergy

## Specific Goal

## Specific Practice

---

Monitor Project Against Plans

- Monitor Project Planning Parameters (H)
- Monitor Commitments (M)
- Monitor Project Risks (H)
- Monitor Data Management (M)
- Monitor Stakeholder Interactions (H)
- Conduct Progress Reviews (H)
- Conduct Milestone Reviews (H)

---

Manage Corrective Actions to Closure

- Analyze Issues (H)
- Take Corrective Actions (H)
- Manage Corrective Actions (H)

## Project Monitor and Control: Detail Example

SP1.4-1 Monitor the management of project data.

RUP Components:

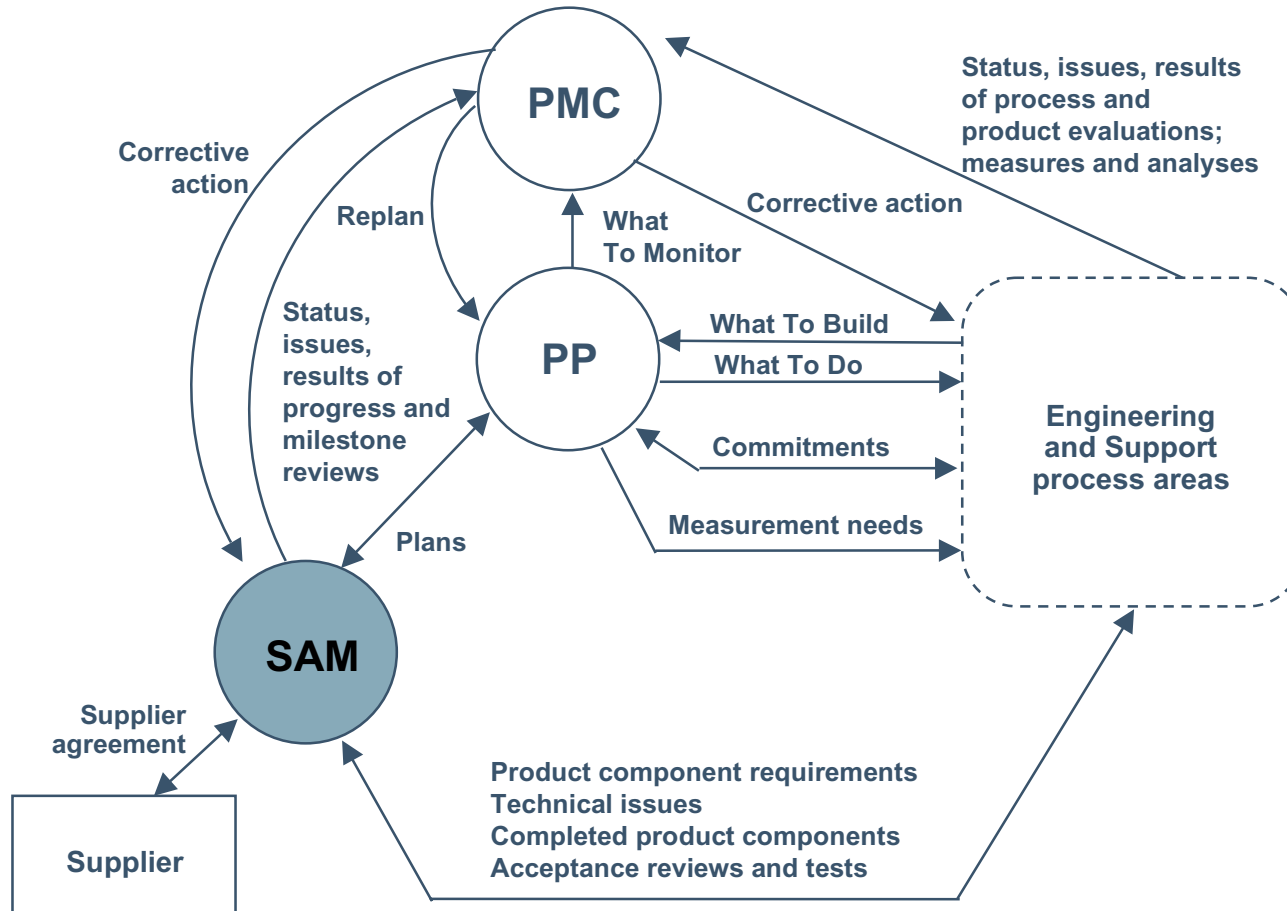
Workflow: Configuration Management

Comments: Although not required, managing project data could be called out in the Configuration Management Plan.

Degree of Synergy: **Medium**



# CMMI Basic Project Management





# Supplier Agreement Management: Overview

## CMMI

### Purpose

Manage the acquisition of products and services from suppliers external to the project for which there exists a formal agreement.

## RUP

### Workflow

none

### Synergy

- RUP does not explicitly deal with managing work from external suppliers to the project
- RUP's QA Plan, CM Plan, and Software Development Plan have sections labeled for supplier and subcontractor control

# Supplier Agreement Management: Mapping

## CMMI

### SG 1: Establish Supplier Agreements

Agreements with the suppliers are established and maintained.

---

### SG 2: Satisfy Supplier Agreements

Agreements with the suppliers are satisfied by both the project and the supplier

## RUP

Workflow: none  
Outside of the scope of RUP

Workflow: none  
Outside of the scope of RUP

# Supplier Agreement Management: Synergy

## Specific Goal

## Specific Practice

---

Establish Supplier  
Agreements

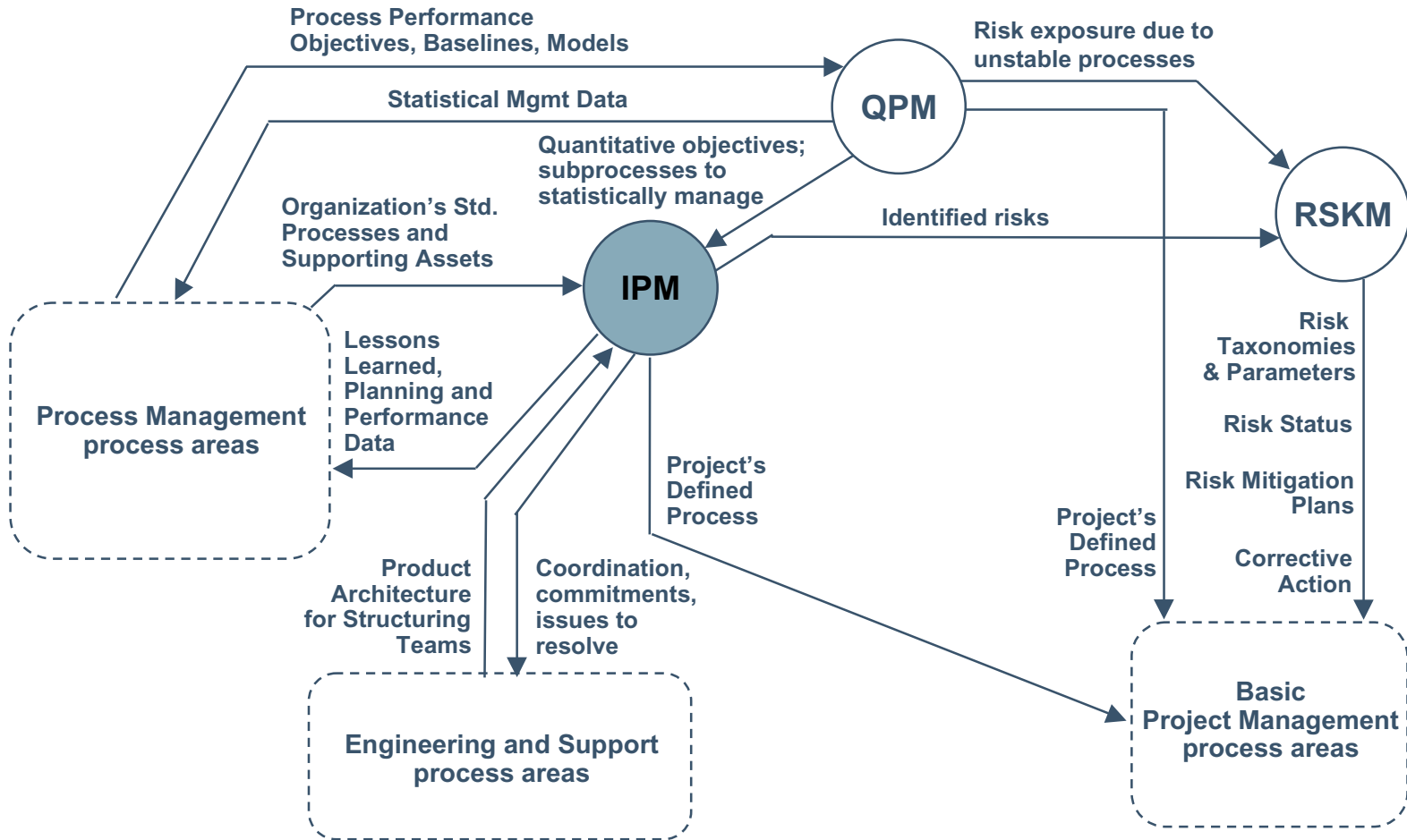
- Analyze Needs and Requirements Determined by the Project (L)
- Select Suppliers (L)
- Establish Supplier Agreements (L)

---

Satisfy Supplier  
Agreements

- Acquire COTS Products (L)
- Execute the Supplier Agreement (L)
- Conduct Acceptance Testing (L)
- Transition Products (L)

# CMMI Advanced Project Management



# Integrated Project Management: Overview

## CMMI

### Purpose

Establish and manage the project and the involvement of the relevant stakeholders according to an integrated and defined process that is tailored from the organization's set of standard processes.

## RUP

### Workflow

Project Management, Environment

### Synergy

- RUP encourages developing integrated plans
- RUP supports tailoring for project unique needs through the development case artifact

# Integrated Project Management: Mapping

## CMMI

### SG 1: Use the Project's Defined Process

The project is conducted using a defined process that is tailored from the organization's set of standard processes.

---

### SG 2: Coordinate and Collaborate with Relevant Stakeholders

Coordination and Collaboration of the project with relevant stakeholders is conducted.

## RUP

**Workflow:** Environment

**WD:** Prepare Environment for Project/Iteration

**Workflow:** Project Management

**WD:** Develop Software Development Plan

**WD:** Monitor and Control Project

**Workflow:** Project Management

**WD:** Close-out Phase



# Integrated Project Management: Synergy

## Specific Goal

## Specific Practice

Use the Project's  
Defined Process

- Establish the Project's Defined Process (M)
- Use Organizational Assets for Planning Project Activities (M)
- Integrate Plans (M)
- Manage the Project Using the Integrated Plans (H)
- Contribute to the Organization's Process Assets (H)

Coordinate and  
Collaborate with  
Relevant Stakeholders

- Manage Stakeholder Involvement (H)
- **Manage Dependencies (L)**
- Resolve Coordination Issues (H)



## Integrated Project Management: Detail Example

SP1.1-1 Establish and maintain the project's defined process.

### RUP Components:

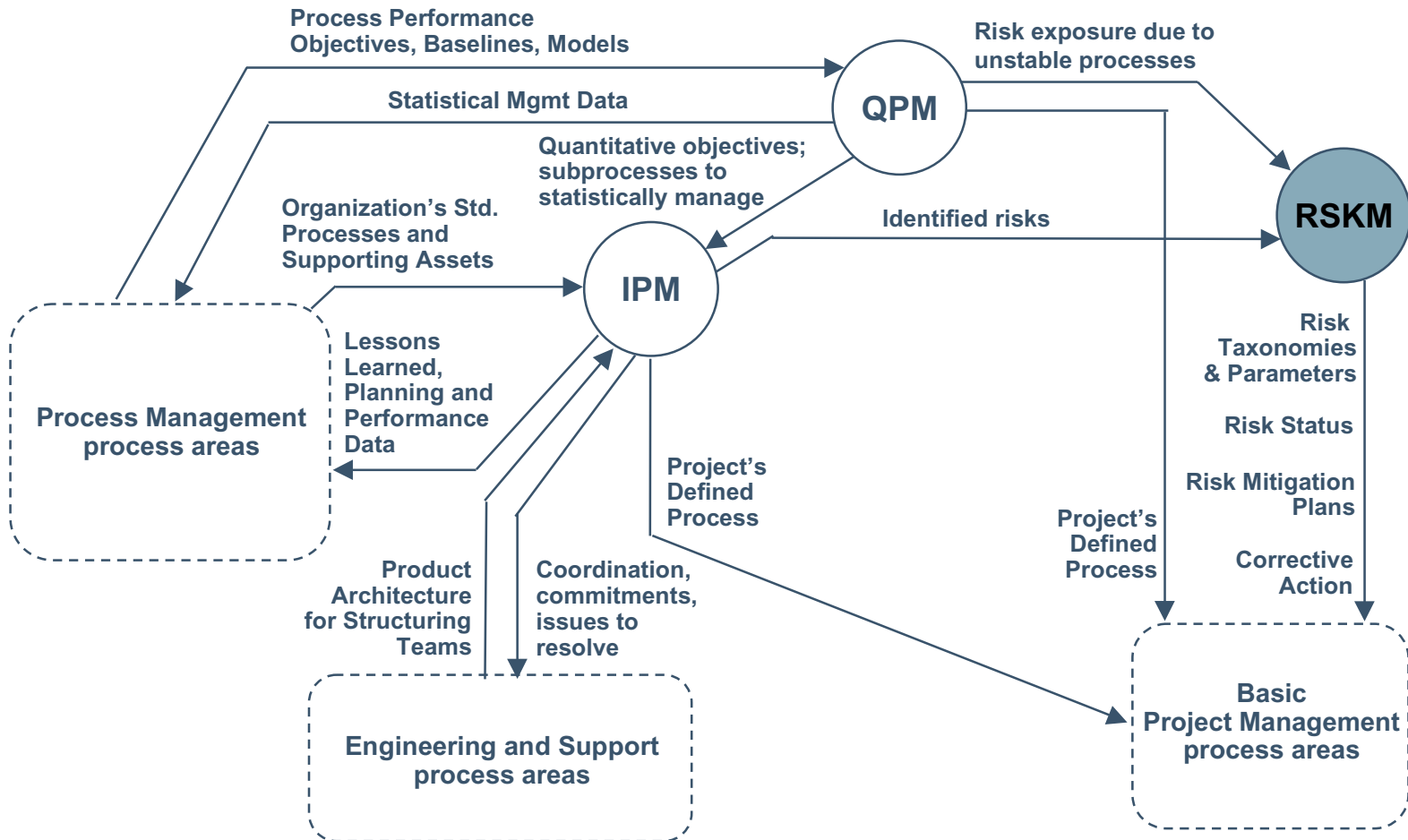
Workflow: Environment

Workflow Detail: Prepare Environment for Project/Iteration

**Comments:** Using RUP, a project would assess the current software development organization and select the processes and tools to support the project. This is less formal than having an “organizational standard process” comprised of a suite of lifecycles and processes to choose from complete with tailoring guidelines.

