



CMMI[®] Version 1.2 Upgrade Training

CMMI Model Refresher

Module 7

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Purpose

The purpose of this module is to re-familiarize and reinforce important concepts in CMMI.

These slides are taken from the *Introduction to CMMI Version 1.2* course.

If you completed the Continuous or Staged version of the *Introduction to CMMI* course, some of the material addressing representations may be new.



Topics

Process Improvement Concepts and CMMI

Model Representations

Overview of CMMI Model Components

Process Areas



How CMMI Helps You

CMMI provides guidance for improving your organization's processes and your ability to manage the development, acquisition, and maintenance of products or services.

CMMI places proven approaches into a structure that helps your organization

- appraise its organizational maturity or process area capability
- establish priorities for improvement
- implement these improvements



The CMMI Framework

The CMMI Framework is the structure that organizes the components used in generating models, training materials, and appraisal methods.

The CMMI Product Suite is the full collection of models, training materials, and appraisal methods generated from the CMMI Framework.

A constellation is the subset of the CMMI Product Suite relevant to improvement in a particular area of interest. Currently, there are several constellations:

- Development
- Acquisition
- Services



Performance Measures - CMMI

The performance results in the following table are from 30 different organizations that achieved percentage change in one or more of the six categories of performance measures below.

Performance Category	Median Improvement
Cost	34%
Schedule	50%
Productivity	61%
Quality	48%
Customer Satisfaction	14%
Return on Investment	4:1



Benefits Information

Information about CMMI benefits is available in the August 2006 SEI technical report, *Performance Results of CMMI-Based Process Improvement (CMU/SEI-2006-TR-004)*.

- This report is based on public reports, interviews, supplementary materials, and comprehensive literature review.
- It is available on the SEI Web site at <http://www.sei.cmu.edu/publications/documents/06.reports/06tr004.html>.
- For more information, see the CMMI Performance Results Web site at <http://www.sei.cmu.edu/cmmi/results.html>.



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CMMI Model Representations

There are two types of representations in CMMI models:

- staged
- continuous

A **representation** in CMMI is analogous to a view into a data set provided by a database.

Both representations provide ways of implementing process improvement to achieve **business goals**.

Both representations provide essentially the same content and use the same model components but are organized in different ways.



Continuous Representation: PAs by Categories

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



Staged Representation: PAs by Maturity Level

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



Understanding Levels

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

CMMI supports two improvement paths:

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



Capability Levels -1

A capability level consists of a generic goal and its related generic practices that can improve the organization's processes associated with a process area.

Capability levels provide a scale for measuring your processes against each process area in a CMMI model.

There are six capability levels.

Each level is a layer in the foundation for continuous process improvement.

Capability levels are cumulative (i.e., a higher capability level includes the practices of the lower levels).



Capability Levels -2

5 Optimizing

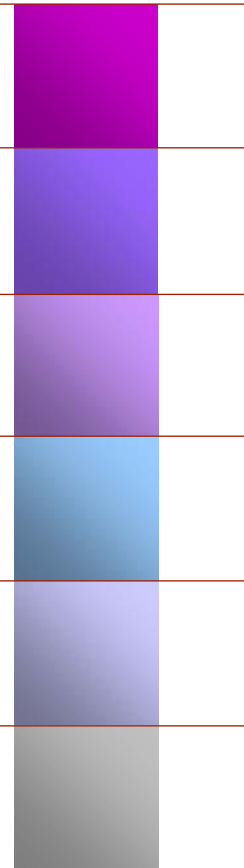
4 Quantitatively Managed

3 Defined

2 Managed

1 Performed

0 Incomplete





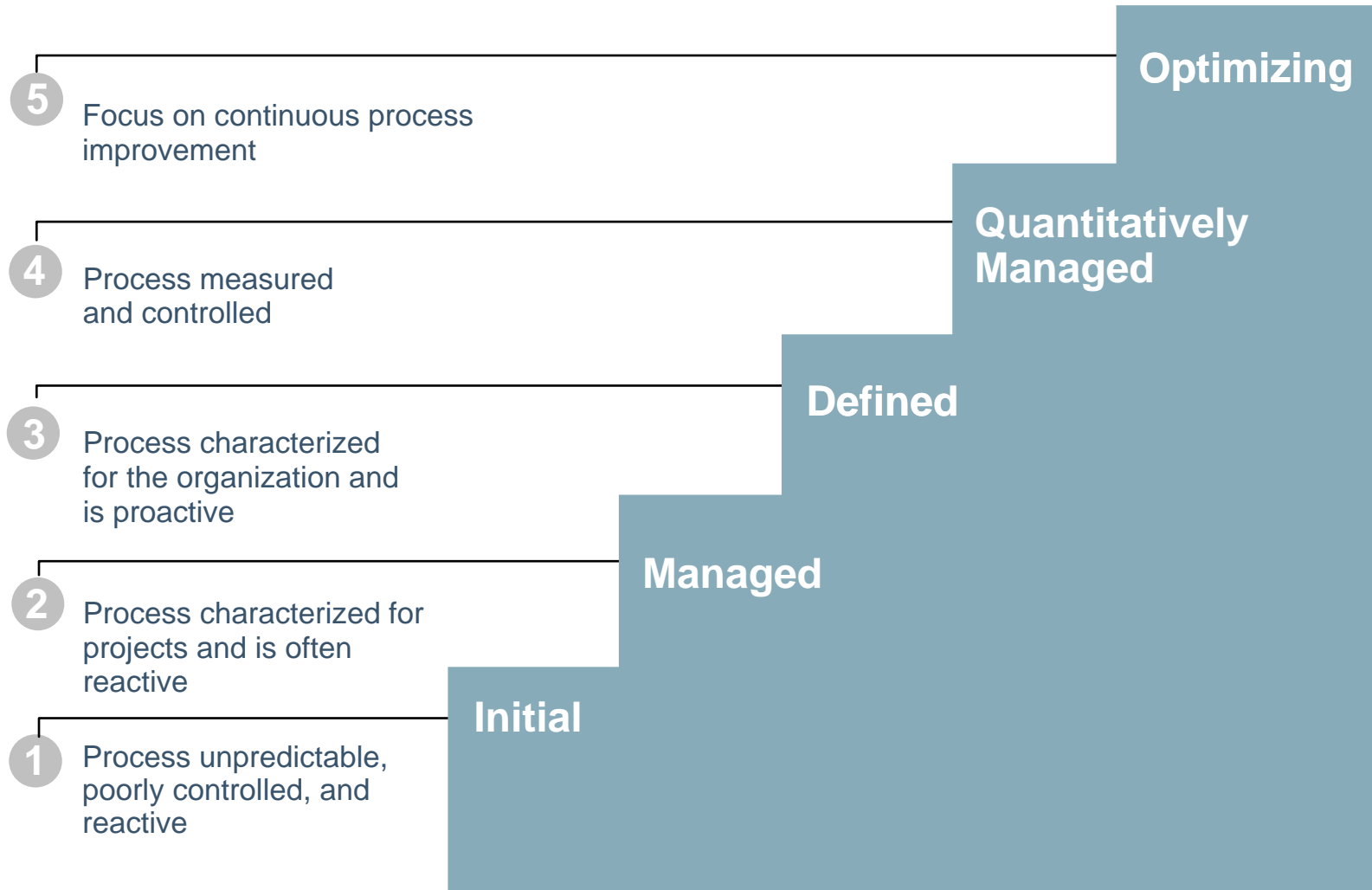
Maturity Levels -1

The maturity levels are

- 1: Initial
- 2: Managed
- 3: Defined
- 4: Quantitatively Managed
- 5: Optimizing



Maturity Levels -2





Comparing Capability and Maturity Levels

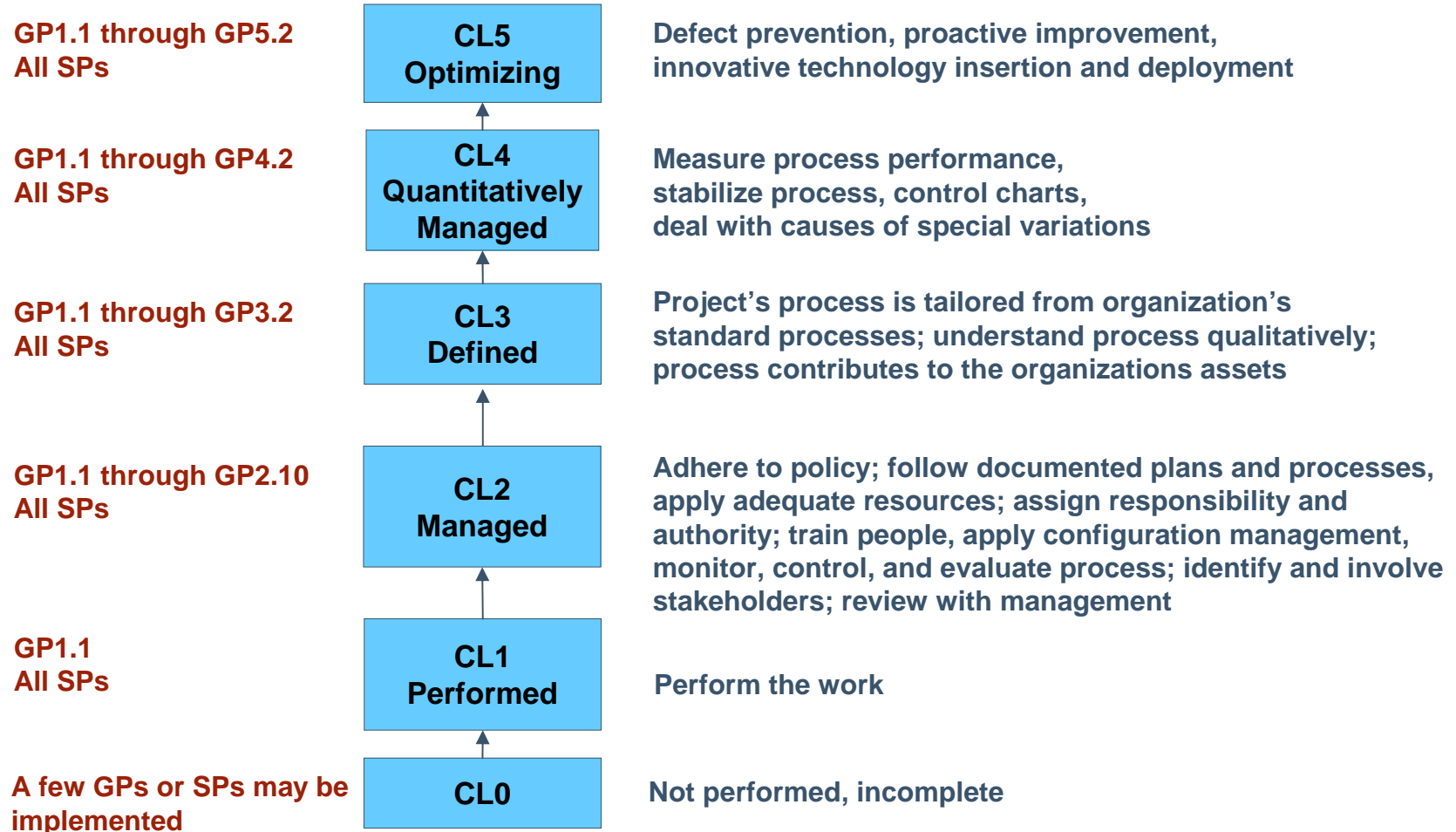
Continuous

Staged

Level	Capability Levels	Maturity Levels
0	Incomplete	N/A
1	Performed	Initial
2	Managed	Managed
3	Defined	Defined
4	Quantitatively Managed	Quantitatively Managed
5	Optimizing	Optimizing



Achieving Capability Levels (CL) for a Process Area





Achieving Maturity Levels¹

To achieve a maturity level

- All process areas at that level and all levels below it must be satisfied or determined to be not applicable.

And to achieve a maturity level 3 or higher

- The generic goal 3 for each applicable maturity level 2 PA must also be rated satisfied for maturity level 3 or higher.

Note: A process area is satisfied if and only if all of the process area's relevant specific and generic goals are rated as satisfied.



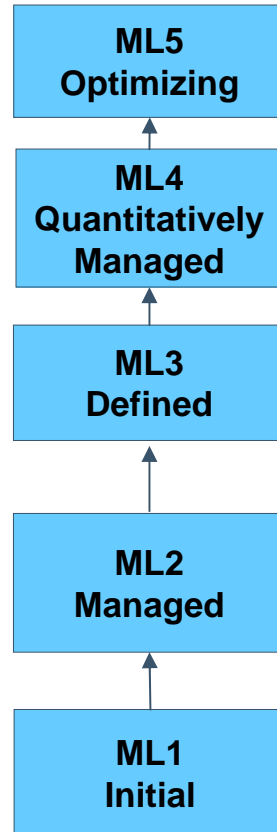
Achieving Maturity Levels²

GP2.1 through GP3.2
All ML2, ML3, ML4,
and ML5 PAs

GP2.1 through GP3.2
All ML2, ML3, and
ML4 PAs

GP2.1 through GP3.2
All ML2 and ML3 PAs

GP2.1 through GP2.10
All ML2 PAs



Prevent defects; proactively improve; insert and deploy innovative technology

Measure process performance; stabilize process and control charts; deal with causes of special variations

Tailor the project's process from organization's standard processes; understand processes qualitatively; ensure that projects contribute to organization assets

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

Processes are ad hoc and chaotic



Typographical Conventions

Some components of the process areas are labeled Staged Only or Continuous Only.

Components that are not marked apply to both representations.

Components marked **Staged Only** apply only if you are using the staged representation.

Components marked **Continuous Only** apply only if you are using the continuous representation.

These restrictions appear in the Generic Practices by Goal area of every process area.



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CMMI for Development Model Document Contents

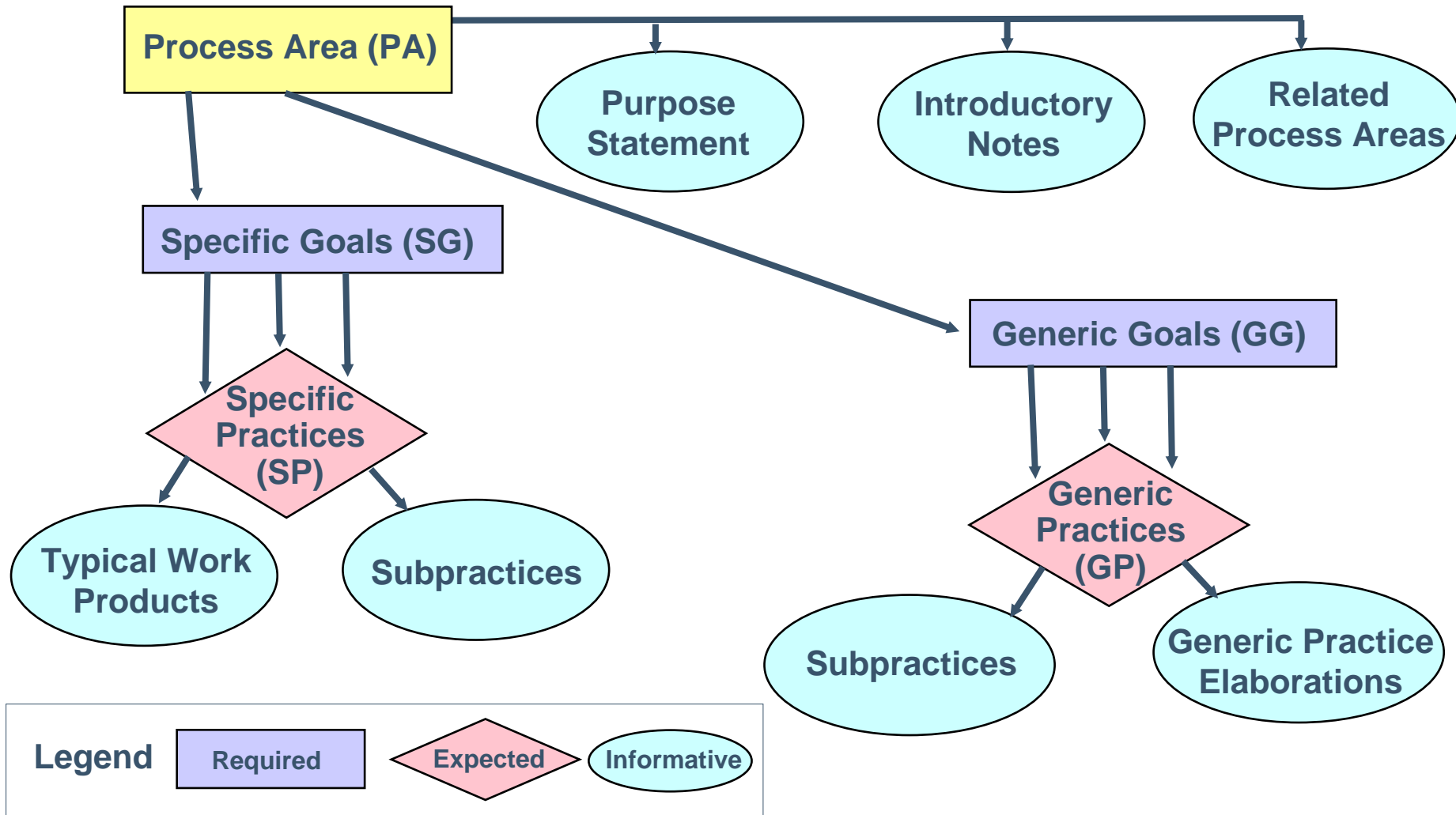
Preface
Part One – About CMMI for Development
1. Introduction
2. Process Area Components
3. Tying It All Together
4. Relationships Among Process Areas
5. Using CMMI Models

**Part Two – Generic Goals and Practices, and
the Process Areas**

Part Three – The Appendices and Glossary
References
Acronyms
CMMI for Development Project Participants
Glossary



Process Area Components





Process Area

Cluster of related practices in an area that, when implemented collectively, satisfy a set of goals considered important for making improvement in that area.

All CMMI process areas are common to both continuous and staged representations.

They are organized by

- maturity level in the staged representation
- category (i.e., Process Management, Project Management, Support, and Engineering) in the continuous representation.

There are 22 process areas.



Process Area Contents

All process areas contain the following:

- Purpose Statement
- Introductory Notes
- Related Process Areas
- Specific Goal and Practice Summary
- Specific Practices by Goal
 - Specific Goals and Specific Practices
- Generic Practices by Goal
 - Generic Goals and Generic Practices



Required, Expected, and Informative Model Components

Process area components are grouped into three categories:

- required
- expected
- informative

These categories reflect how to interpret the process area components.



Required Components

Required components describe what an organization must achieve to satisfy a process area. This achievement must be visibly implemented in an organization's processes.

Goal satisfaction is used in appraisals as the basis for deciding whether a process area has been achieved and satisfied.

Specific goals and **generic goals** are the required components in CMMI models.



Expected Components

Expected Components describe what an organization will typically implement to achieve a required component.

Expected components guide

- those who implement improvements
- those who perform appraisals

Specific practices and **generic practices** are the expected components in CMMI models.

Before goals can be considered satisfied, either the practices as described or acceptable alternatives to them are present in the planned and implemented processes of the organization.



Informative Components

Informative components provide details that help organizations get started in thinking about how to approach the required and expected components.

Examples of informative components include

- subpractices
- typical work products
- amplifications
- generic practice elaborations
- goal and practice titles
- goal and practice notes
- references



Summary of CMMI Model Components

Purpose
Introductory Notes

}

Informative

Specific Goals
Generic Goals

}

Required

Specific Practices
Generic Practices

}

Expected

Notes
Work Products
Subpractices
Amplifications
Elaborations

}

Informative



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Process Improvement Concepts and CMMI

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The Presentation Order of Process Areas

The CMMI model has the process areas organized in alphabetical order. We follow that same order in this module.

There are many process area relationships:

- organized by categories in the continuous representation
- organized by maturity levels in the staged representation



Causal Analysis and Resolution (CAR)

Purpose

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



Causal Analysis and Resolution Discussion

Causal Analysis and Resolution activities provide a mechanism for both project and organization-level process evaluation so as to implement improvements.

The informative material in this process area assumes that the specific practices are applied to a quantitatively managed process.



Causal Analysis and Resolution Goals

SG 1: Determine Causes of Defects

Root causes of defects and other problems are systematically determined.

SG 2: Address Causes of Defects

Root causes of defects and other problems are systematically addressed to prevent their future occurrence.

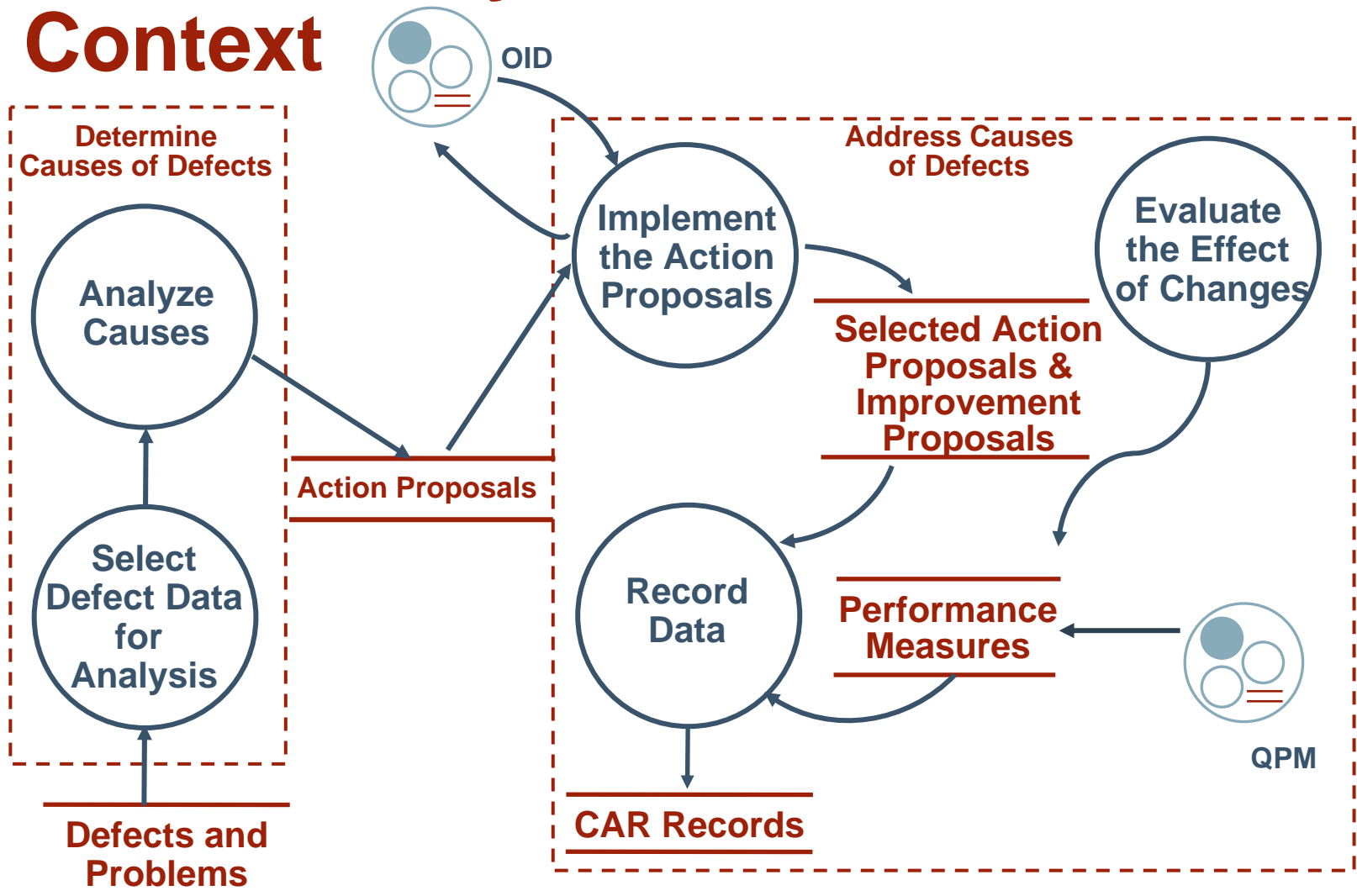
The process area also has generic goals to support institutionalization.

Note relationship with

Causal Analysis and Resolution \longleftrightarrow GP 5.2



Causal Analysis and Resolution Context





Configuration Management (CM)

Purpose

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



Configuration Management Goals

SG 1: Establish Baselines

Baselines of identified work products are established.

SG 2: Track and Control Changes

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

SG 3: Establish Integrity

Integrity of baselines is established and maintained.

The process area also has generic goals to support institutionalization.

Note relationship with

Configuration Management



GP 2.6



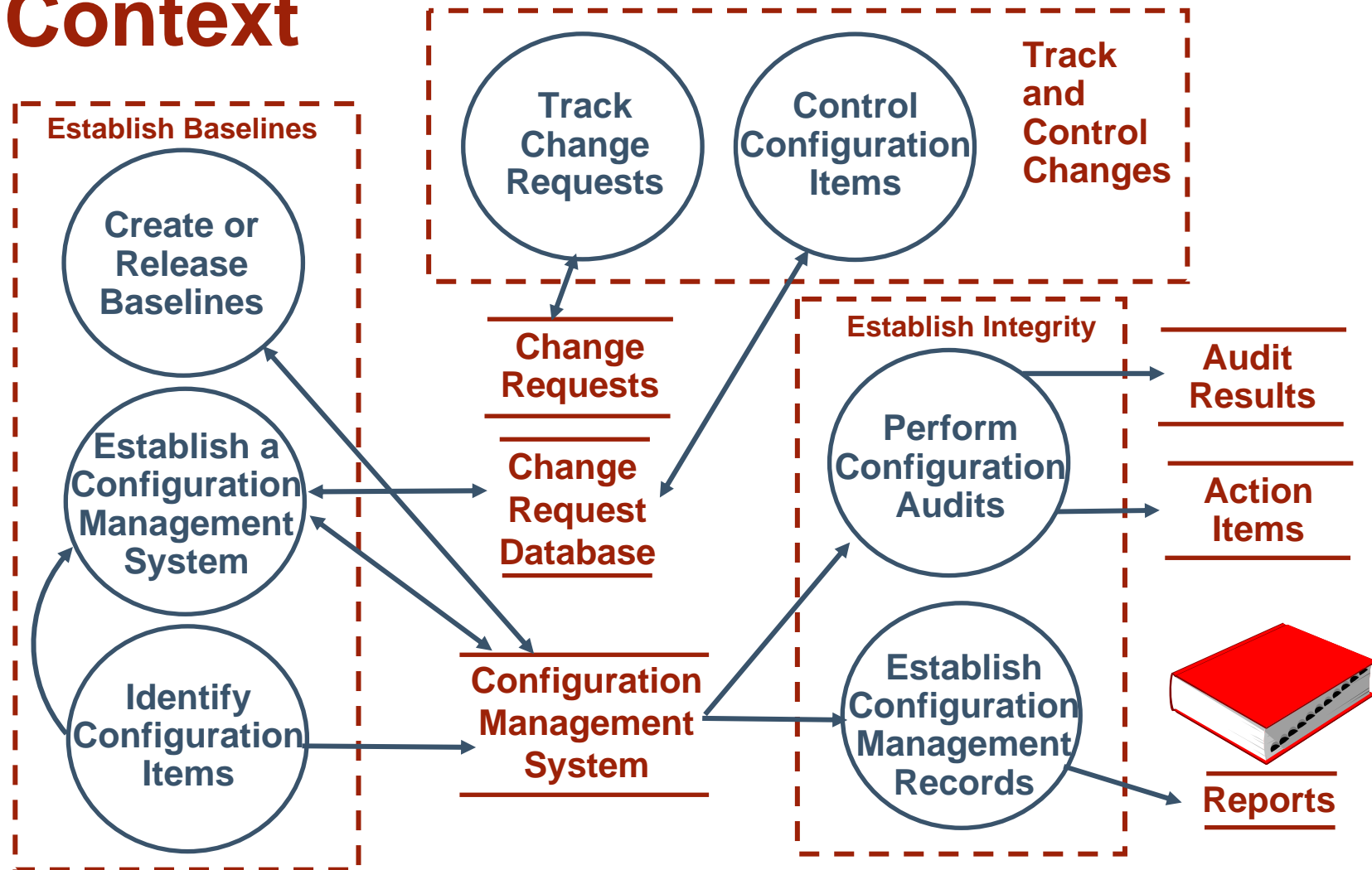
Relevant Terminology

Configuration Baseline

The configuration information formally designated at a specific time during a product's or product component's life. Configuration baselines, plus approved changes from those baselines, constitute the current configuration information.