Degree of Synergy: **Medium**

# CMMI Advanced Project Management



# Risk Management: Overview

## CMMI

### Purpose

Identify potential problems before they occur, so that risk-handling activities may be planned and invoked as needed across the life cycle to mitigate adverse impacts on achieving objectives.

## RUP

### Workflow

Project Management

### Synergy

- RUP is a risk driven development process
- Activities are performed to mitigate the highest risks and tackle the hardest jobs first

# Risk Management: Mapping

## CMMI

### 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.

## RUP

**Workflow:** Project Management

**WD:** Develop Software Development Plan

---

**Workflow:** Project Management

**WD:** Conceive New Project

---

**Workflow:** Project Management

**WD:** Conceive New Project



# Risk Management: Synergy

## Specific Goal

## Specific Practice

---

Prepare for Risk Management

- Determine Risk Sources and Categories (H)
- Define Risk Parameters (M)
- Establish a Risk Management Strategy (M)

---

Analyze Risks

- Identify Risks (H)
- Evaluate, Classify, and Prioritize Risks (H)

---

Mitigate Risks

- Develop Risk Mitigation Plans (H)
- Implement Risk Mitigation Plans (H)



# Risk Management: Detail Example

SP2.1-1 Identify and document the risks.

RUP Components:

Workflow: Project Management

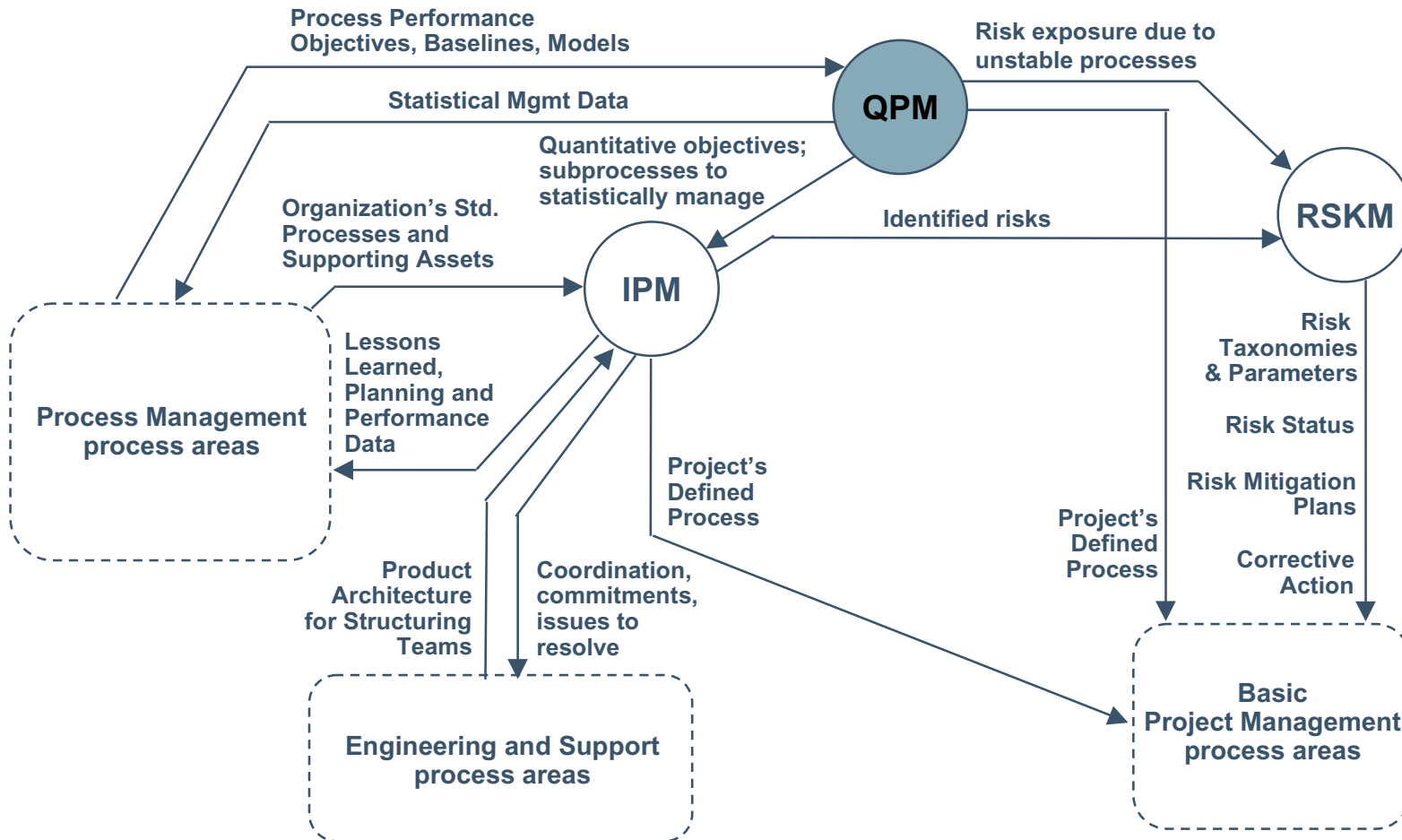
Workflow Detail: Conceive New Project

Activity: Identify and Assess Risks

Comments: RUP calls for identifying risks. The resulting artifact, the Risk List, documents the identified risks.

Degree of Synergy: **High**

# CMMI Advanced Project Management



# Quantitative Project Management: Overview

## CMMI

### Purpose

Quantitatively manage the project's defined process to achieve the project's established quality and process performance objectives.

## RUP

### Workflow

Environment

### Synergy

- Quantitatively managing the project's processes is outside the scope of RUP
- RUP provides some guidance on measures pertinent to RUP

# Quantitative Project Management: Mapping

## CMMI

### 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.

## RUP

**Workflow:** Environment  
WD: Prepare Environment for Project

**Workflow:** none

# Quantitative Project Management: Synergy

## Specific Goal

## Specific Practice

---

Quantitatively Manage  
the Project

- Establish the Project's Objectives (L)
- Compose the Defined Process (M)
- Select the Subprocesses to be Managed (L)
- Manage Project Performance (L)

---

Statistically Manage  
Subprocess  
Performance

- Select Measures and Analytic Techniques (L)
- Apply Statistical Methods to Understand Variation (L)
- Monitor Performance of the Selected Subprocesses (L)
- Record Statistical Management Data (L)



## Quantitative Project Management: Detail Example

SP1.2-1 Select the processes and process elements that comprise the project's defined process based on historical stability and capability data.

### RUP Components:

Workflow: Environment

Workflow Detail: Prepare Environment for Project

Guidelines: Process Discriminates

**Comments:** While selection of processes and process elements aren't selected based on historical stability (meaning statistically understood), RUP provides guidelines to help projects select processes based on characteristics.

**Degree of Synergy: Medium**



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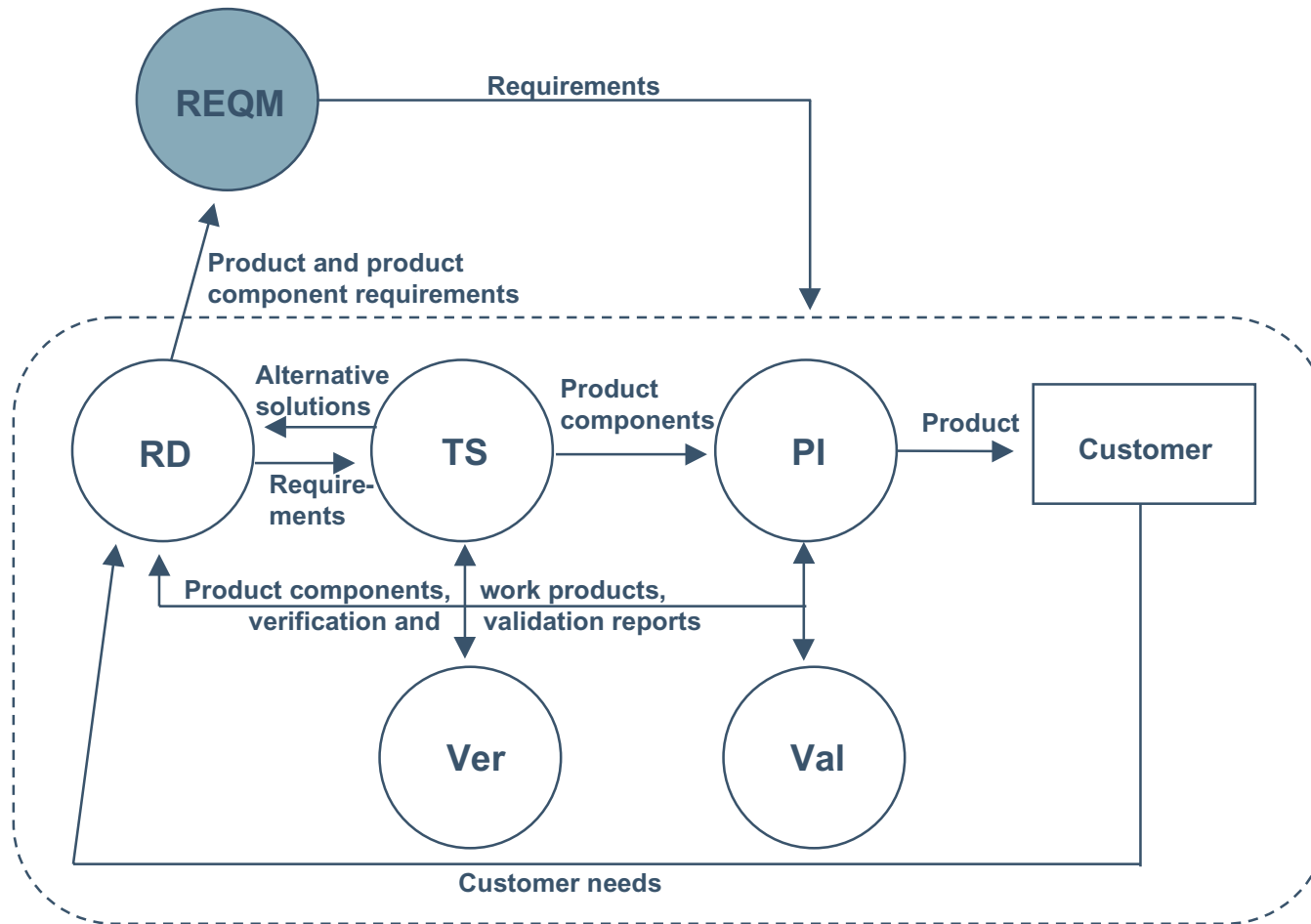


- Project Management
- Engineering
- Support
- Process Management
- Generic Practices

Lessons Learned



# CMMI Engineering Process Areas





# Requirements Management: Overview

## CMMI

### Purpose

Manage the requirements of the project's product and product components and to identify inconsistencies between those requirements and the project's plans and work products.

## RUP

### Workflow

Requirements

### Synergy

- RUP provides adequate support mechanisms
- RUP integrates the tracking (or change management) of requirements with capturing and analyzing requirements



# Requirements Management: Mapping

## CMMI

### SG 1: Manage Requirements

Requirements are managed and inconsistencies with project plans and work products are identified.

## RUP

**Workflow:** Requirements

WD: Understand Stakeholder Needs

WD: Manage the Scope of the System

WD: Manage Changing Requirements

**Workflow:** Analysis and Design

WD: Analyze Behavior

WD: Design Components

WD: Design Database

WD: Design Real-time



# Requirements Management: Synergy

## Specific Goal

## Specific Practice

### Manage Requirements

- Obtain an Understanding of Requirements (H)
- Obtain Commitment to Requirements (Level 2) (H)
- Manage Requirement Changes (H)
- Maintain Bi-Directional Traceability of Requirements (Level 2) (H)
- Identify Inconsistencies between Project Work and Requirements (H)

## Requirements Management: Detail Example

SP1.2-2: Obtain commitment to the requirements from the project participants.

### RUP Elements:

Workflow: Requirements

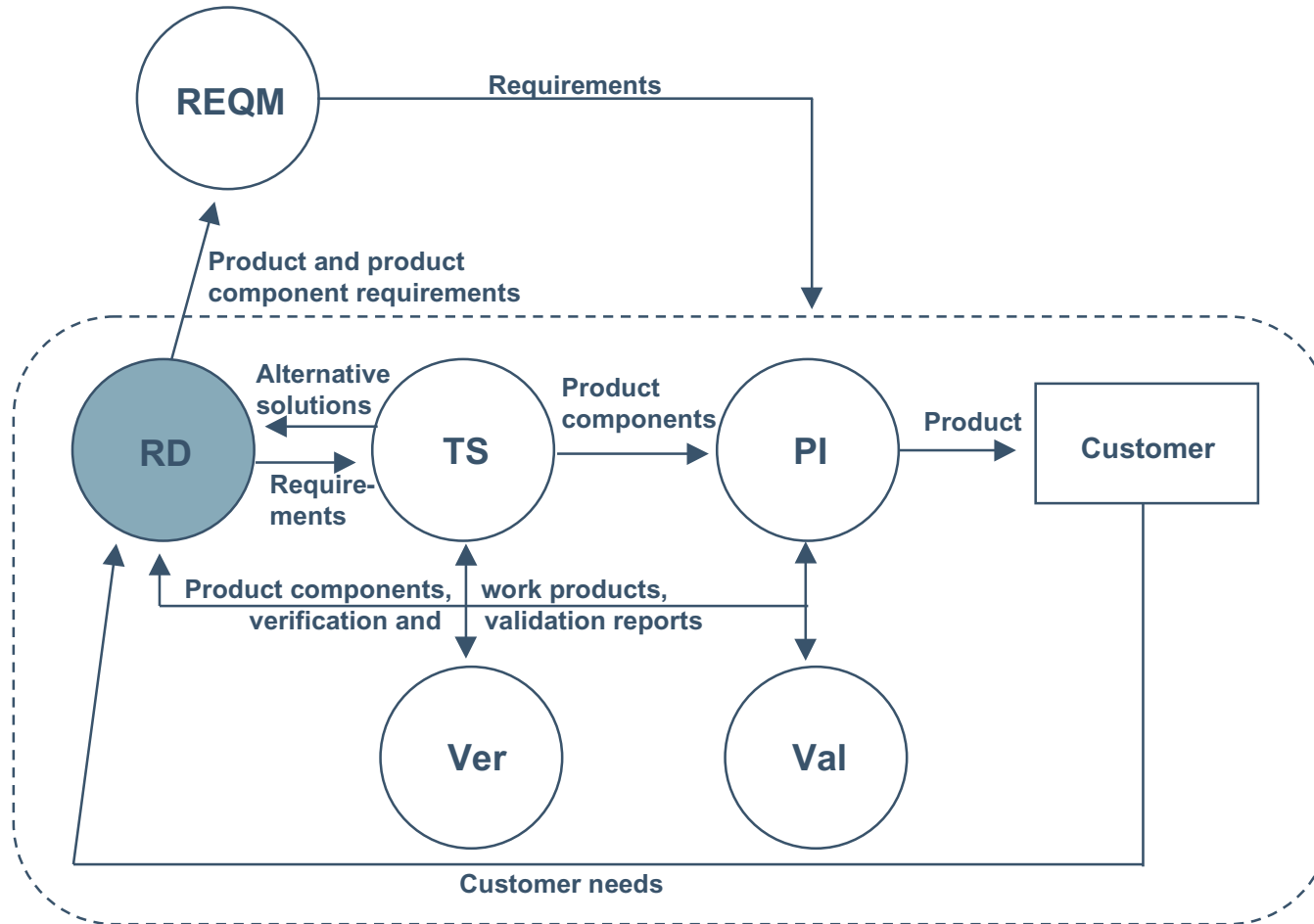
Workflow Detail: Manage the Scope of the System

Activity: Prioritize Use Cases

**Comments:** RUP employs use cases to plan and package the work to be done. The architect comes up with a first cut at a list of prioritized use cases. The project team is involved in revising the prioritized list based on project risks, availability of resources, and stakeholder needs.