Configuration Management Context





Decision Analysis and Resolution (DAR)

Purpose

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



Decision Analysis and Resolution Applicability

- Documented guidelines should be provided when formal evaluation processes are to be used.
- Guidelines often suggest using formal evaluation processes when issues are associated with medium to high risks or when issues affect the ability to achieve project objectives.



Decision Analysis and Resolution Goals

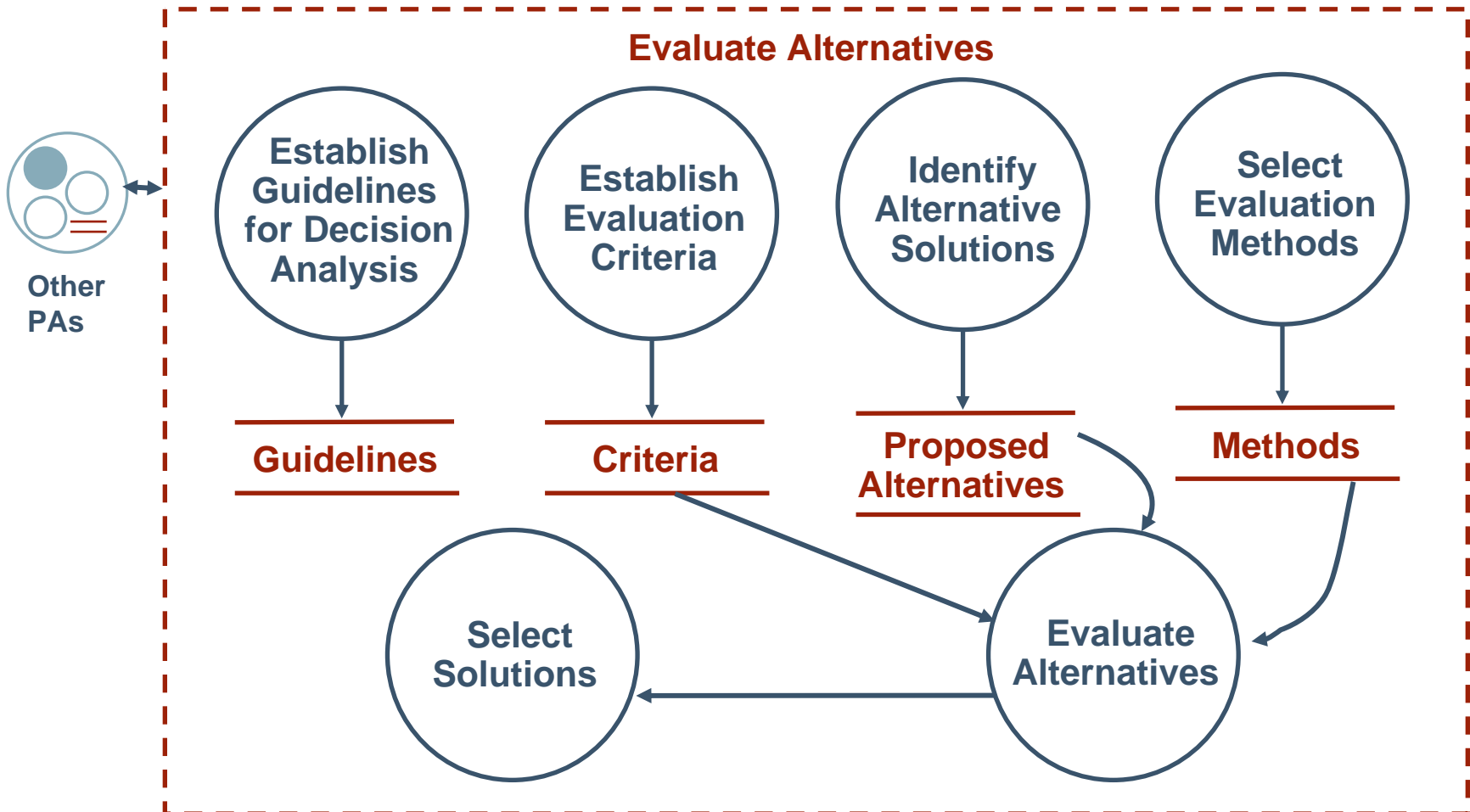
SG 1: Evaluate Alternatives

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

The process area also has generic goals to support institutionalization.



Decision Analysis and Resolution Context





Integrated Project Management (IPM)

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.



Integrated Project Management Goals

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.

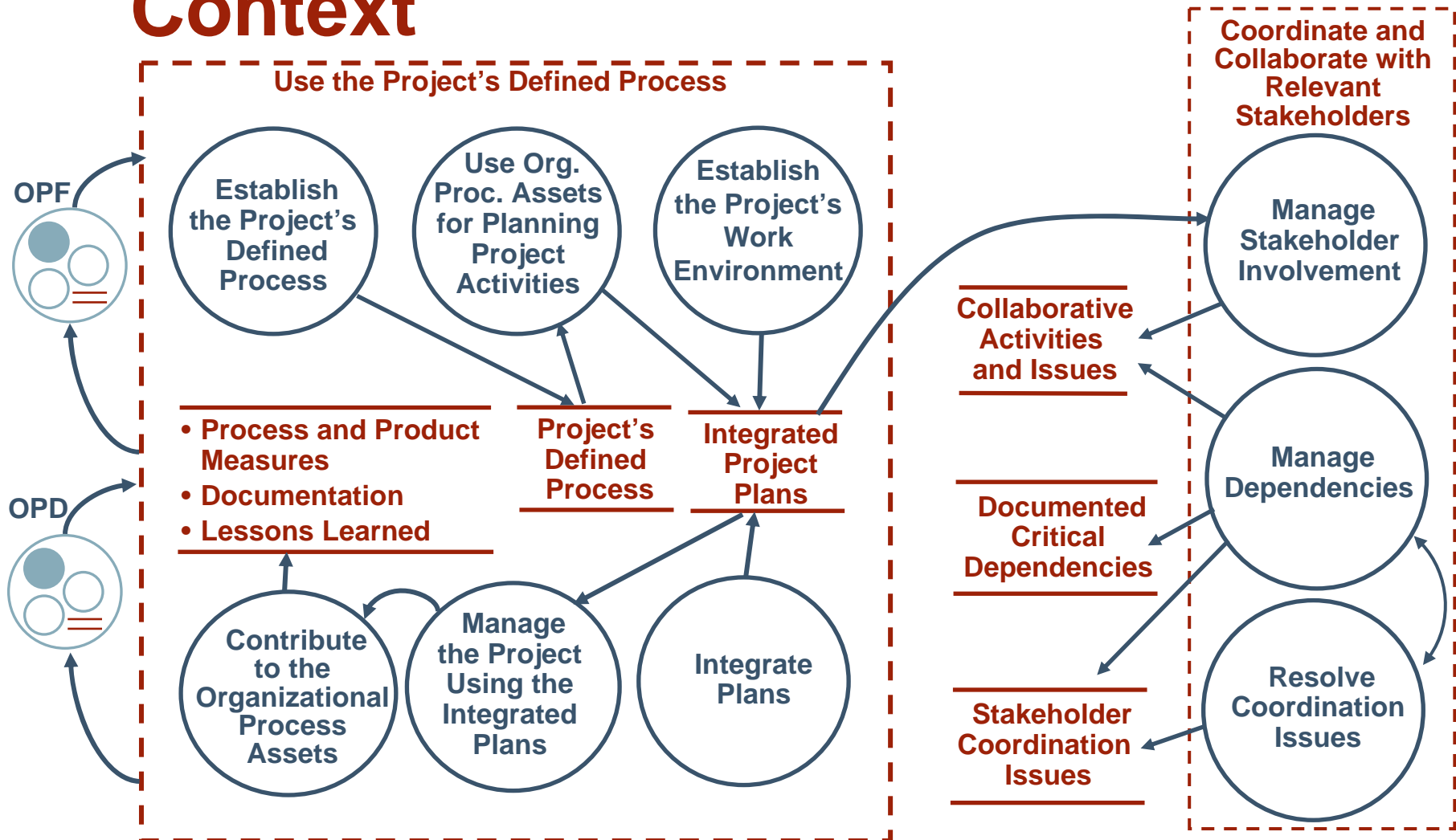
SG 2: Coordinate and Collaborate with Relevant Stakeholders

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

The process area also has generic goals to support institutionalization.



Integrated Project Management Context





Integrated Project Management +IPPD (IPM+IPPD)

Purpose

IPPD Addition

For IPPD, Integrated Project Management +IPPD also covers the establishment of a shared vision for the project and the establishment of integrated teams that will carry out objectives of the project.



Integrated Project Management +IPPD Goal

SG 3: Apply IPPD Principles

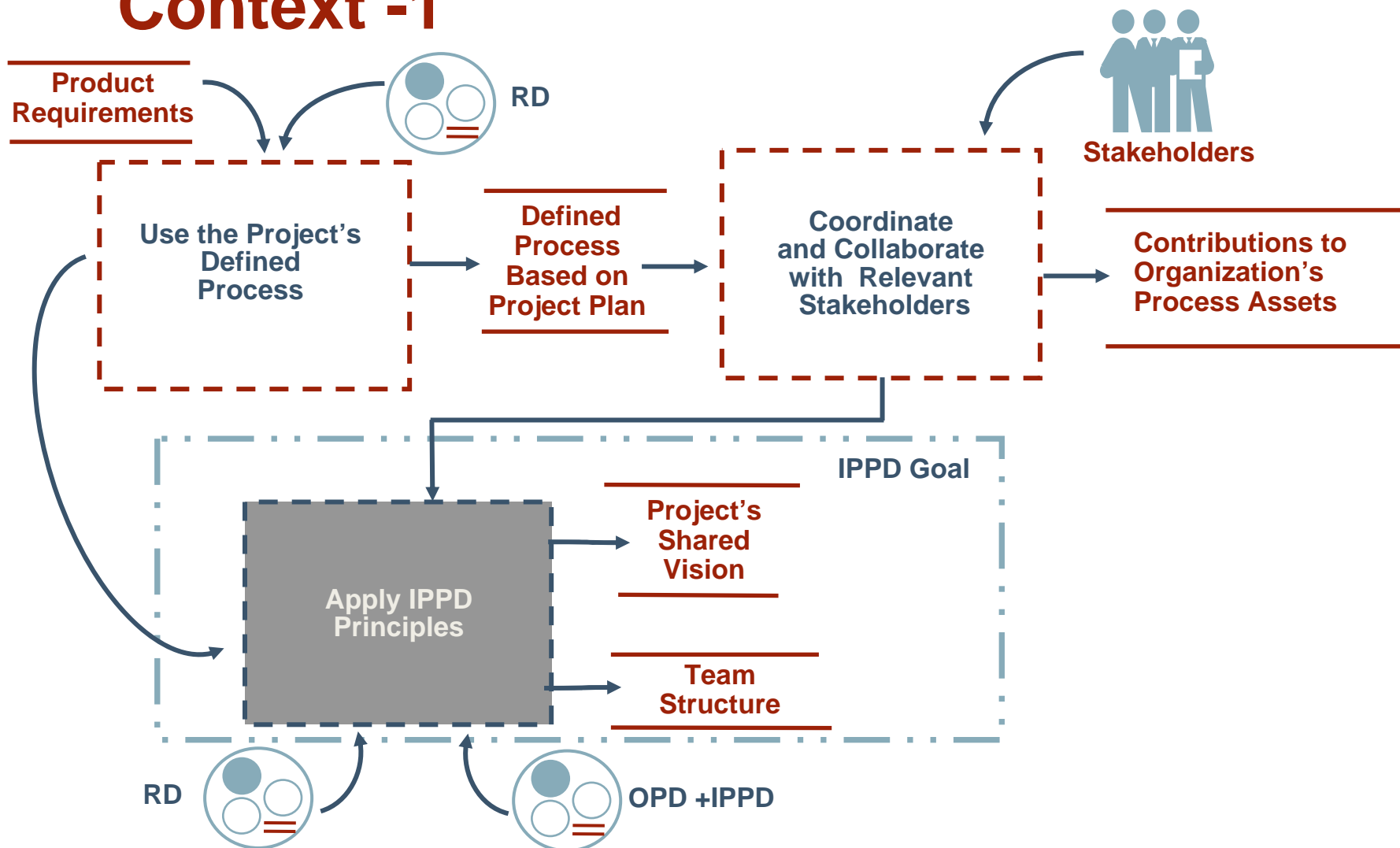
The project is managed using IPPD principles.

The process area also has generic goals to support institutionalization.



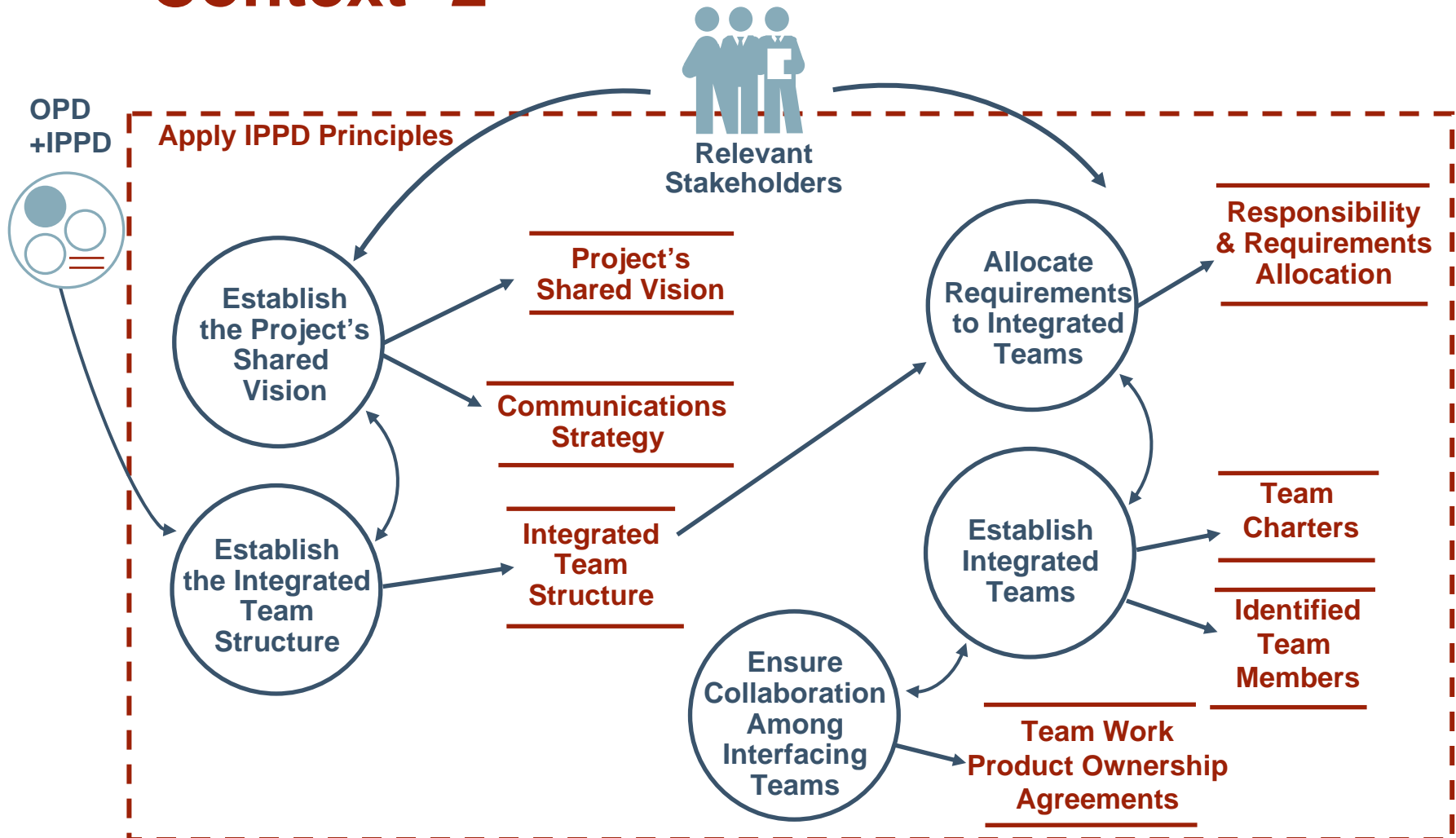
Integrated Project Management +IPPD

Context -1



Integrated Project Management +IPPD

Context -2





Measurement and Analysis (MA)

Purpose

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



Measurement and Analysis Goals

SG 1: Align Measurement and Analysis Activities

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

SG 2: Provide Measurement Results

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

The process area also has generic goals to support institutionalization.



Relevant Terminology

Base Measure

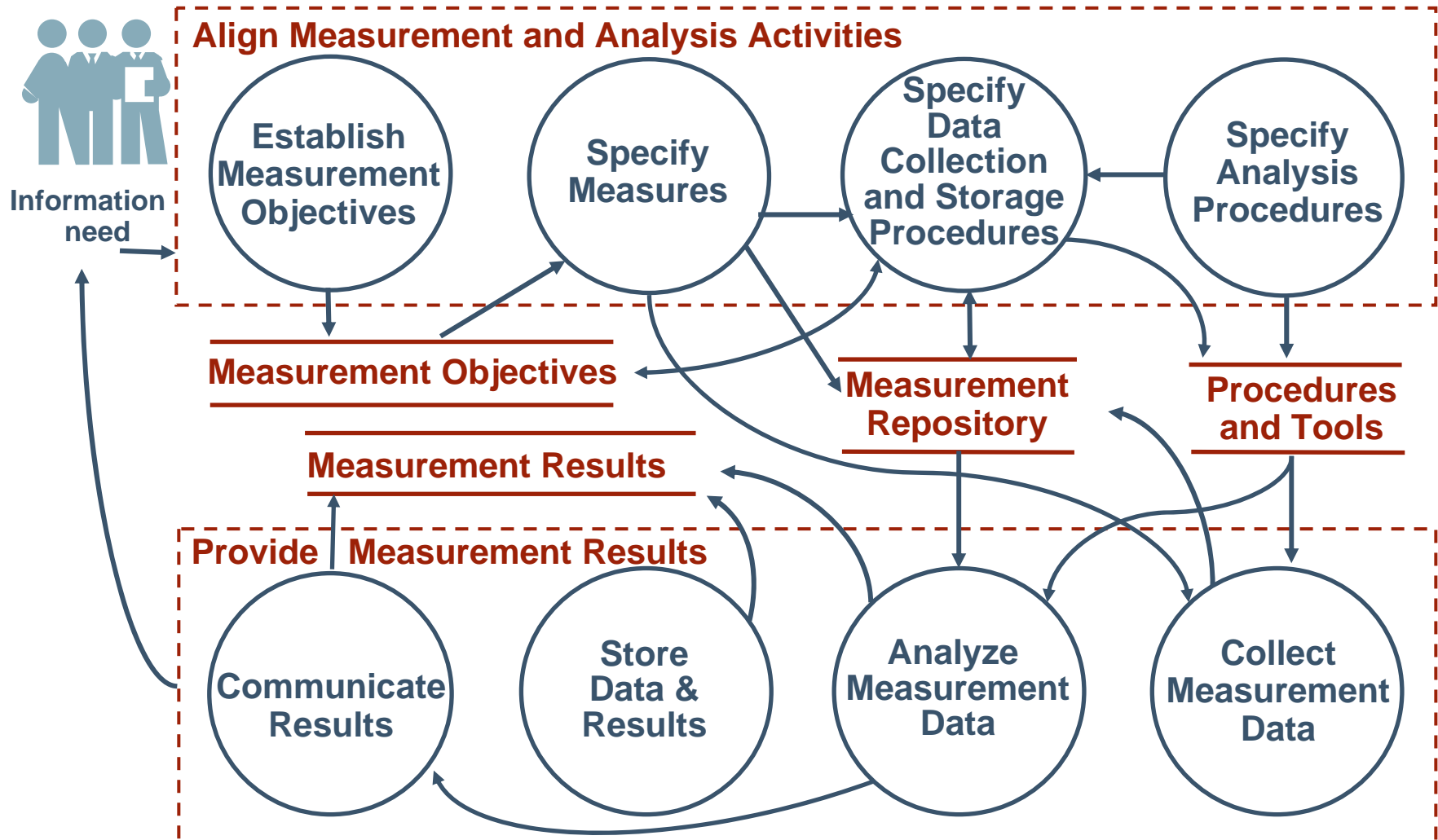
A distinct property or characteristic of an entity and the method for quantifying it.

Derived Measure

Data resulting from the mathematical function of two or more base measures.



Measurement & Analysis Context





Organizational Innovation and Deployment (OID)

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.



Organizational Innovation and Deployment

The Organizational Innovation and Deployment (OID) process area enables selection and deployment of improvements.

Both the defined processes and the organization's set of standard processes are targets of improvement activities.

The specific practices in this process area complement and extend those found in the Organizational Process Focus process area.

The focus, however, of OID is process improvement that is based on a quantitative knowledge of the organization's set of standard processes and technologies and their expected quality and performance in predictable situations.



Organizational Innovation and Deployment Goals

SG 1: Select Improvements

Process and technology improvements that contribute to meeting quality and process-performance objectives are selected.

SG 2: Deploy Improvements

Measurable improvements to the organization's processes and technologies are continually and systematically deployed.

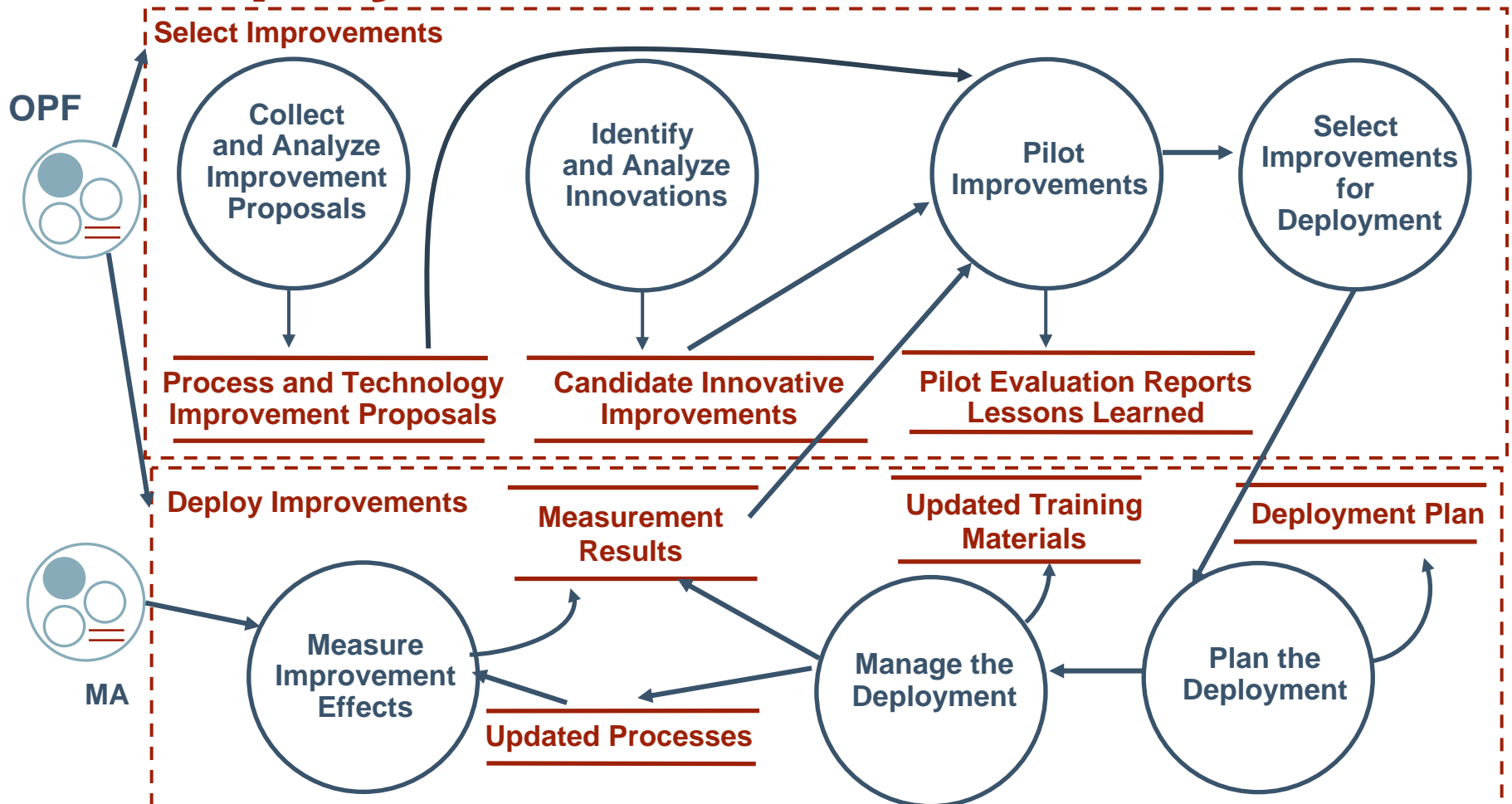
The process area also has generic goals to support institutionalization.

Note relationship with

Organizational Innovation and Deployment ↔ GP 5.1



Organizational Innovation and Deployment Context





Organizational Process Definition (OPD)

Purpose

Establish and maintain a usable set of organizational process assets and work environment standards.



Organizational Process Definition Goals

SG 1: Establish Organizational Process Assets

A set of organizational process assets is established and maintained.

The process area also has generic goals to support institutionalization.