Degree of Synergy: **High**

# CMMI Engineering Process Areas



# Requirements Development: Overview

## CMMI

### Purpose

Produce and analyze customer, product, and product component requirements.

## RUP

### Workflows

Requirements, Configuration and Change Management, Analysis and Design, Implementation, Test

### Synergy

- RUP provides good support mechanisms
- RUP “features” equivalent to customer requirements
- Interfaces treated as one kind of requirement
- Prototyping key approach for requirements (incl. interfaces) validation

# Requirements Development: Mapping -1

## CMMI

### SG 1: Develop Customer Requirements

Stakeholder needs, expectations, constraints, and interfaces are collected and translated into customer requirements.

---

### SG 2: Develop Product Requirements

Customer requirements are refined and elaborated to develop product and product component requirements for the product life cycle.

## RUP

**Workflow:** Requirements

WD: Understand Stakeholder Needs

WD: Analyze the Problem

WD: Define the System

**Workflow:** Configuration and Change Management

WD: Manage Change Requests

---

**Workflow:** Requirements

WD: Refine the System Definition

WD: Develop Software Development Plan

**Workflow:** Analysis and Design

WD: Analyze Behavior

# Requirements Development: Mapping -2

## CMMI

## RUP

### SG 3: Analyze and Validate Requirements

The requirements are analyzed and validated, and a definition of required functionality is developed.

**Workflow:** Requirements  
**Guidelines:** Use-case Storyboard  
**WD:** Analyze the Problem, Understand Stakeholder Needs, Define the System, Manage the Scope of the System, Refine the System Definition, Manage Changing Requirements

**Workflow:** Analysis and Design  
**WD:** Define a Candidate Architecture

**Workflows:** Implementation, Test (to create and assess prototypes)



# Requirements Development: Synergy -1

## Specific Goal

## Specific Practice

---

Develop Customer Requirements

- Collect Stakeholder Needs (H)
- Elicit Needs (Level 2) (H)
- Transform Stakeholder Needs, Expectations, Constraints, and Interfaces into Customer Requirements (H)

---

Develop Product Requirements

- Establish Product and Product Component Requirements (H)
- Allocate Product Component Requirements (M)
- Identify Interface Requirements (H)

# Requirements Development: Synergy -2

## Specific Goal

## Specific Practice

Analyze and Validate  
Requirements

- Establish Operational Concepts and Scenarios (H)
- Establish a Definition of Required Functionality (H)
- Analyze Requirements (H)
- Evaluate Product Cost, Schedule and Risk (Level 3) (H)
- Validate Requirements (H)
- Validate Requirements with Comprehensive Methods (Level 2) (H)

## Requirements Development: Detail Example

SP2.2-1: Allocate the requirements for each product component.

### RUP Elements:

Workflow: Analysis and Design

Workflow Detail: Analyze Behavior

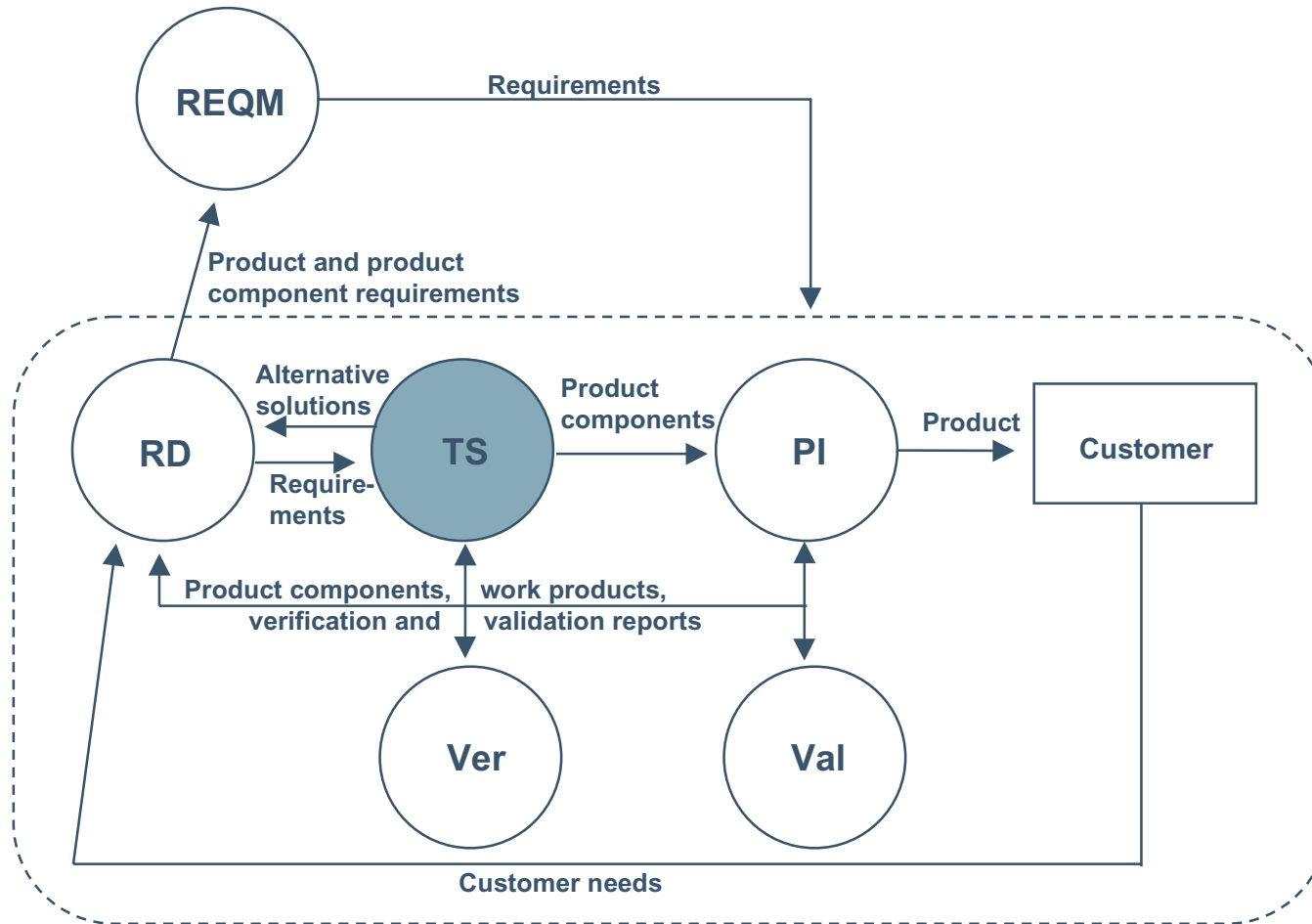
Activity: Use-case Analysis, Identify Design Elements

**Comments:** RUP transforms the behavioral descriptions from the use cases into a set of design elements for the product using an object-oriented approach for analysis and design. RUP does not refer to this set of activities as “requirements flowdown”.

CMMI stipulates that higher-level functionality that becomes the responsibility of 2+ product components must be partitioned for unique component allocation. This can lead to a functional design, which RUP explicitly avoids.

Degree of Synergy: **Medium**

# CMMI Engineering Process Areas



# Technical Solution: Overview

## CMMI

### Purpose

Develop, design, and implement solutions to requirements. Solutions, designs and implementations encompass products, product components, and product related processes either singly or in combinations as appropriate.

## RUP

### Workflows

Analysis and Design, Implementation, Deployment, Project Management

### Synergy

- RUP addresses the central goals of forming, designing, and implementing engineered solutions
- RUP provides greater guidance on architecture development and validation than CMMI
- RUP does not explicitly cover consideration of design alternatives except at the architectural level
- RUP does not explicitly cover the use of selection criteria for product solutions or components

# Technical Solution: Mapping -1

## CMMI

### SG 1: Select Product Component Solutions

Product or product component solutions, including applicable product related processes, are selected from alternative solutions.

---

### SG 2: Develop the Design

Product or product component designs are developed.

## RUP

**Workflow:** Project Management

**WD:** Conceive New Project

**Artifact:** Business Case

**Workflow:** Analysis and Design

**WD:** Define a Candidate Architecture

**WD:** Refine the Architecture

---

**Workflow:** Analysis & Design  
(all workflow details, activities, guidelines, artifacts)



## Technical Solution: Mapping -2

### CMMI

SG 3: Implement the Product Design  
Product components, and associated support documentation, are implemented from their designs.

### RUP

Workflow: Implementation  
WD: Implement Component  
Artifact: Programming Guidelines  
Workflow: Deployment  
WD: Develop Support Materials

# Technical Solution: Synergy -1

## Specific Goal

## Specific Practice

---

Select Product  
Component Solutions

- Develop Alternative Solutions and Selection Criteria (M)
- Develop Detailed Alternative Solutions and Selection Criteria (Level 2) (L)
- Evolve Operational Concepts and Scenarios (Level 2) (H)
- Select Product Component Solutions (M)



# Technical Solution: Synergy -2

## Specific Goal

## Specific Practice

---

### Develop the Design

- Use Effective Design Methods (H)
- Develop a Technical Data Package (H)
- Establish a Complete Technical Data Package (Level 3) (H)
- Establish Interface Descriptions (H)
- Design Comprehensive Interface (Level 3) (H)
- Perform Make, Buy, or Reuse Analyses (Level 3) (L)

---

### Implement the Product Design

- Implement the Design (H)
- Establish Product Support Documentation (H)

## Technical Solution: Detail Example

SP1.1-1: Develop alternative solutions and establish selection criteria.

### RUP Elements:

Workflow: Project Management

Artifact: Business Case

Workflow: Analysis and Design

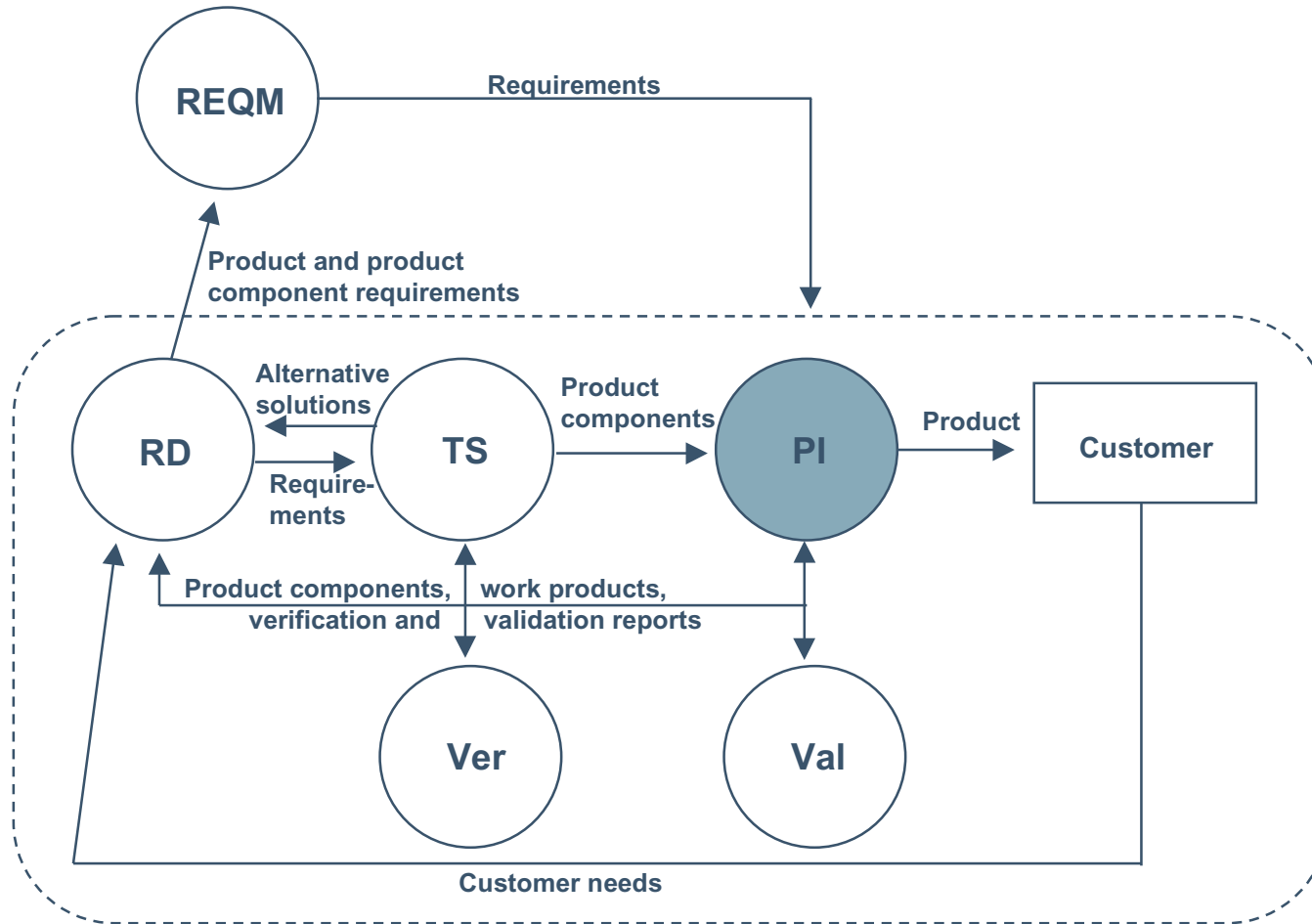
Workflow Details: Define a Candidate Architecture, Refine the Architecture

**Comments:** The Business Case describes at least two approaches to realizing the system Vision, and analyze these in terms of capability, risk impact, schedule, and economic outcomes. Project options might include differing contractual bases, differing project lifecycles, differing mixes of 'make' and 'buy', and so on. During the Project Approval Review, one of the offered choices is selected. RUP provides references to sources for risk and decision analysis techniques but does not explicitly establish criteria.