Relevant Terminology

Standard process

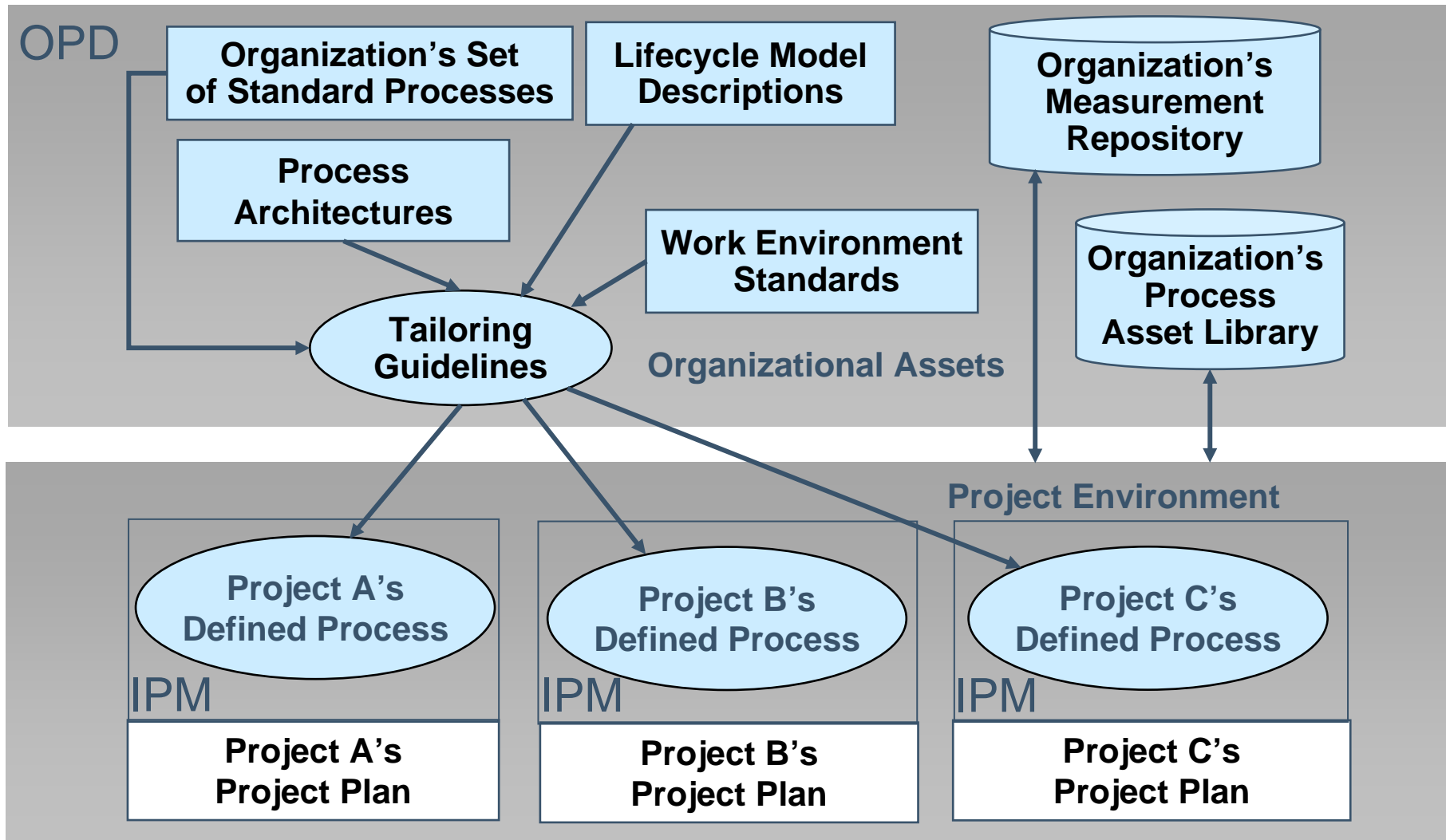
- is a basic process that guides the establishment of a common process across the organization
- describes fundamental process elements that are expected to be incorporated into any defined process
- exists at the organizational level

Process architecture

- describes the ordering, interfaces, interdependencies, and other relationships among the process elements in a standard process
- describes the interfaces, interdependencies, and other relationships between process elements and external processes

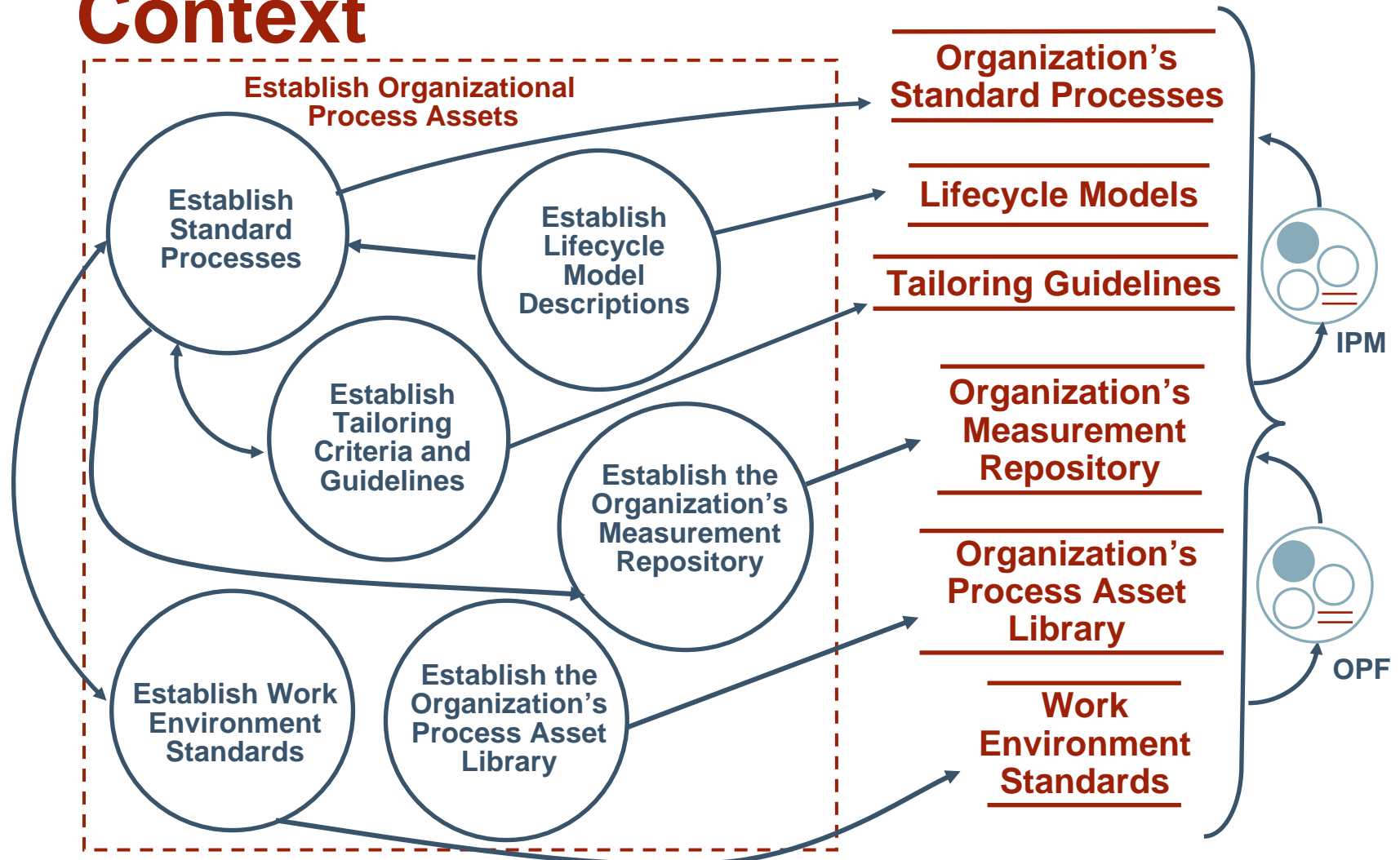


Interaction Between OPD and IPM





Organizational Process Definition Context





Organizational Process Definition for IPPD (OPD+IPPD)

Purpose

IPPD Addition

For IPPD, Organizational Process Definition +IPPD also covers the establishment of organizational rules and guidelines that enable conducting work using integrated teams.



Organizational Process Definition Goal for IPPD Addition

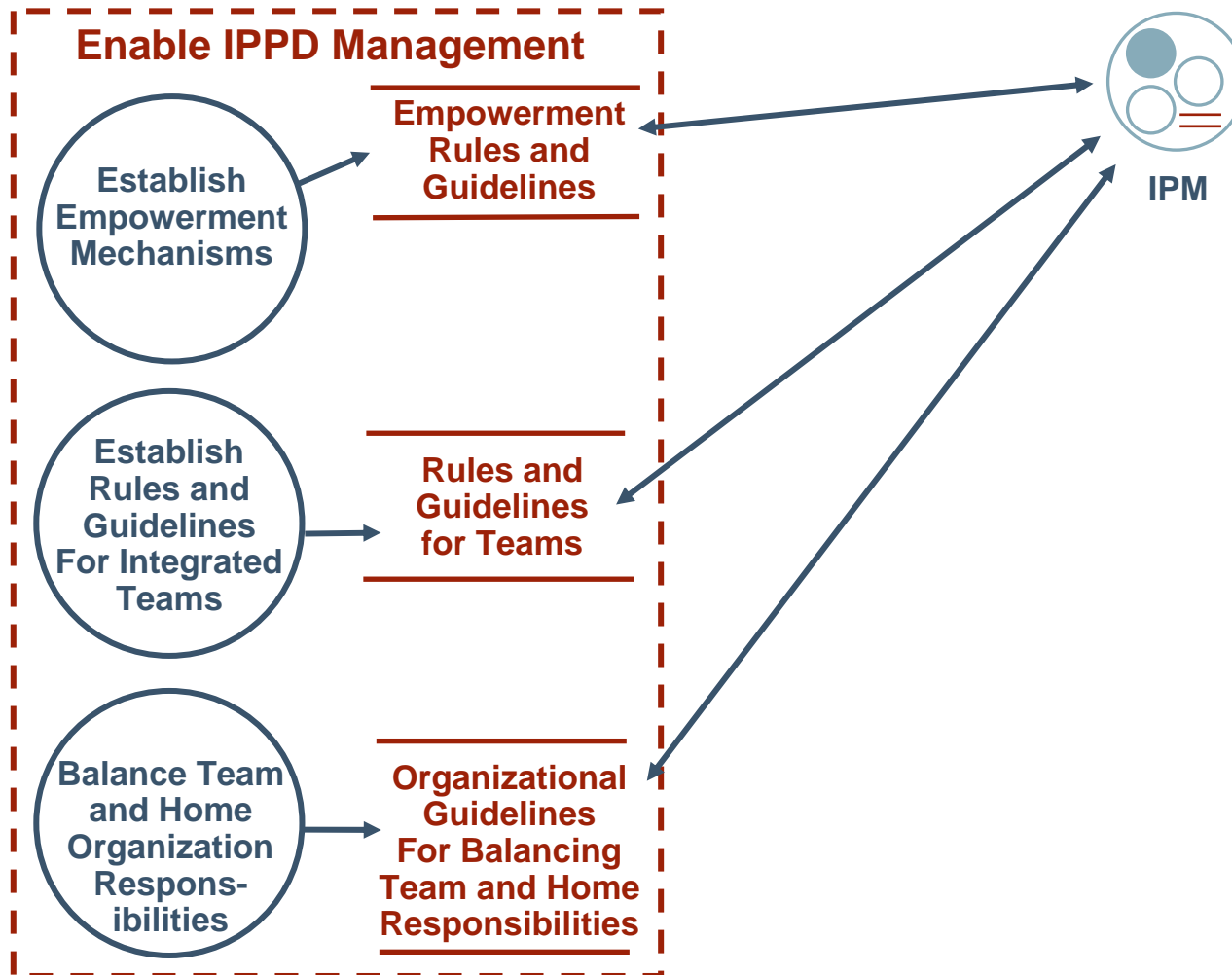
SG 2: Enable IPPD Management

Organizational rules and guidelines that govern the operation of integrated teams are provided.

The process area also has generic goals to support institutionalization.



Organizational Process Definition + IPPD Context





Organizational Process Focus (OPF)

Purpose

Plan, implement, and deploy organizational process improvements based on a thorough understanding of the current strengths and weaknesses of the organization's processes and process assets.



Relevant Terminology

Organizational process assets

- are artifacts that relate to describing, implementing, and improving processes (e.g., policies, measurements, and process descriptions)
- are developed or acquired to meet the business objectives of the organization
- represent investments by the organization that are expected to provide current and future business value

Project startup

- The point in time when a set of interrelated resources are directed to develop one or more products for a customer or end user.



Organizational Process Focus Goals

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 Improvements

Process actions that address improvements to the organization's processes and process assets are planned and implemented.

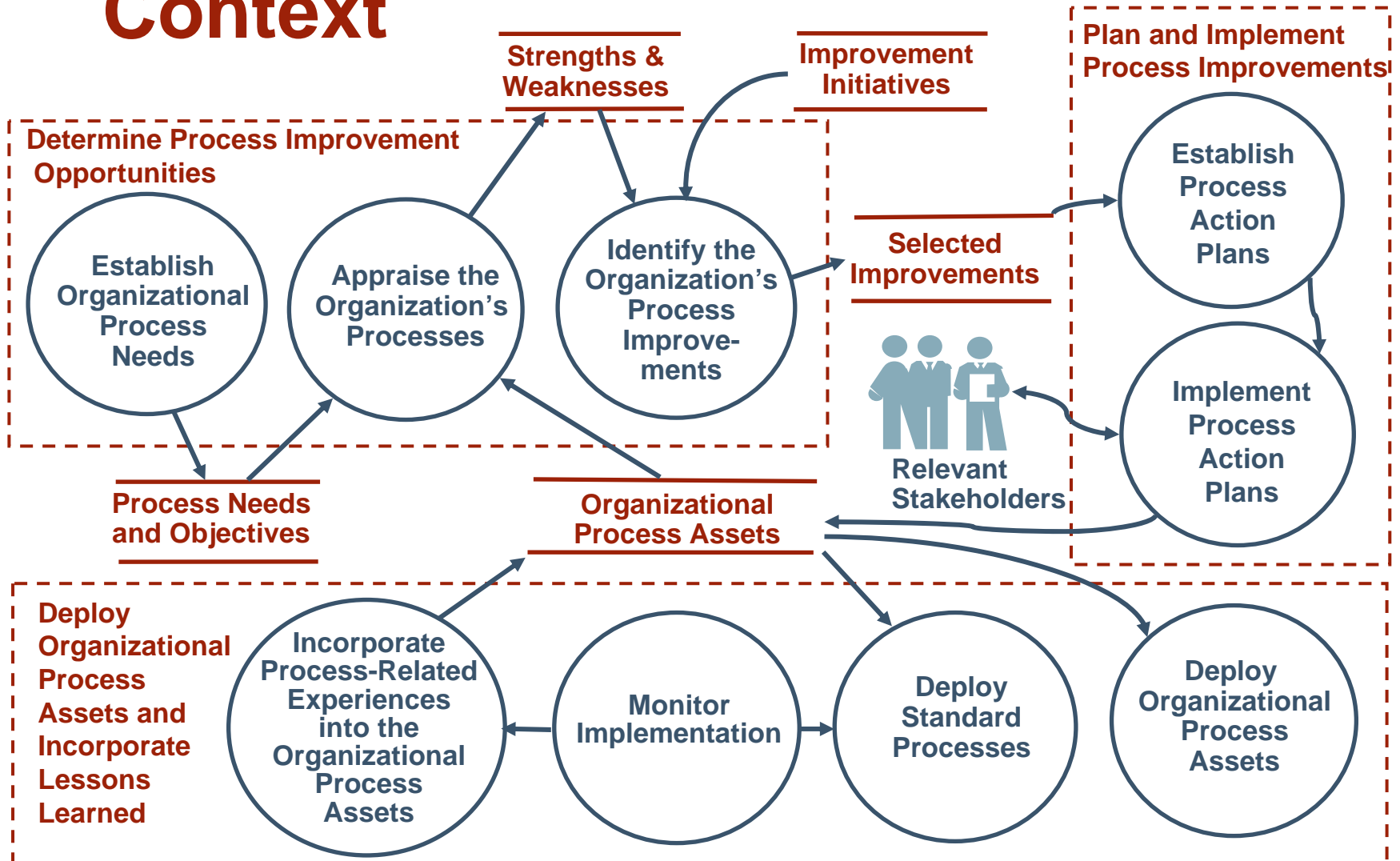
SG 3: Deploy Organizational Process Assets and Incorporate Lessons Learned

The organizational process assets are deployed across the organization and process-related experiences are incorporated into the organizational process assets.

The process area also has generic goals to support institutionalization.



Organizational Process Focus Context





Organizational Process Performance (OPP)

Purpose

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



Organizational Process Performance Goals

SG 1: Establish Performance Baselines and Models

Baselines and models that characterize the expected process performance of the organization's set of standard processes are established and maintained.

The process area also has generic goals to support institutionalization.

Note relationship with

Organizational Process Performance ↔ GP 4.1

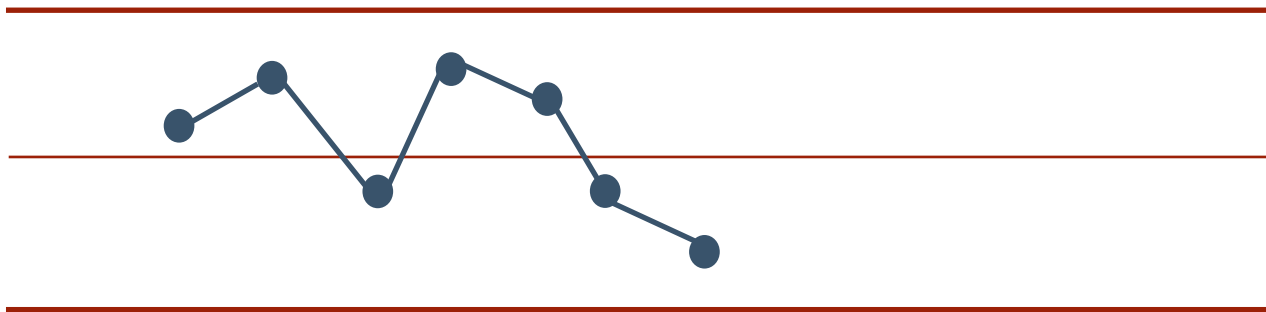


Relevant Terminology -1

Process performance

A measure of actual results achieved by following a process. It is characterized by both process measures (e.g., effort, cycle time, and defect removal efficiency) and product measures (e.g., reliability, defect density, and response time).

The common measures for the organization are composed of process and product measures that can be used to summarize the actual performance of processes in individual projects in the organization.





Relevant Terminology -2

Process-performance baseline

A documented characterization of the actual results achieved by following a process, which is used as a benchmark for comparing actual process performance against expected process performance.

Process-performance model

A description of the relationships among attributes of a process and its work products that are developed from historical process-performance data and calibrated using collected process and product measures from the project and that are used to predict results to be achieved by following a process.



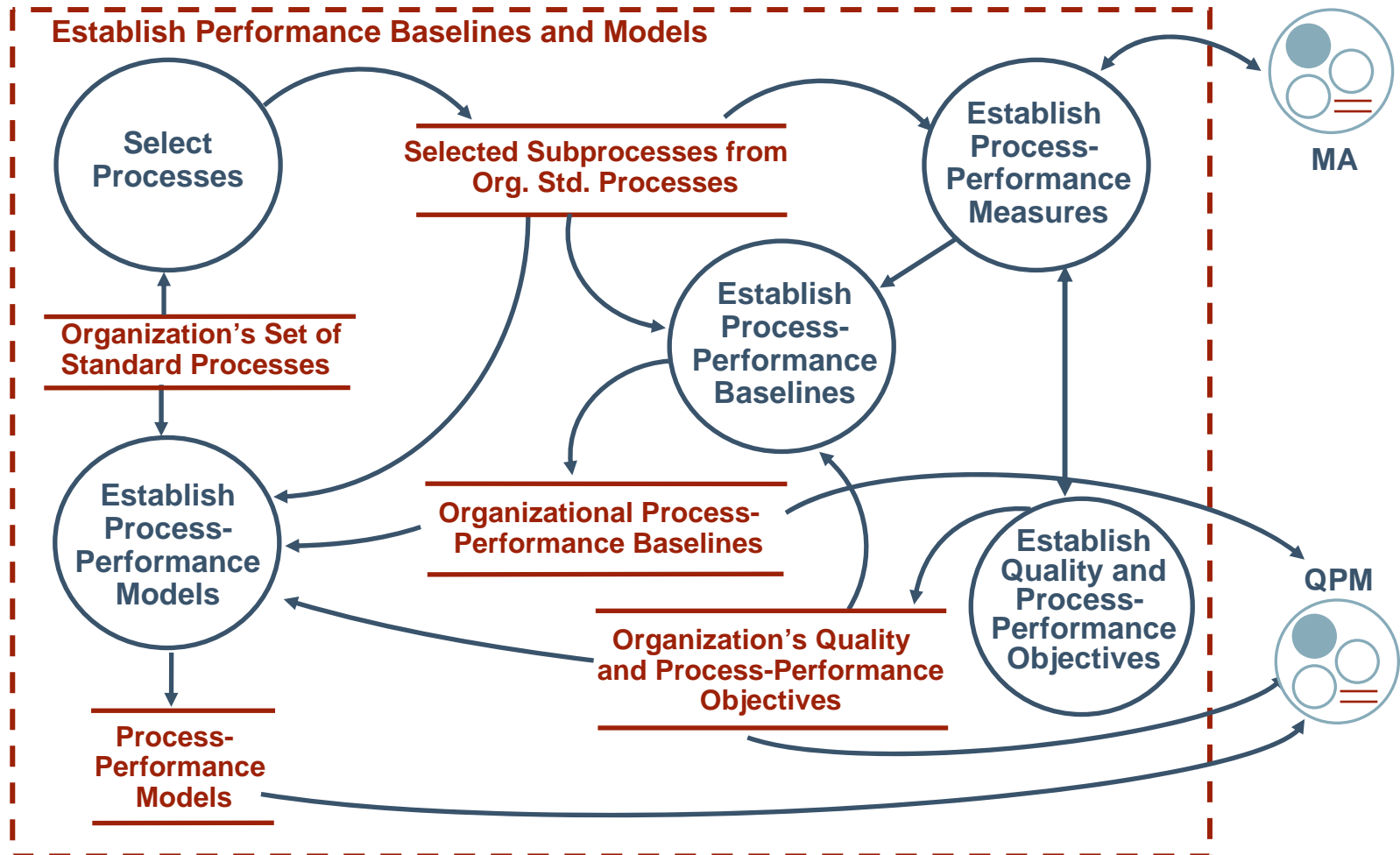
Relevant Terminology -3

Quality and process-performance objectives

Objectives and requirements for product quality, service quality, and process performance.



Organizational Process Performance Context





Organizational Training (OT)

Purpose

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



Organizational Training Goals

SG 1: Establish an Organizational Training Capability

A training capability that supports the organization's management and technical roles is established and maintained.

SG 2: Provide Necessary Training

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

The process area also has generic goals to support institutionalization.

Note relationship with
Organizational Training ↔ GP 2.5



Organizational Training Context

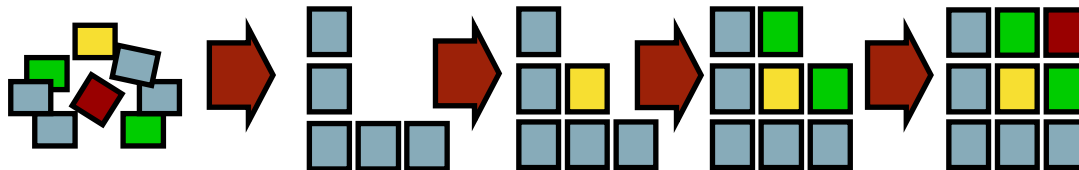




Product Integration (PI)

Purpose

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





Product Integration Goals

SG 1: Prepare for Product Integration

Preparation for product integration is conducted.

SG 2: Ensure Interface Compatibility

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

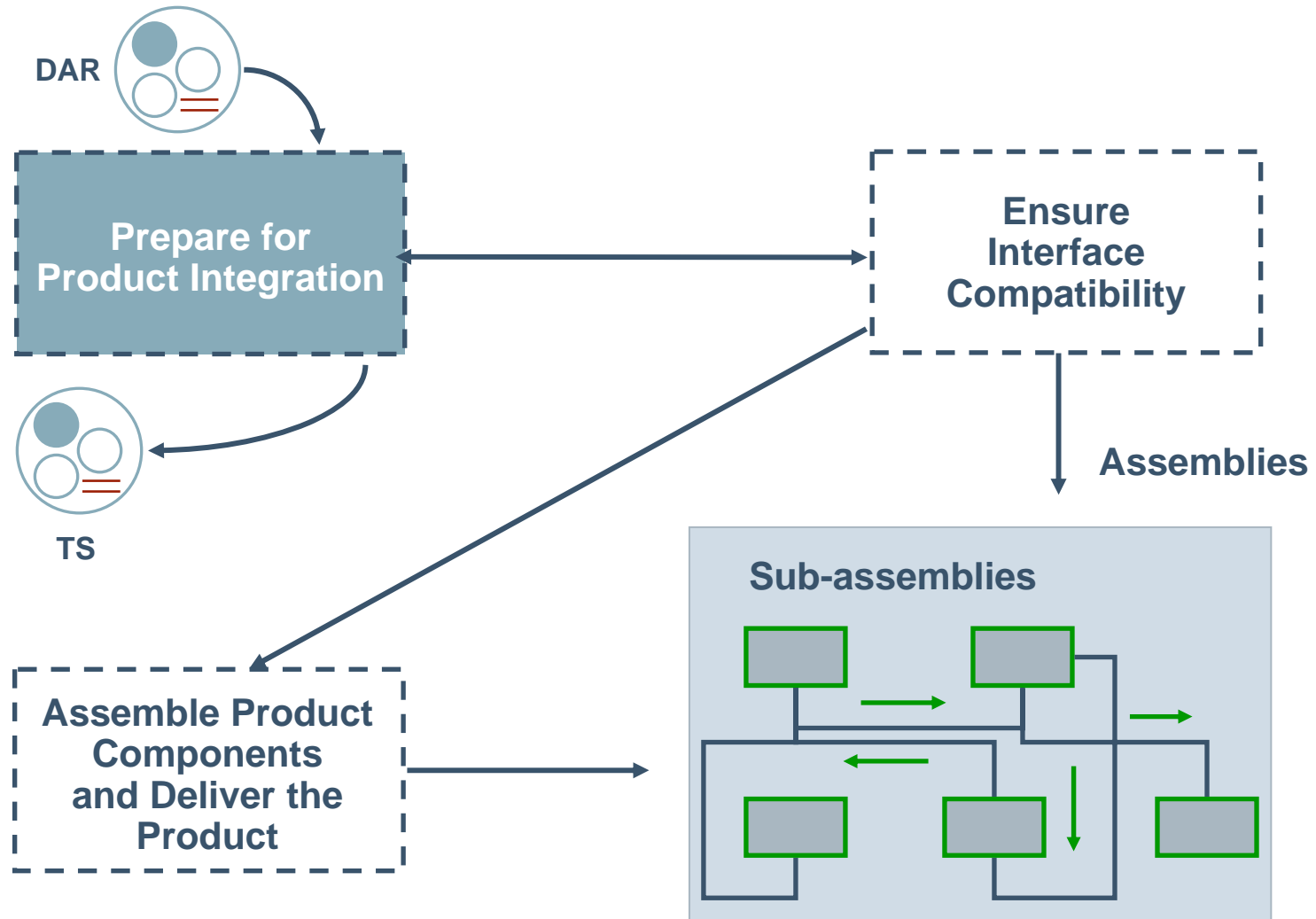
SG 3: Assemble Product Components and Deliver the Product

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

The process area also has generic goals to support institutionalization.