While RUP is very architecture focussed, it does not provide guidance on product component selection.

Degree of Synergy: **Medium**

# CMMI Engineering Process Areas

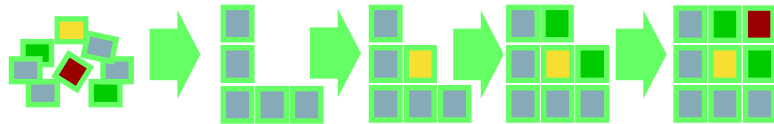


# Product Integration: Overview

## CMMI

### Purpose

Assemble the product from the product components, ensure that the product, as integrated, functions properly and deliver the product.



## RUP

### Workflows

Implementation, Test, Deployment, Change & Configuration Management, Analysis & Design

### Synergy

- RUP supports the general intent of product integration
- RUP does not single interfaces out for special treatment but does treat them as first class elements of any design and integration



# Product Integration: Mapping -1

## CMMI

### SG 1: Prepare for Product Integration

The strategy for conducting product integration is established and maintained.

---

### SG 2: Ensure Interface Compatibility

The product component interfaces, both internal and external, are compatible.

## RUP

**Workflow:** Implementation

**WD:** Plan the Integration

**Artifact:** Integration Build Plan

**Workflow:** Change and Configuration Management

**WD:** Create Project CM Environment

**Activity:** Create Integration Workspace

**Workflow:** Analysis and Design

**Artifact:** Design Model

**Workflow:** Implementation

**WD:** Structure the Implementation Model, Integrate each Subsystem, Integrate the System

**Workflow:** Test

**WD:** Execute Integration Tests, Execute System Test



# Product Integration: Mapping -2

## CMMI

SG 3: Assemble Product  
Components and Deliver the Product

Verified product components are assembled and the integrated, verified, and validated product is delivered.

## RUP

**Workflow:** Implementation  
WD: Implement Component  
Activity: Perform Unit Tests  
WD: Integrate Each Subsystem  
WD: Integrate the System  
**Workflow:** Test  
WD: Execute Test in Integration Test Stage  
**Workflow:** Deployment  
WD: Product Deployment Unit  
WD: Package Product  
WD: Provide Access to Download Site



# Product Integration: Synergy -1

## Specific Goal

## Specific Practice

---

Prepare for Product Integration

- Establish a Product Integration Strategy (H)
- Establish the Product Integration Environment (Level 2) (H)
- Define Detailed Product Integration Procedures (Level 3) (H)

---

Ensure Interface Compatibility

- Review Interface Descriptions for Completeness (H)
- Manage Interfaces (H)



# Product Integration: Synergy -2

## Specific Goal

## Specific Practice

Assemble Product  
Components and  
Deliver the Product

- Confirm Readiness of Product (H)
- Components for Integration (H)
- Assemble Product Components (H)
- Checkout Assembled Product Components (H)
- Package and Deliver the Product or Product Components (H)



## Product Integration: Detail Example

SP2.1-1: Review interface descriptions for coverage and completeness.

### RUP Elements:

Workflow: Analysis and Design

Artifact: Design Model

Workflow: Implementation

Workflow Details: Structure the Implementation Model, Integrate each Subsystem, Integrate the System

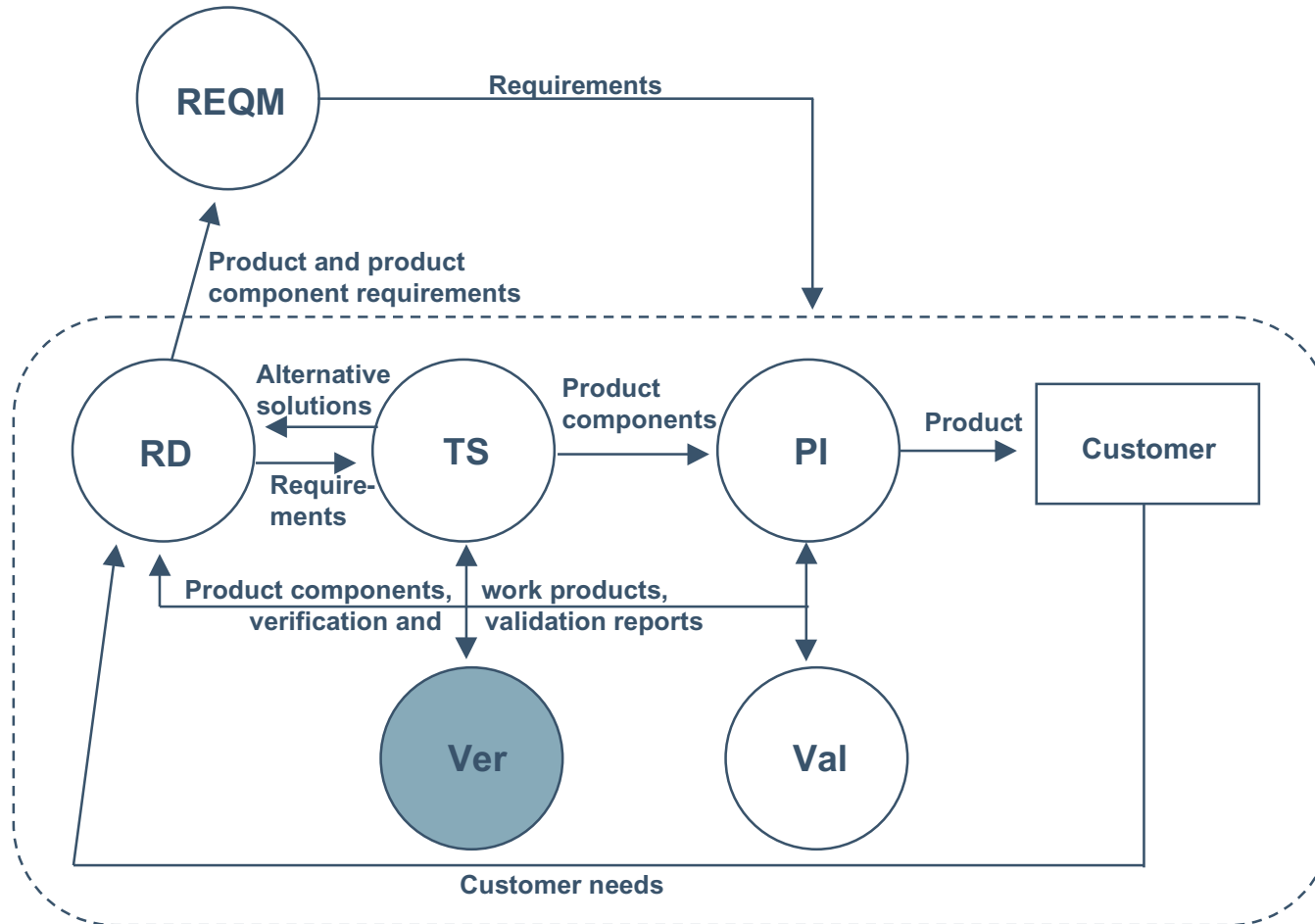
Workflow: Test

Workflow Details: Execute Integration Tests, Execute System Test

**Comments:** Interfaces are a critical part of the architecture and design in RUP. The primary review mechanism is building architectural prototypes and integrating and testing the executables in each iteration such that the interfaces are exercised in a more realistic setting.

**Degree of Synergy:** High

# CMMI Engineering Process Areas





# Verification: Overview

## CMMI

### Purpose

Assure that selected work products meet their specified requirements.

## RUP

### Workflows

Test, Environment, Implementation

### Synergy

- RUP provides good support for verification practices
- Verification occurs with each iteration

# Verification: Mapping

## CMMI

### SG 1: Prepare for Verification

Preparation for verification is conducted.

---

### SG 2: Perform Peer Reviews

Peer reviews are performed on selected work products.

---

### SG 3: Verify Selected Work Products

Selected work products are verified against their specified requirements.

## RUP

**Workflow:** Test

WD: Plan Test

WD: Design Test

**Workflow:** Environment

WD: Support Environment

---

Work Guideline: Reviews (applies to all work products in all workflows)

---

**Workflow:** Test

WD: Execute Integration Test

WD: Execute System Test

WD: Evaluate Test

**Workflow:** Implementation

WD: Implement Component



## Verification: Synergy

### Specific Goal

### Specific Practice

---

#### Prepare for Verification

- Establish a Verification Strategy (H)
- Establish the Verification Environment (Level 2) (H)
- Establish Detailed Verification Plans (Level 3) (H)

---

#### Perform Peer Reviews

- Prepare for Peer Reviews (H)
- Conduct Peer Reviews (H)
- Analyze Peer Review Data (Level 2) (H)

---

#### Verify Selected Work Products

- Perform Verification (H)
- Analyze Verification Results and Identify Corrective Actions (Level 2) (H)
- Perform Re-Verification (H)



## Verification: Detail Example

SP3.3-1: Perform re-verification of corrected work products and ensure that work products have not been negatively impacted.

### RUP Elements:

Workflow: Test

Workflow Detail: Execute Tests

Activity: Execute Tests in Integration Test Stage

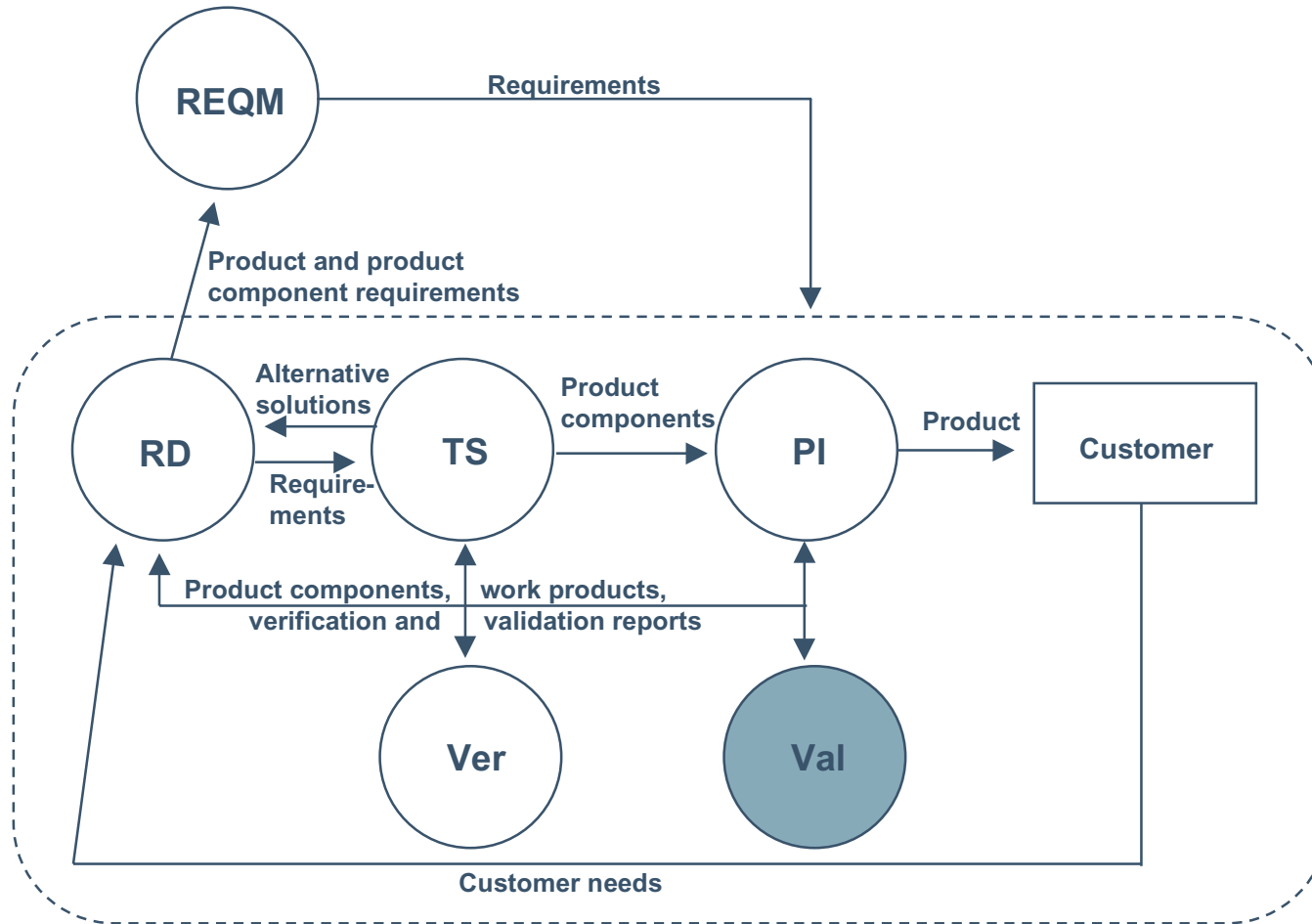
Activity: Execute Tests in System Test Stage

Activity: Fix a Defect

**Comments:** In iterative development, regression testing occurs with each iteration. If bugs fix are needed, another iteration is performed with its own test activities. For each iteration a new version of the test model is developed that contains old tests (as regression tests), and new tests that take new functionality into account.

**Degree of Synergy:** High

# CMMI Engineering Process Areas



# Validation: Overview

## CMMI

### Purpose

Demonstrate that a product or product component fulfills its intended use when placed in its intended environment.

## RUP

### Workflows

Project Management, Deployment

### Synergy

- RUP begins validation early with use case reviews with the users and continues with each iteration's executable evaluated in a pre-release setting with selected users
- Product acceptance is defined as part of the project plan



# Validation: Mapping

## CMMI

### SG 1: Prepare for Validation

Preparation for validation is conducted.

---

### SG 2: Validate Product or Product Components

The product or product components are validated to ensure that they are suitable for use in their intended operating environment.

## RUP

**Workflow:** Project Management

**WD:** Develop Product Acceptance Plan

**Workflow:** Deployment

**WD:** Beta Test Product

**Workflow:** Project Management

**WD:** Close-out Project

**Artifact:** Product Acceptance Plan

**Workflow:** Deployment

**WD:** Beta Test Product



# Validation: Synergy

## Specific Goal

## Specific Practice

---

### Prepare for Validation

- Establish a Validation Strategy (H)
- Establish the Validation Environment (Level 2) (H)
- Define Detailed Validation Procedures (Level 3) (H)

---

### Validate Product or Product Components

- Perform Validation (H)
- Capture and Analyze Validation Results (H)



## Validation: Detail Example

SP1.1-1: Establish and maintain a validation strategy.