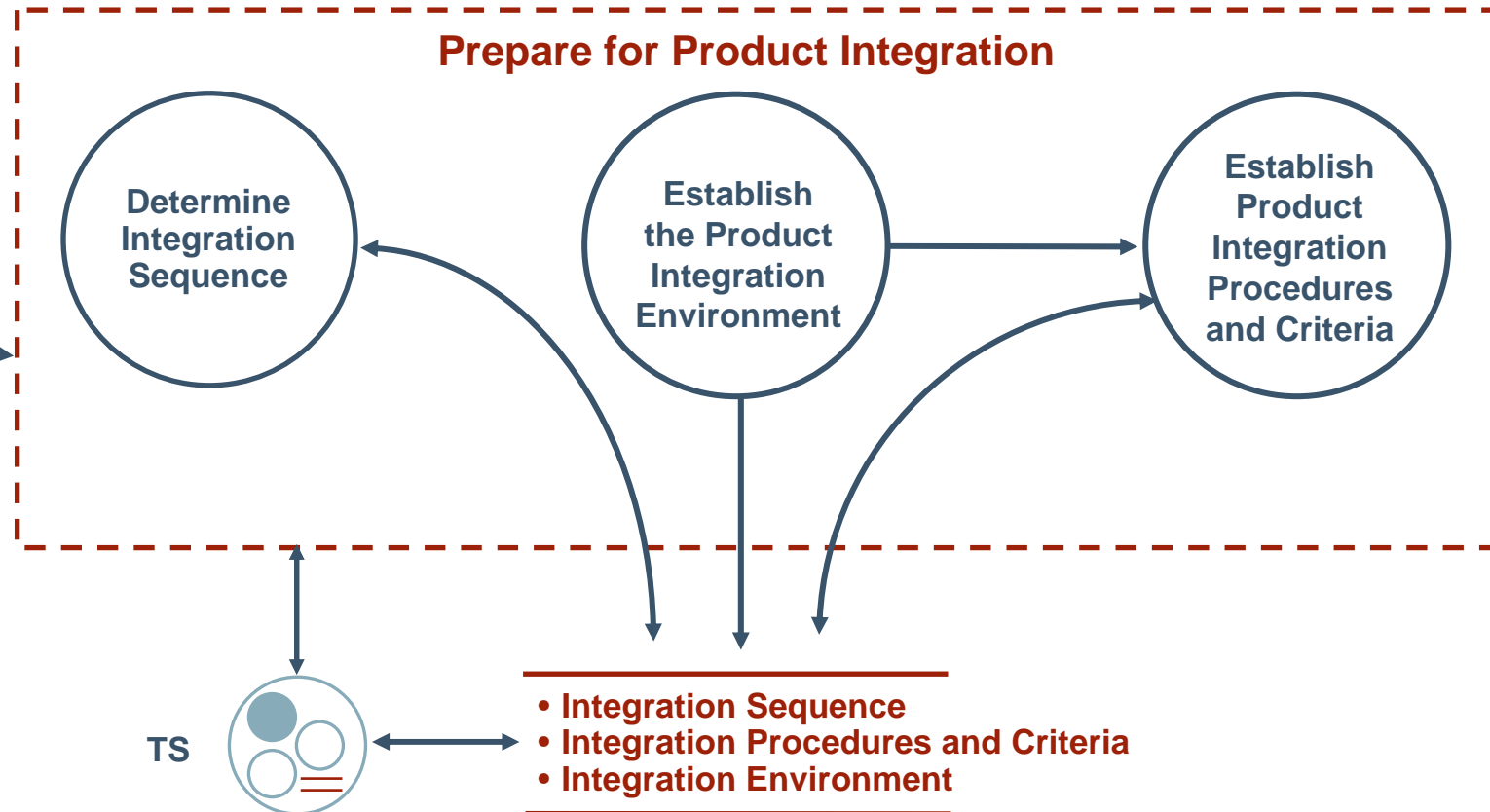


Product Integration Context -1



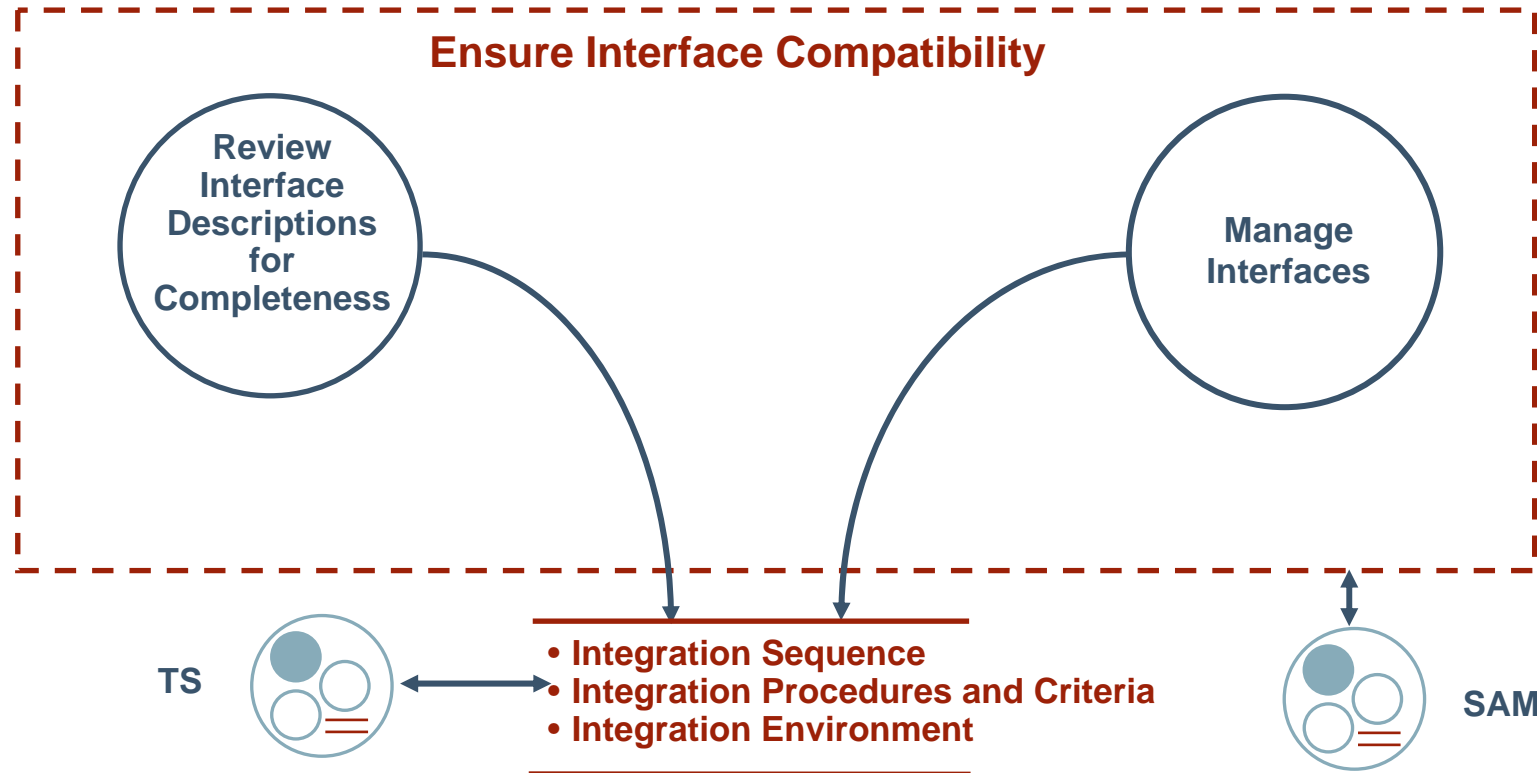


Product Integration Context -2



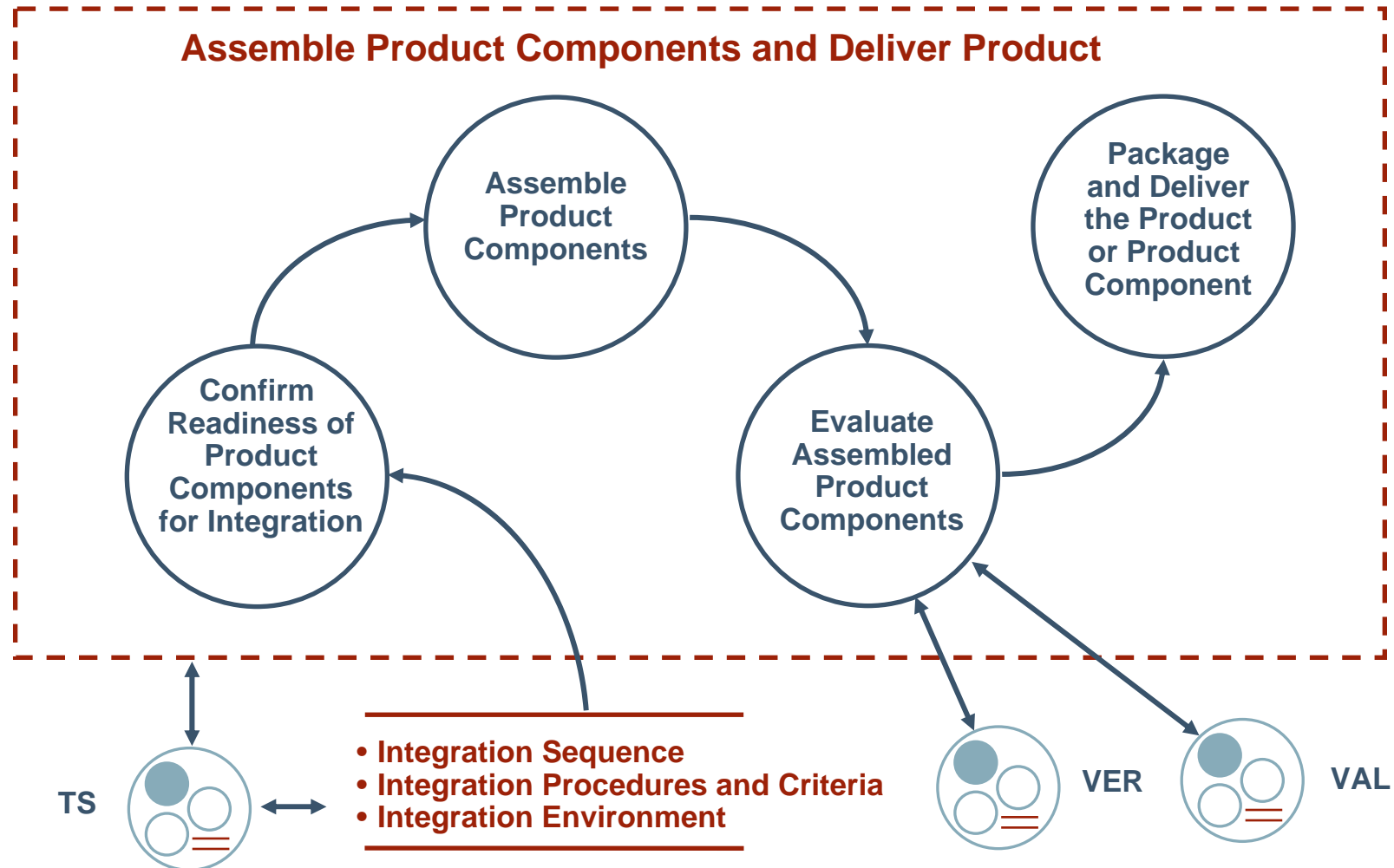


Product Integration Context -3





Product Integration Context -4





Project Monitoring and Control (PMC)

Purpose

Provide 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 Monitoring and Control Goals

SG 1: Monitor Project Against Plan

Actual performance and progress of the project are monitored against the project plan.

SG 2: Manage Corrective Action to Closure

Corrective actions are managed to closure when the project's performance or results deviate significantly from the plan.

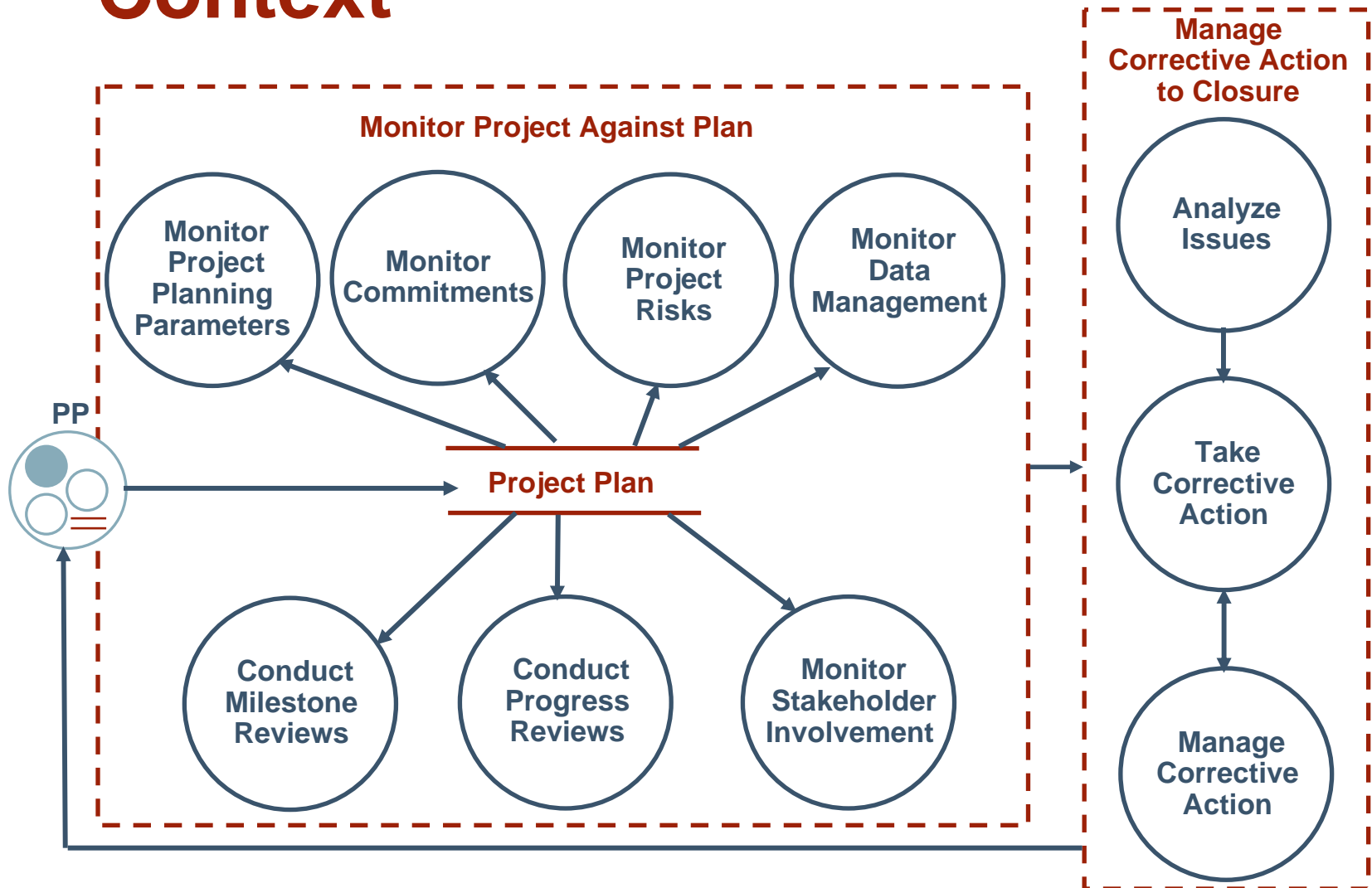
The process area also has generic goals to support institutionalization.