### RUP Elements:

Workflow: Deployment

Workflow Detail: Beta Test Product

Activity: Manage Beta Test

Workflow: Project Management

Workflow Detail: Develop Product Acceptance Plan

**Comments:** Inherent to RUP is the continual validation of each iteration's executable by actual users in order to identify defects or disconnects as early as possible. The product acceptance plan is co-developed with the users.

Degree of Synergy: **High**



## Topics

Goals and Purpose

CMMI Overview

RUP Overview

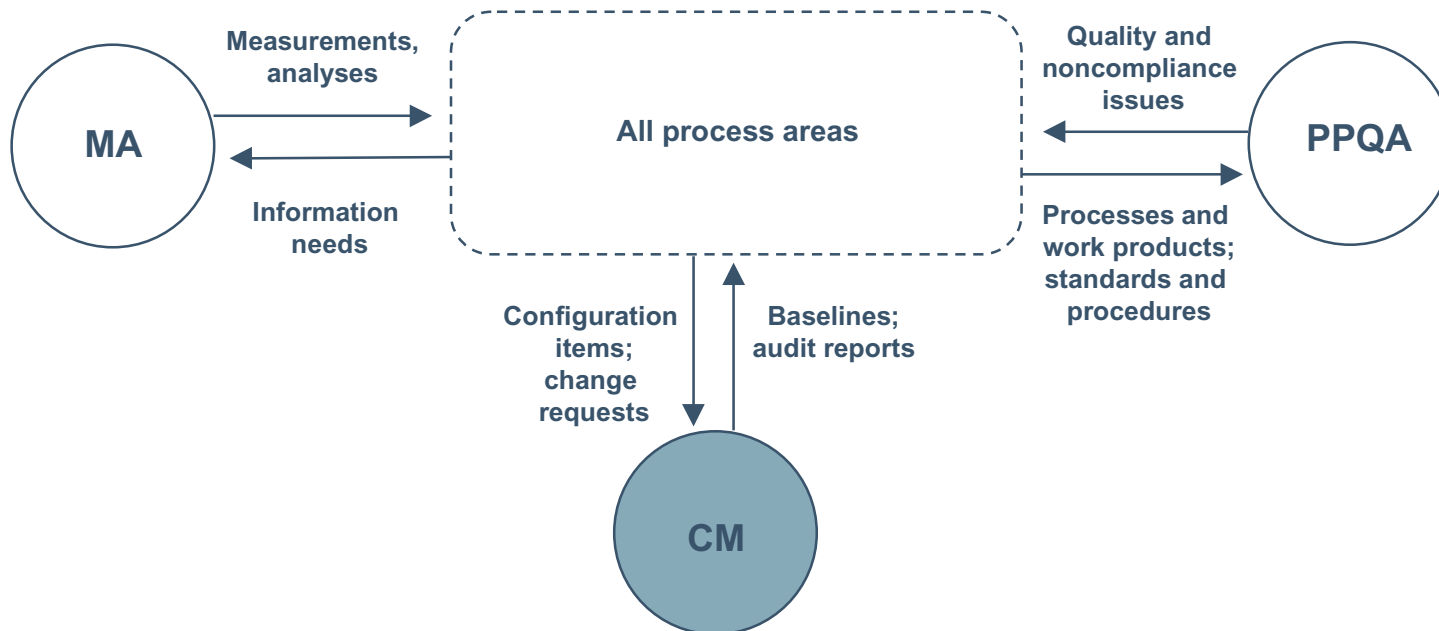
RUP to CMMI Mapping

- Project Management
- Engineering
- Support
- Process Management
- Generic Practices



Lessons Learned

# CMMI Basic Support Process Areas





# Configuration Management: Overview

## CMMI

### Purpose

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

## RUP

### Workflow

Configuration and Change Management

### Synergy

- RUP provides good support mechanisms

# Configuration Management: Mapping -1

## CMMI

### SG 1: Establish Baselines

Baselines of identified work products are established and maintained.

---

### SG 2: Track and Control Changes

Changes to the work products under configuration management are tracked and controlled.

## RUP

**Workflow:** Configuration and Change Management

WD: Plan Project Configuration & Change Control

WD: Change & Deliver Configuration Items

WD: Manage Baselines & Releases

---

**Workflow:** Configuration and Change Management

WD: Manage Change Requests

# Configuration Management: Mapping -2

## CMMI

### SG 3: Establish Integrity

Integrity of baselines is established and maintained.

## RUP

**Workflow:** Configuration and Change Management

**WD:** Monitor and Report Configuration Status



# Configuration Management: Synergy

## Specific Goal

## Specific Practice

---

### Establish Baselines

- Identify Configuration Items (H)
- Establish a Configuration Management System (H)
- Create or Release Baselines (H)

---

### Track and Control Changes

- Track Changes (H)
- Control Changes (H)

---

### Establish Integrity

- Establish Configuration Management Records (H)
- Perform Configuration Audits (H)

## Configuration Management: Detail Example

**SP1.3-1:** Create or release baselines for internal use and for delivery to the customer.

### RUP Elements:

Workflow: Configuration and Change Management

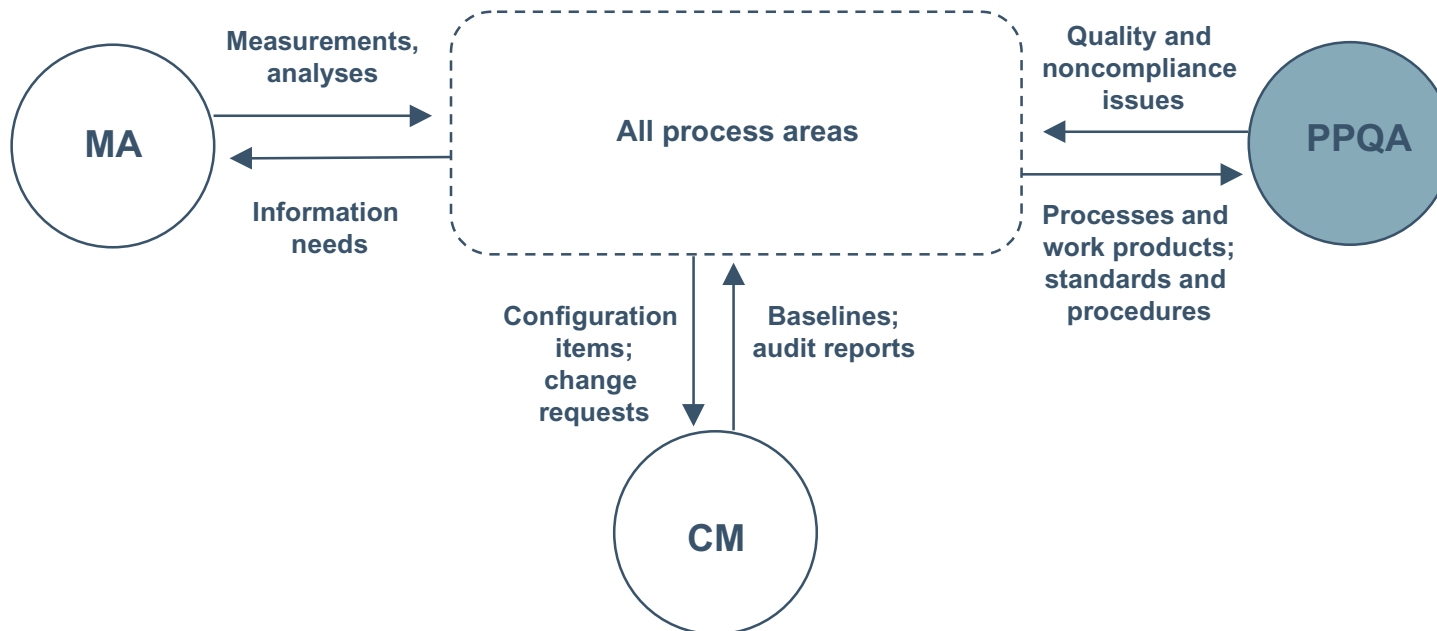
    Workflow Detail: Change and Deliver Configuration Items

    Workflow Detail: Manage Baselines and Releases

**Comments:** RUP provides for the creation of internal as well as external baselines (i.e., deployment unit = an executable collection of components, documents (end-user support material and release notes) and installation artifacts).

**Degree of Synergy:** High

# CMMI Basic Support Process Areas





# Process and Product Quality Assurance: Overview

## CMMI

### Purpose

Provide staff and management with objective insight into the processes and associated work products.

## RUP

### Workflow

Project Management

### Synergy

- RUP implements process and product quality throughout all workflows, phases, and iterations
- RUP Activity, Artifacts, Guidelines, Checkpoints, and Templates “encode” what should be evaluated

# Process and Product Quality Assurance: Mapping

## CMMI

### 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.

## RUP

**Workflow:** Project Management

**Artifact:** Quality Assurance Plan

**WD:** Monitor and Control Project

**Activity:** Assess Iteration

**Artifact:** Review Record (reviews and checkpoints in each workflow)

**Workflow:** Project Management

**Artifact:** Problem Resolution Plan

**WD:** Monitor and Control Project:

**Activity:** Handle Exceptions and Problems

**Artifact:** Review Record (reviews and checkpoints in each workflow)



# Process and Product Quality Assurance: Synergy

## Specific Goal

## Specific Practice

---

Objectively Evaluate  
Processes and Work  
Products

- Objectively Evaluate Processes (H)
- Objectively Evaluate Work Products and Services (H)

---

Provide Objective  
Insight

- Communicate and Ensure Resolution of Noncompliance Issues (H)
- Establish Records (H)



## Process and Product Quality Assurance: Detail Example

**SP2.1-1:** Communicate quality issues and ensure resolution of noncompliance issues with the staff and managers.

### RUP Elements:

Workflow: Project Management

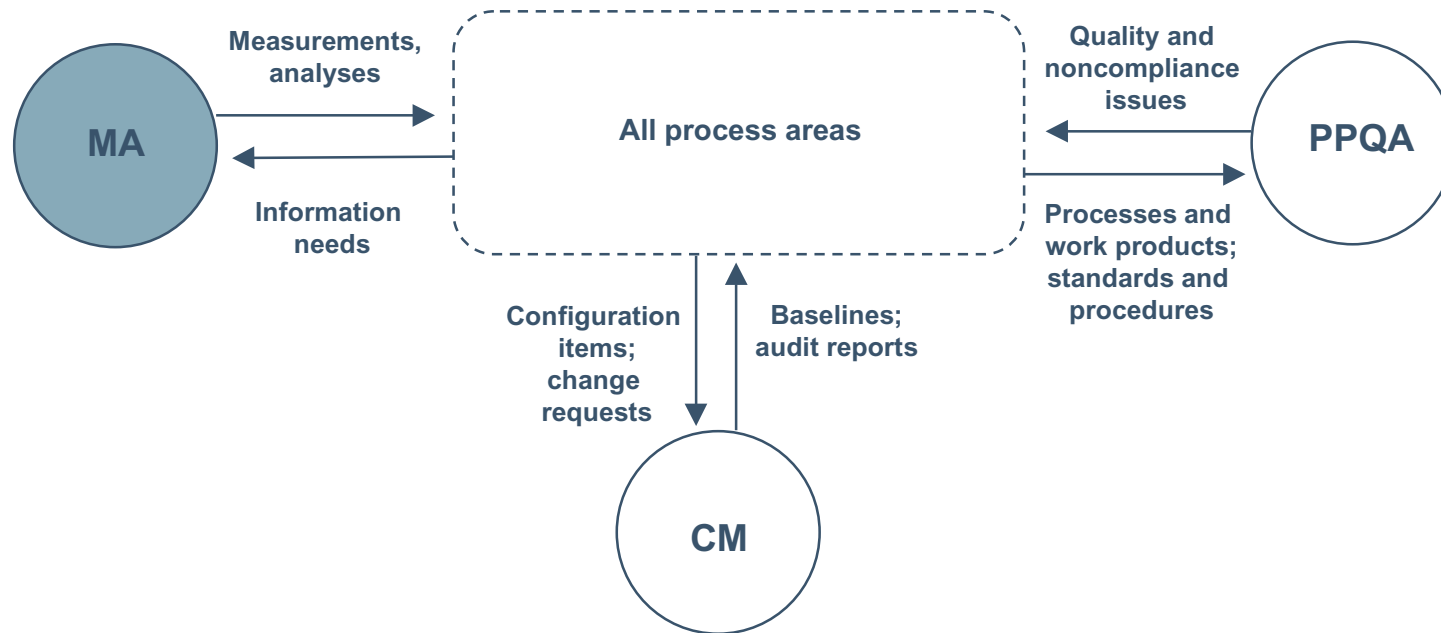
Workflow Detail: Monitor and Control Project

Activity: Handle Exceptions and Problems

**Comments:** Following the Problem Resolution Plan, problem management procedures are triggered in Activity: Handle Exceptions & Problems based on problems identified in a Status Assessment, raising of Change Requests to track defects, anomalies discovered during reviews, or through non-conformances raised during process audits and reviews.

**Degree of Synergy: High**

# CMMI Basic Support Process Areas



# Measurement and Analysis: Overview

## CMMI

### Purpose

Develop and sustain a measurement capability that is used to support management information needs.

## RUP

### Workflow

Project Management

### Synergy

- RUP provides good support mechanisms including extensive guidelines on candidate measures of project, process, and product
- RUP does not explicitly address the communication of measurement results to data providers

# Measurement and Analysis: Mapping

## CMMI

### SG 1: Align Measurement and Analysis Activities

Measurement objectives and practices are aligned with identified information needs and objectives.

---

### SG 2: Provide Measurement Results

Measurement results that address identified information needs and objectives are provided.

## RUP

**Workflow:** Project Management

**WD:** Develop Software Development Plan

**Activity:** Develop Measurement Plan

**Guidelines:** Metrics

---

**Workflow:** Project Management

**WD:** Monitor and Control the Project

**Activity:** Monitor Project Status

**Activity:** Report Status



# Measurement and Analysis: Synergy

## Specific Goal

## Specific Practice

---

Align Measurement  
and Analysis Activities

- Establish Measurement Objectives (H)
- Specify Measures (H)
- Specify Data Collection and Storage Procedures (H)
- Specify Analysis Procedures (H)

---

Provide Measurement  
Results

- Collect Measurement Data (H)
- Analyze Measurement Data (H)
- Store Data and Results (H)
- Communicate Results (H)

## Measurement and Analysis: Detail Example

SP2.4-1: Report results of measurement and analysis activities to all affected stakeholders.

### RUP Elements:

Workflow: Project Management

Workflow Detail: Monitor and Control the Project

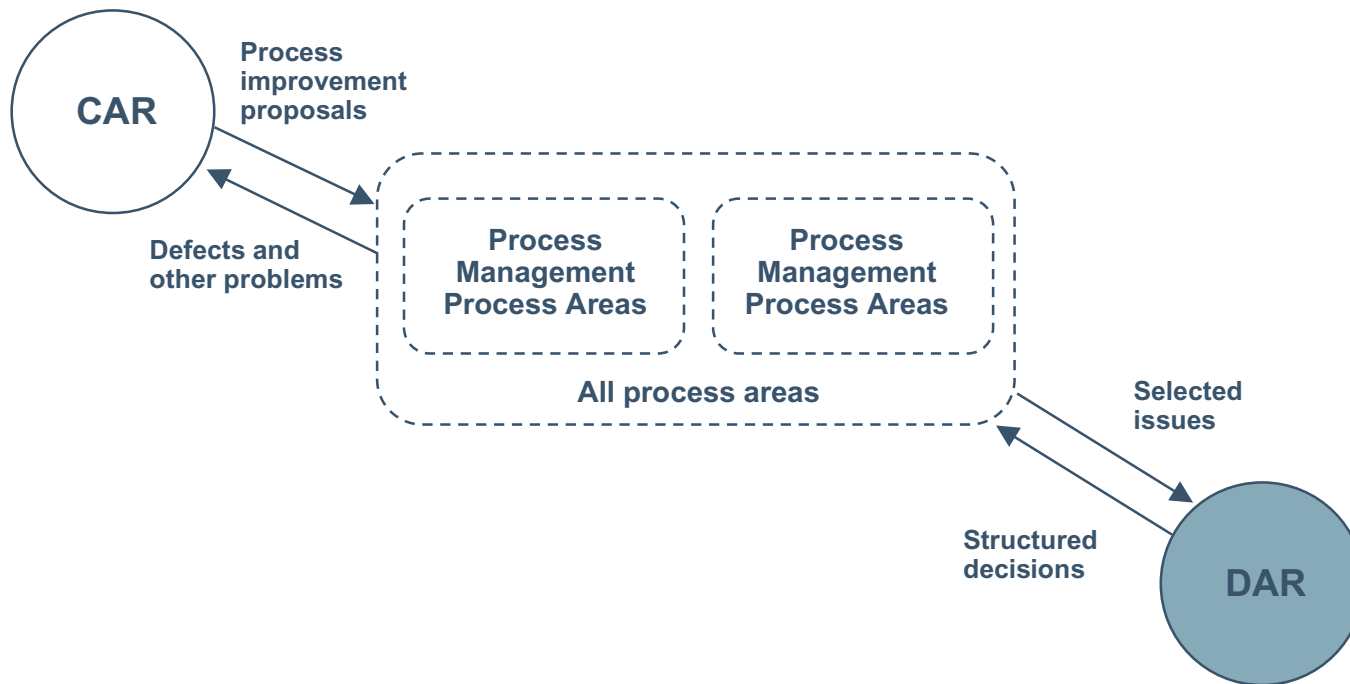
Activity: Report Status

Artifact: Status Assessment

**Comments:** Artifact: Status Assessment is drawn from the Project Measurements in Activity: Monitor Project Status. Status Assessment is used to ensure that expectations (i.e., Project Review Authority, project manager, and team leads in the functional areas) are synchronized and consistent. Data providers are not explicitly identified as receivers of measurement data.

**Degree of Synergy:** High

# CMMI Advanced Support Process Areas



# Decision Analysis and Resolution: Overview

## CMMI

### Purpose

Make decisions using a structured approach that evaluates identified alternatives against established criteria.

## RUP

### Workflow

none

### Synergy

- Decision analysis and resolution processes are outside the scope of RUP

# Decision Analysis and Resolution: Mapping

## CMMI

### SG 1: Evaluate Alternatives

Decisions are based on an evaluation of alternatives using established criteria.

## RUP

Workflow: none

Outside the scope of RUP

---

### SG 2: Provide Measurement Results

Measurement results that address identified information needs and objectives are provided.

Workflow: none

Outside the scope of RUP

# Decision Analysis and Resolution: Synergy

## Specific Goal

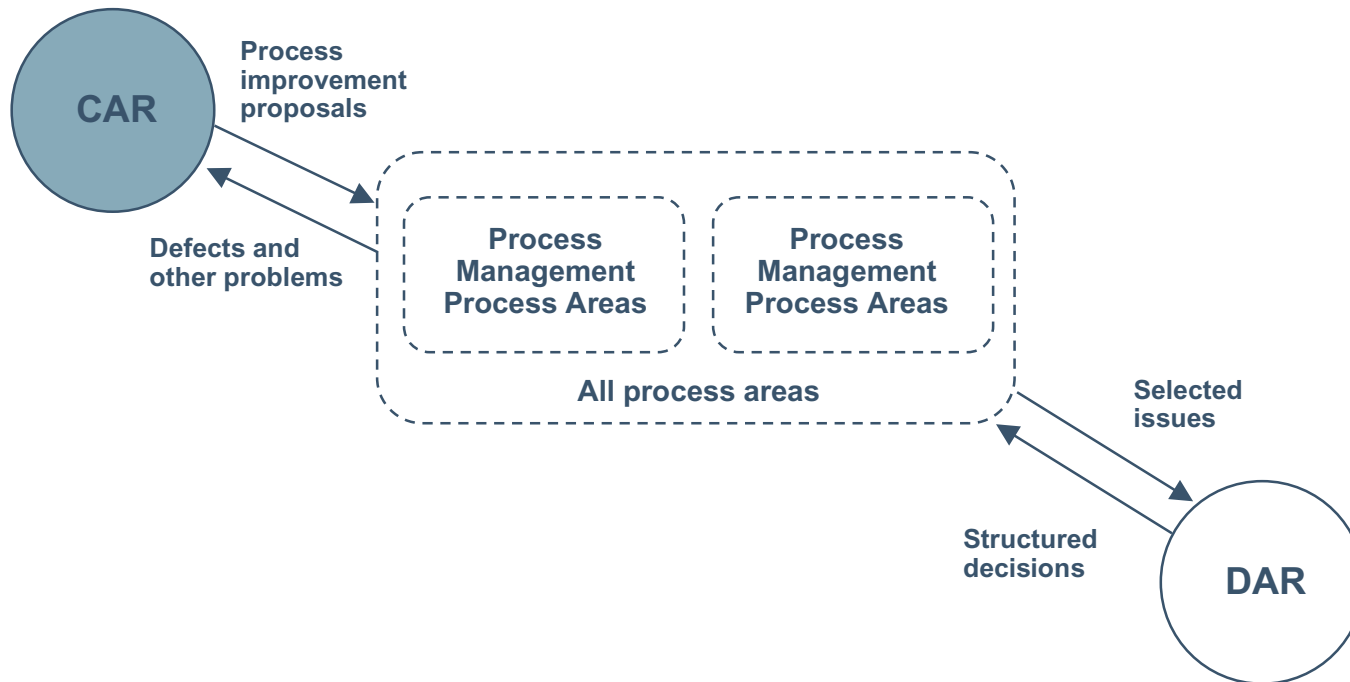
## Specific Practice

---

### Evaluate Alternatives

- Establish and Use Guidelines for Decision Analysis (L)
- Select Evaluation Technique (L)
- Establish Evaluation Criteria (L)
- Identify Proposed Alternatives (L)
- Evaluate Alternative Solutions (L)
- Select Solutions (L)

# CMMI Advanced Support Process Areas





# Causal Analysis and Resolution: Overview

## CMMI

### Purpose

Identify causes of defects and other problems and take action to prevent them from occurring in the future.

## RUP

### Workflow

Project Management

### Synergy

- In RUP, the iteration assessment supplies a natural point in each iteration to integrate causal analysis and resolution
- Projects would need to develop their own quantitatively-based causal analysis techniques

# Causal Analysis and Resolution: Mapping

## CMMI

### 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.

## RUP

**Workflow:** Project Management

**WD:** Manage Iteration

**Activity:** Assess Iteration

**Artifact:** Iteration Assessment

**Workflow:** Project Management

**WD:** Plan for Next Iteration

**Activity:** Develop Iteration Plan

**Artifact:** Development Case

**Workflow:** Test

**Activity:** Execute System Tests



# Causal Analysis and Resolution: Synergy

## Specific Goal

## Specific Practice

---

Determine Causes  
of Defects

- Select Data for Analysis (M)
- Analyze Causes (L)

---

Address Causes  
of Defects

- Implement the Action Proposals (M)
- Evaluate the Effect of Changes (M)
- Record Data (L)



## Causal Analysis and Resolution: Detail Example

**SP1.2-1:** Perform causal analysis of selected defects and other problems and propose actions to address them.

### RUP Elements:

Workflow: Project Management

Workflow Detail: Manage Iteration

Activity: Assess Iteration, Artifact: Iteration Assessment

**Comments:** In RUP, each iteration ends with an assessment of the iteration's objectives, risks, and defects that is used to modify the project or improve the process. Artifact: Iteration Assessment captures the result of an iteration, the degree to which the evaluation criteria was met, lessons learned, and changes to be done. While RUP provides an appropriate context for causal analysis, this CMMI practice assumes a statistical basis for the selection of defects and problems to address and the use of causal analysis techniques to analyze the defects. These aspects would need to be added to the iteration assessment, planning the next iteration, updating the development case, and specifying specific product and process measures in the measurement plan.

**Degree of Synergy:** **Low**



# Topics

Goals and Purpose

CMMI Overview

RUP Overview

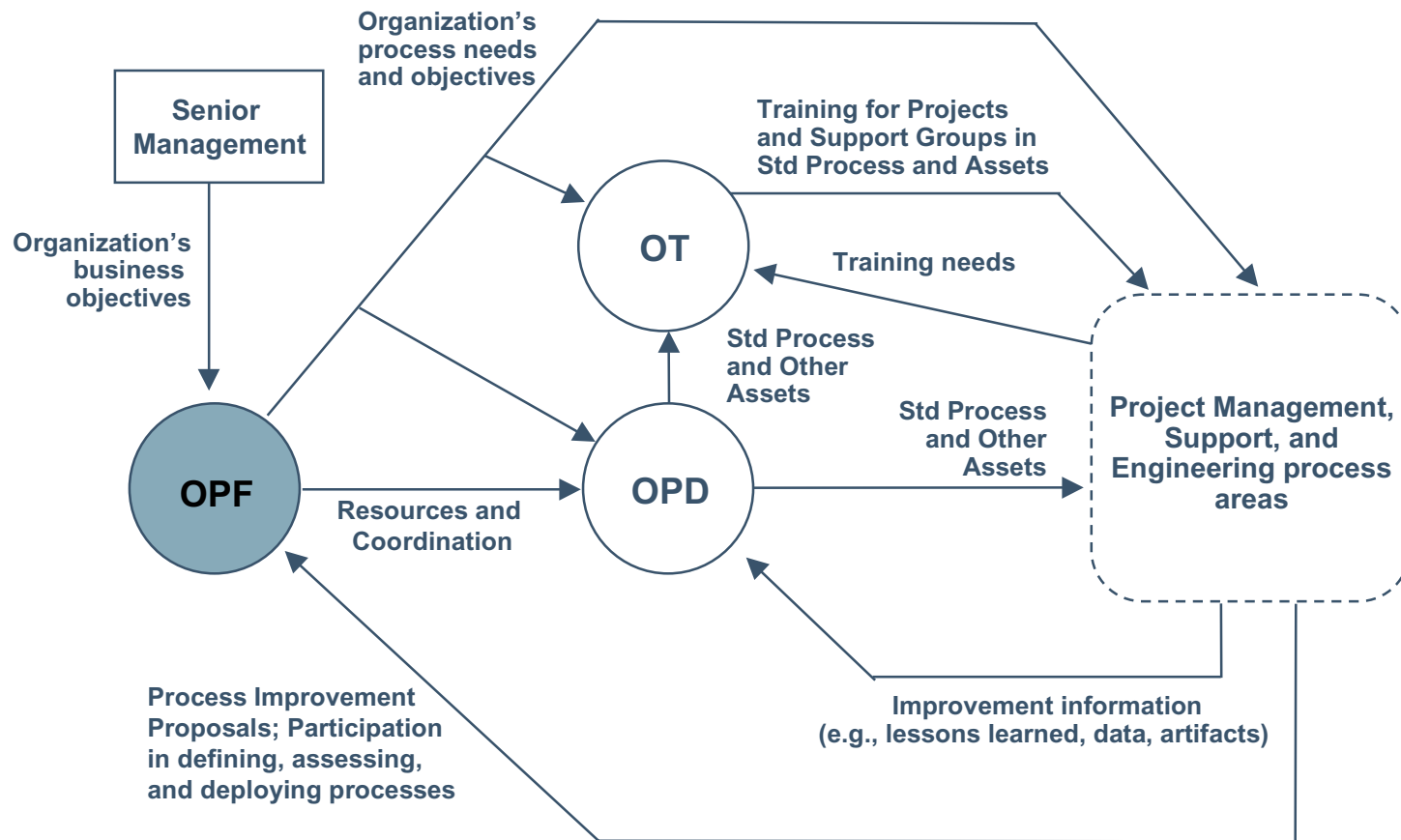
RUP to CMMI Mapping

- Project Management
- Engineering
- Support
- **Process Management**
- Generic Practices



Lessons Learned

# CMMI Basic Process Management Process Areas





# Organizational Process Focus: Overview

## CMMI

### Purpose

Establish and maintain an understanding of the organization's processes and process assets, and to identify, plan, and implement the organization's process improvement activities.

## RUP

### Workflow

Environment

### Synergy

- RUP is primarily a project level tool
- Organizations wanting to use RUP for process management process areas may need to add workflows to address organizational process focus and definition issues

# Organizational Process Focus: Mapping

## CMMI

### SG 1: Determine Process Improvement Opportunities

Strengths, weaknesses, and improvement opportunities for the organization's processes are identified periodically and as needed.

---

### SG 2: Plan and implement Process Improvement Activities

Improvements are planned and implemented, process assets are deployed, and process-related experiences are incorporated into the organization's process assets.

## RUP

**Workflow:** Environment

**WD:** Prepare Environment for Project

**Activity:** Development-Organization Assessment

**Workflow:** Environment

**WD:** Prepare Environment for Project

**Activity:** Development-Organization Assessment



# Organizational Process Focus: Synergy

## Specific Goal

## Specific Practice

---

Determine Process  
Improvement  
Opportunities

- Establish Organizational Process Needs (L)
- Assess the Organization's Processes (H)
- Identify the Organization's Process Improvements (H)

---

Plan and Implement  
Process  
Improvement  
Activities

- Establish Process Action Plans (M)
- Implement Process Action Plans (L)
- Deploy Process and Related Assets (L)
- Incorporate Process-Related Experiences into the Organization's Process Assets (L)



## Organizational Process Focus: Detail Example

**SP1.2-1:** Assess the processes of the organization periodically and as needed to maintain an understanding of their strengths and weaknesses.

### RUP Components:

Workflow: Environment

Workflow Detail: Prepare Environment for Project

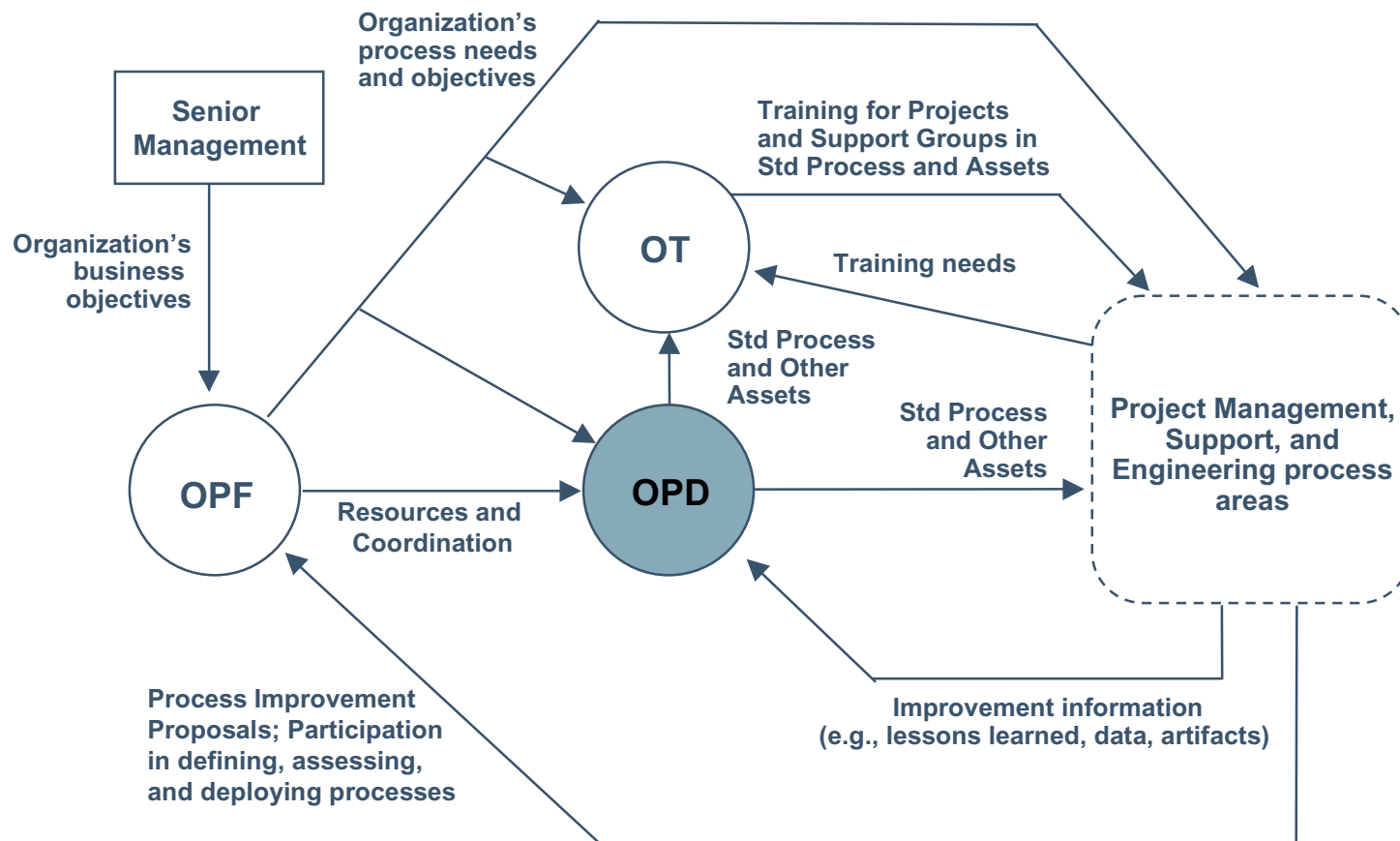
Activity: Development Organization Assessment

**Comments:** When preparing for a new project, RUP provides an activity to assess the organization's processes

**Degree of Synergy:** High



# CMMI Basic Process Management Process Areas





# Organizational Process Definition: Overview

## CMMI

### Purpose

Establish and maintain a usable set of organizational process assets.

## RUP

### Workflow

Environment

### Synergy

- Organizations could use RUP as the basis for their Organizational Standard Process
- Organizations would need to pay attention to Medium and Low synergy areas



# Organizational Process Definition: Mapping

## CMMI

### SG 1: Create Organizational Process Assets

A set of organizational process assets is available.

---

### SG 2: Make Supporting Process Assets Available

Process assets that support the use of the organization's set of standard processes are available.

## RUP

**Workflow:** Environment

**WD:** Develop Guidelines

**Concept:** Implementing a Process in an Organization

**Concept:** Process Configuration

---

**Concept:** Process Configuration



# Organizational Process Definition: Synergy

## Specific Goal

## Specific Practice

---

Create Organizational  
Process Assets

- Establish Standard Processes (M)
- Establish Life-Cycle Model Descriptions (M)
- Establish Tailoring Criteria and Guidelines (M)

---

Make Supporting  
Process Assets  
Available

- Establish An Organizational Measurement Repository (L)
- Establish An Organizational-Process Asset Library (M)



## Organizational Process Definition: Detail Example

**SP1.2-1:** Establish and maintain descriptions of the life-cycle process models approved for use in the organization.

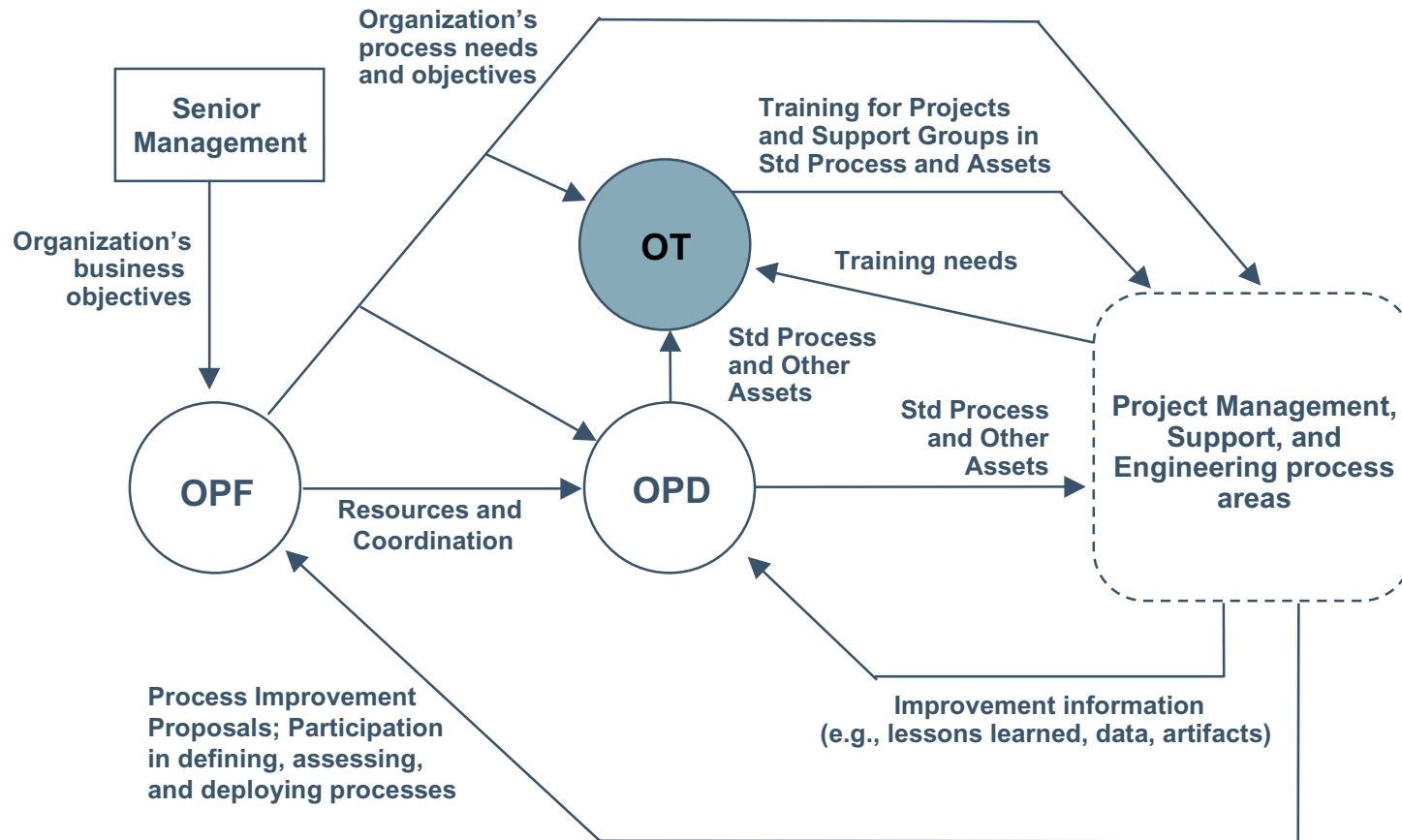
**RUP Components:**

Concepts: Process Configuration

**Comments:** Supplementary information suggests that RUP can be the organization's standard process. Following RUP should allow organizations to describe many life cycle types. RUP suggests that there may be more than one organization-wide process, one for each different type of development.

**Degree of Synergy: Medium**

# CMMI Basic Process Management Process Areas





# Organizational Training: Overview

## CMMI

### Purpose

Develop the skills and knowledge of people so they can perform their roles effectively and efficiently.

## RUP

### Workflow

none

### Synergy

- Organizational training issues are outside the scope of RUP



# Organizational Training: Mapping

## CMMI

### SG 1: Identify Training Needs and Make Training Available

Training to support the organization's management and technical roles is identified and made available.

---

### SG 2: Provide Necessary Training

Training necessary for individuals to perform their roles effectively is provided.

## RUP

Workflow: none

Outside of the scope of RUP

Workflow: none

Outside of the scope of RUP

# Organizational Training: Synergy

## Specific Goal

## Specific Practice

---

Identify Training Needs and Make Training Available

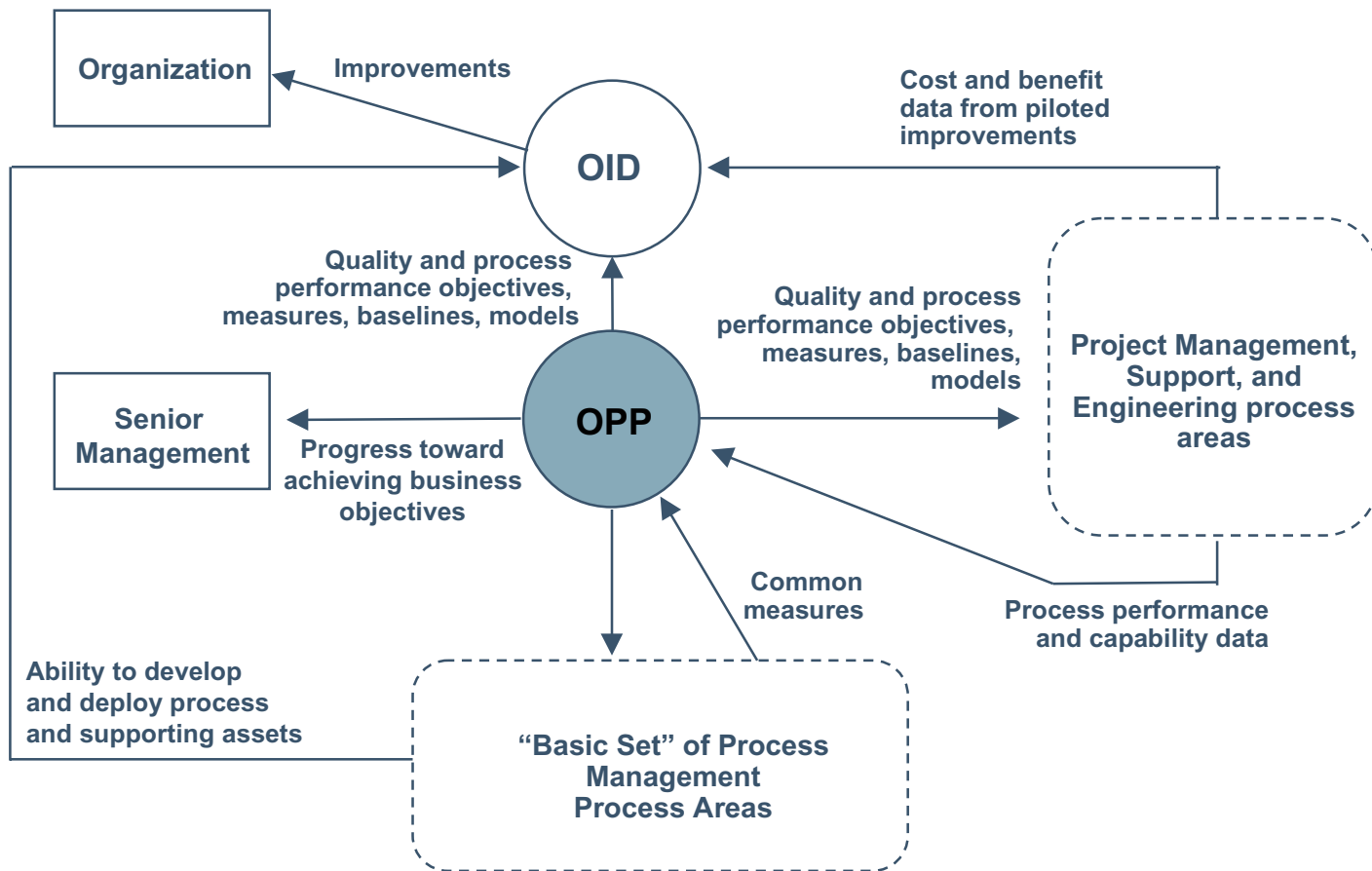
- Establish the Strategic Training Needs (L)
- Determine which Training Needs are the Responsibility of the Organization (L)
- Establish and Maintain Organizational Training Tactical Plan (L)
- Establish and Maintain Training Capability (L)

---

Provide Necessary Training

- Deliver Training (L)
- Establish Training Records (L)
- Assess Training Effectiveness (L)

# CMMI Advanced Process Management Process Areas





# Organizational Process Performance: Overview

## CMMI

### Purpose

Establish and maintain a quantitative understanding of the performance of the organization's set of standard processes, and to provide the process performance data, baselines, and models to quantitatively manage the organization's projects.

## RUP

### Workflow

none

### Synergy

- Establishing a quantitative understanding of an organization's set of processes is outside the scope of RUP



# Organizational Process Performance: Mapping

## CMMI

### 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.

## RUP

Workflow: none

Outside of the scope of RUP



# Organizational Process Performance: Synergy

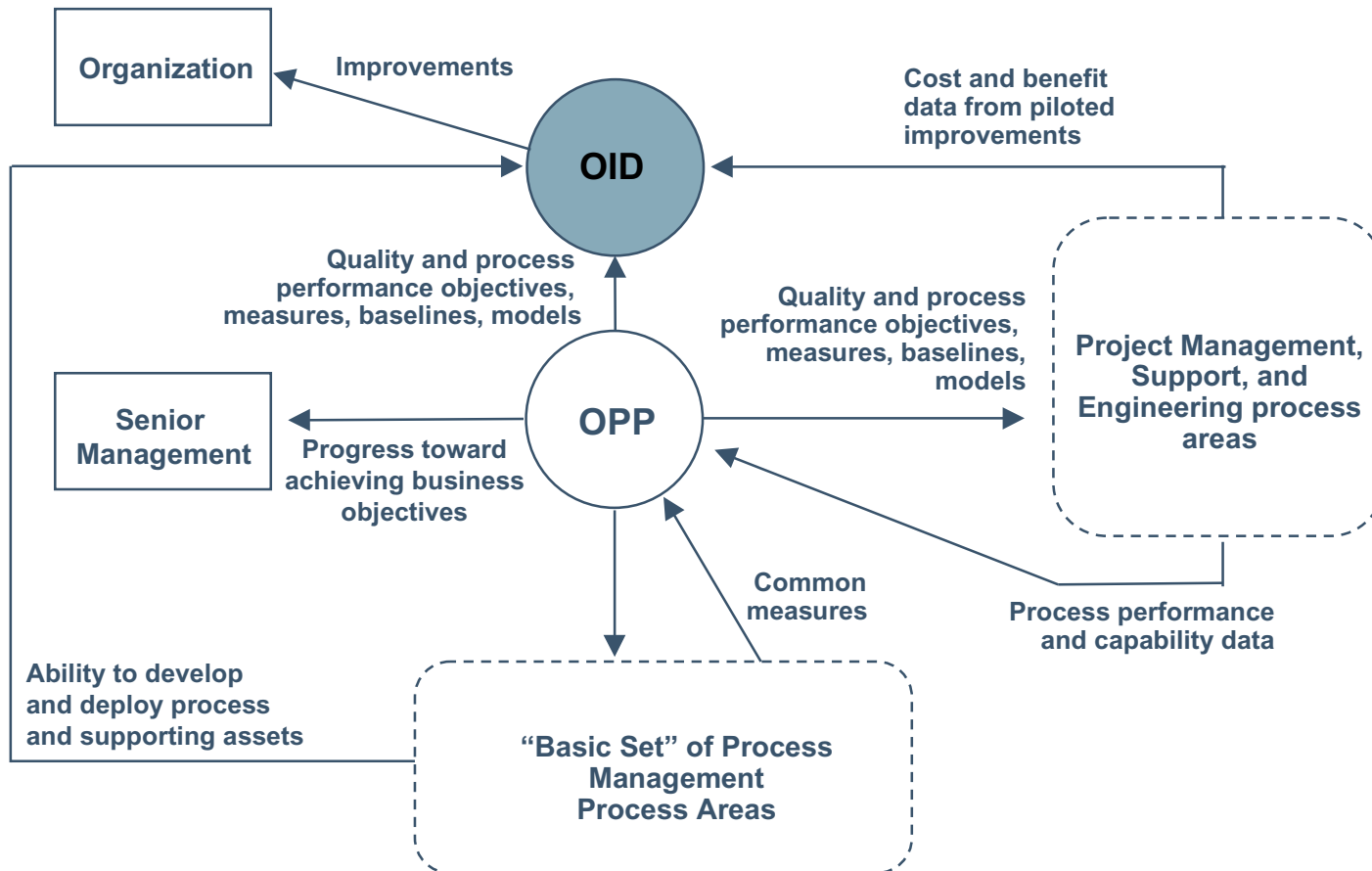
## Specific Goal

## Specific Practice

Establish Performance  
Baselines and Models

- Select Processes (L)
- Establish Process Performance Measures (L)
- Establish Quality and Process Performance Objectives (L)
- Establish Process Performance Baselines (L)
- Establish Process Performance Models (L)

# CMMI Advanced Process Management Process Areas



# Organizational Innovation and Deployment: Overview

## CMMI

### Purpose

Select and deploy incremental and innovative improvements that measurably improve the organization's processes and technologies. The improvements support the organization's quality and process performance objectives as derived from the organization's business objectives.

## RUP

### Workflow

none

### Synergy

- Establishing measurable objectives for incremental and innovative process improvement is outside the scope of RUP



# Organizational Innovation and Deployment: Mapping

## CMMI

### 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.

## RUP

Workflow: none

Outside of the scope of RUP

Workflow: none

Outside of the scope of RUP



# Organizational Innovation and Deployment: Synergy

## Specific Goal

## Specific Practice

---

### Select Improvements

- Collect and Analyze Improvement Proposals (L)
- Identify Innovations (L)
- Pilot Improvements (L)
- Select Improvements for Deployment (L)

---

### Deploy Improvements

- Plan the Deployment (L)
- Manage the Deployment (L)
- Measure Improvement Effects (L)



# Topics

Goals and Purpose

CMMI Overview

RUP Overview

RUP to CMMI Mapping

- Project Management
- Engineering
- Support
- Process Management

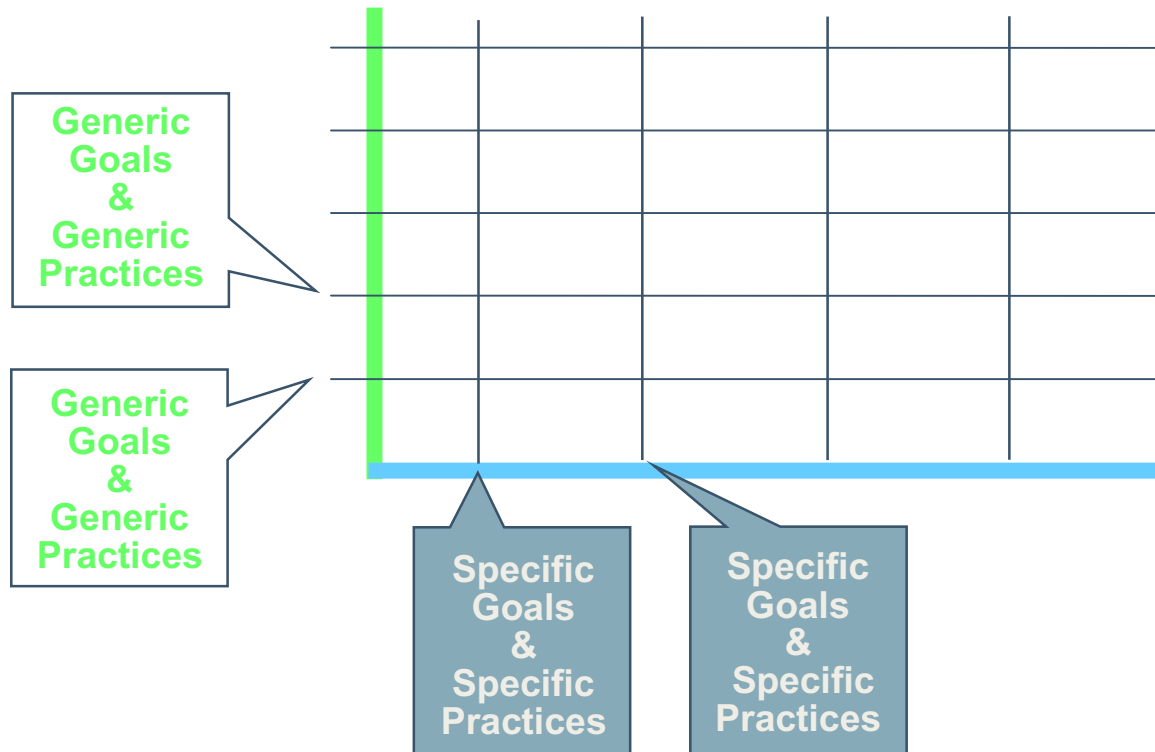


- Generic Practices

Lessons Learned

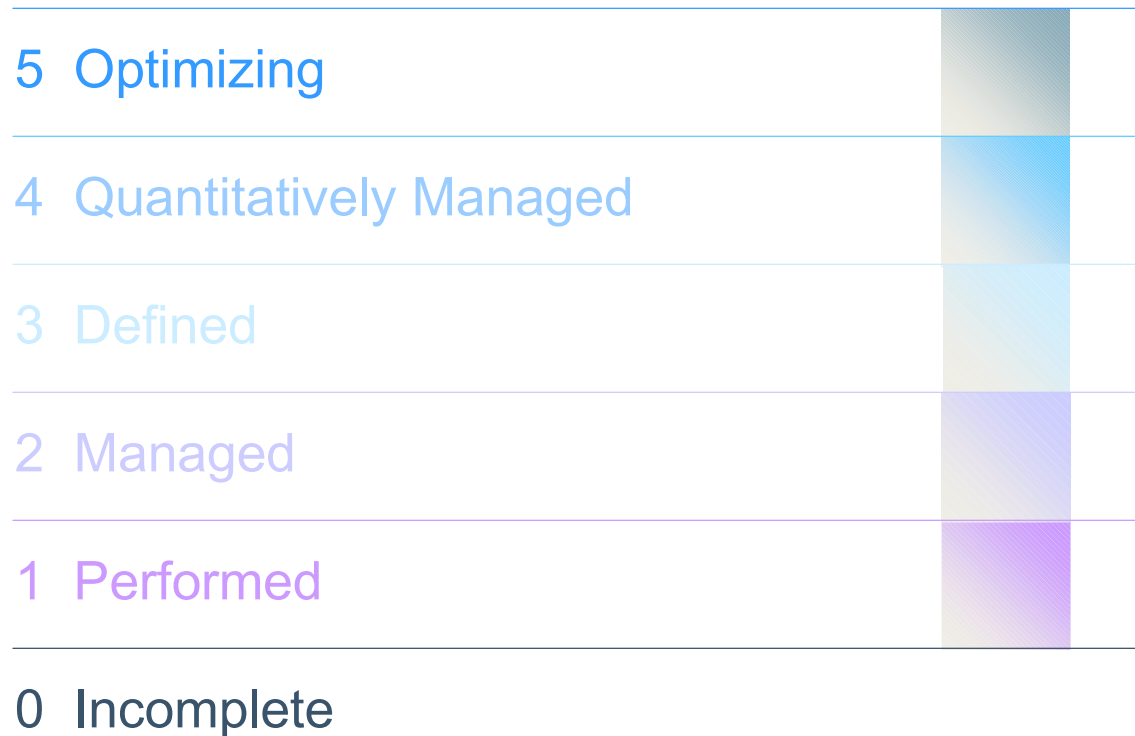
Conclusions

# Continuous Representation Structure





# The Capability Levels





# Capability Level 0

## Generic Goal

## Generic Practices

---

There are none

- There are none



# Capability Level 1

## Generic Goal

## Generic Practices

---

Achieve Specific Goals

- Identify Work Scope
- Perform Base Practices



## Capability Level 2

### Generic Goal

### Generic Practices

Institutionalize a  
Managed Process

- Establish and Maintain an Organizational Policy
- Plan the Process
- Provide Resources
- Assign Responsibility
- Train People
- Manage Configurations
- Identify and Involve Relevant Stakeholders
- Monitor and Control the Process
- Objectively Evaluate Adherence
- Review Status with Higher-Level Management



# Capability Level 3

## Generic Goal

Institutionalize a  
Defined Process

## Generic Practices

- Establish a Defined Process
- Collect Improvement Information



# Capability Level 4

## Generic Goal

Institutionalize a  
Quantitatively  
Managed Process

## Generic Practices

- Establish Quality Objectives
- Stabilize Subprocess Performance



# Capability Level 5

## Generic Goal

Institutionalize an  
Optimizing Process

## Generic Practices

- Ensure Continuous Process Improvement
- Correct Common Causes of Problems

# Topics

Goals and Purpose

CMMI Overview

RUP Overview

RUP to CMMI Mapping



Lessons Learned



## **... On Planning the Comparison**

- **Determining the goals/objectives for the comparison before doing the comparison is key**
- **Comparison objectives, expected results, degree of rigor, and needed resources must be consistent to achieve reasonable results**
- **Determining the “level” on which to base the comparison must be part of setting the objectives and expected results**
- **Determining how comparison results will be captured before the review starts expedites the review**
- **Having all reviewers capture their findings in a similar manner is vital for later consolidation and reporting**



## **... On Executing the Comparison**

- **Prototyping the level of comparison to see if you get the desired results before the review saves rework**
  - **Avoid comparisons below the Specific Practice level**
- **Determining the basic principles that drive both the CMMI and the target process are essential to any valid comparison**
- **Determining the lexicon of the target process is essential for a valid review**
  - **Vital to understand the intent of a CMMI specific practice but don't expect an exact match of terminology**



## ... On Resources Used in the Comparison

- Reviewers need to be familiar (but not necessarily experts) with CMMI *and* the target process
- Reviewers must include resources that have in-depth understanding of CMMI and the target process (not necessarily the same person)
- Reviewers need to have a common understanding
  - Comparison objectives and expected results
  - Level of comparison, “rating” scheme, form of findings capture
  - Lexicon and basic principles of the target process
  - Intent of CMMI process areas



## **CMMI Observations**

CMMI provides good guidance on general systems development practices and institutionalization of process practices

CMMI could better address

- Architecture-related practices
- Recursive nature of the process elements in the engineering process areas
- “Waterfall” appearance of the engineering process areas

## RUP Observations

RUP provides strong engineering, basic support, and basic project management practices

- Clear definition of roles and responsibilities
- Integration of engineering and project management activities
- Use of iterations to mitigate risks as early as possible
- Validation of requirements and solutions
- Focus on early architecture definition and validation

Organizations using RUP may have need to address

- Statistical process control
- Organizational process elements
- Subcontractor or vendor management practices
- Institutionalization of processes



## Parting Thoughts

RUP is a software engineering process that is integrated with a suite of software development tools.

CMMI is a process framework that integrates systems and software engineering process elements and the organizational processes necessary to institutionalize them.

RUP and CMMI complement each other in achieving a mature software development organization.

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