Note relationship with

Project Monitoring and Control ↔ GP 2.8



Project Monitoring and Control Context





Project Planning (PP)

Purpose

Establish and maintain plans that define project activities.



Project Planning Goals

SG 1: Establish Estimates

Estimates of project planning parameters are established and maintained.

SG 2: Develop a Project Plan

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

SG 3: Obtain Commitment to the Plan

Commitments to the project plan are established and maintained.

The process area also has generic goals to support institutionalization.

Note relationship with

Project Planning ↔ GP 2.2, GP 2.7



Relevant Terminology

Project

A managed set of interrelated resources which delivers one or more products to a customer or end user. A project has a definite beginning and typically operates according to a plan. Such a plan is frequently documented and specifies the product to be delivered or implemented, the resources and funds to be used, the work to be done, and a schedule for doing the work. A project can be composed of projects.

Program

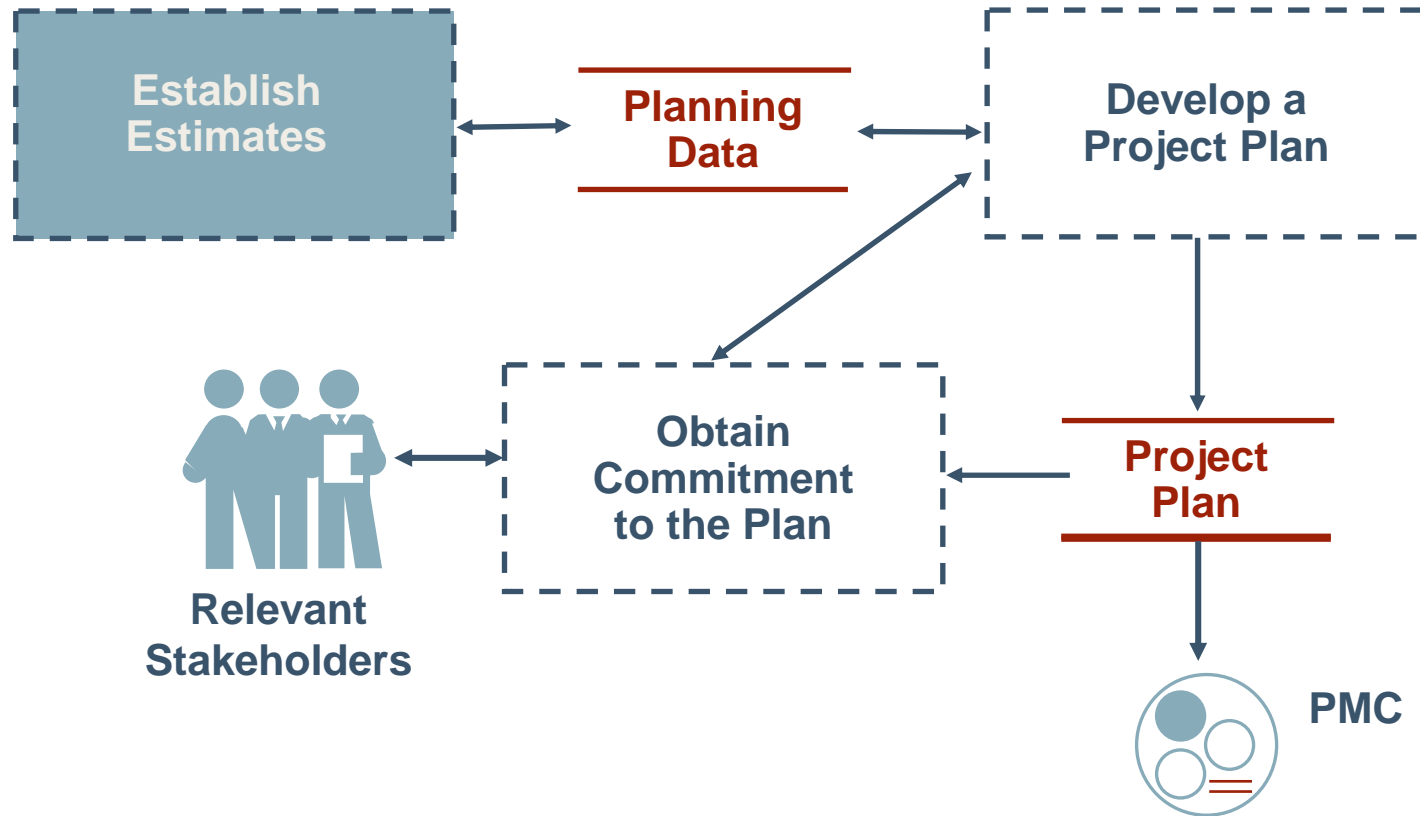
(1) A project. (2) A collection of related projects and the infrastructure that supports them, including objectives, methods, activities, plans, and success measures.

Work breakdown structure (WBS)

An arrangement of work elements and their relationship to each other and to the end product.

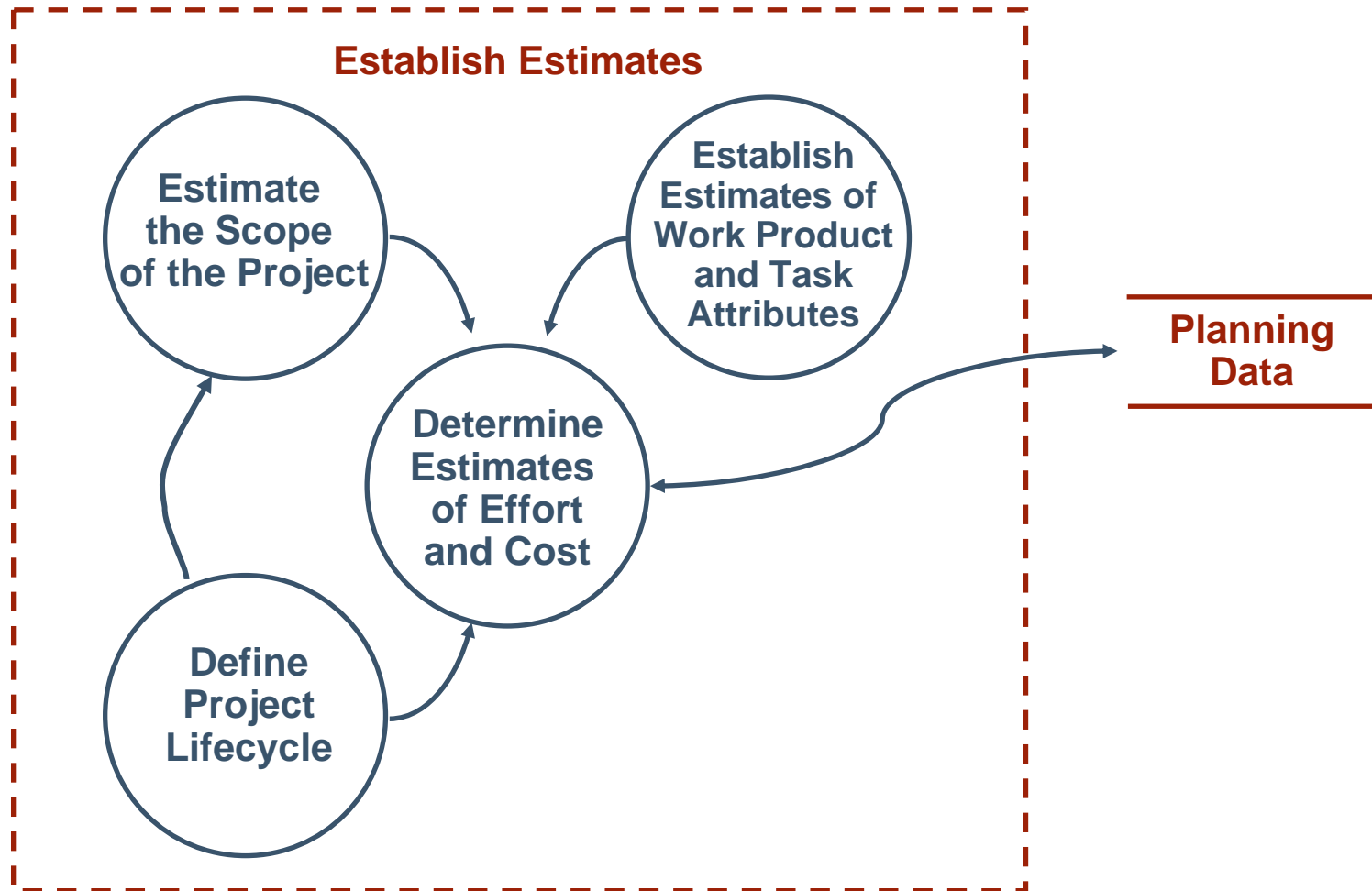


Project Planning Context -1





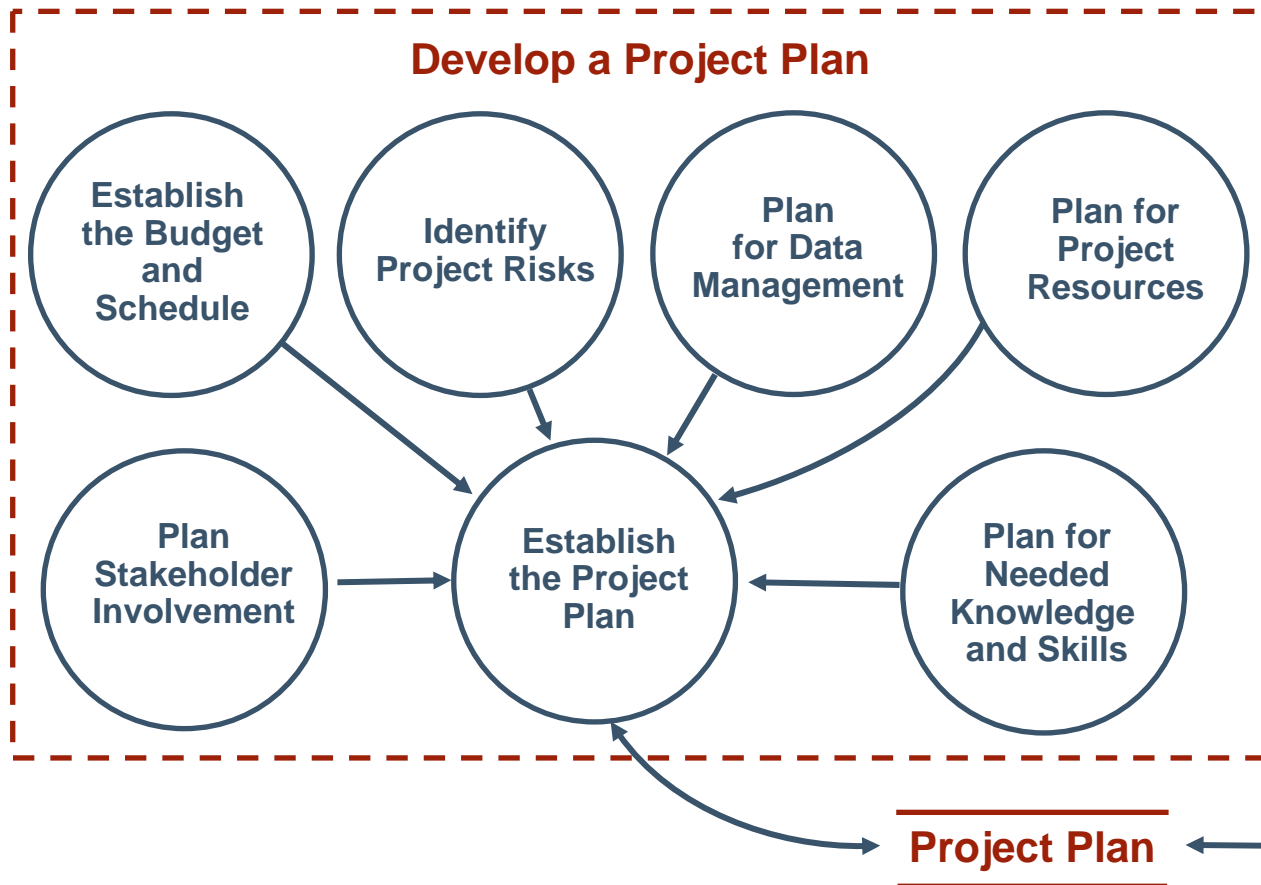
Project Planning Context -2





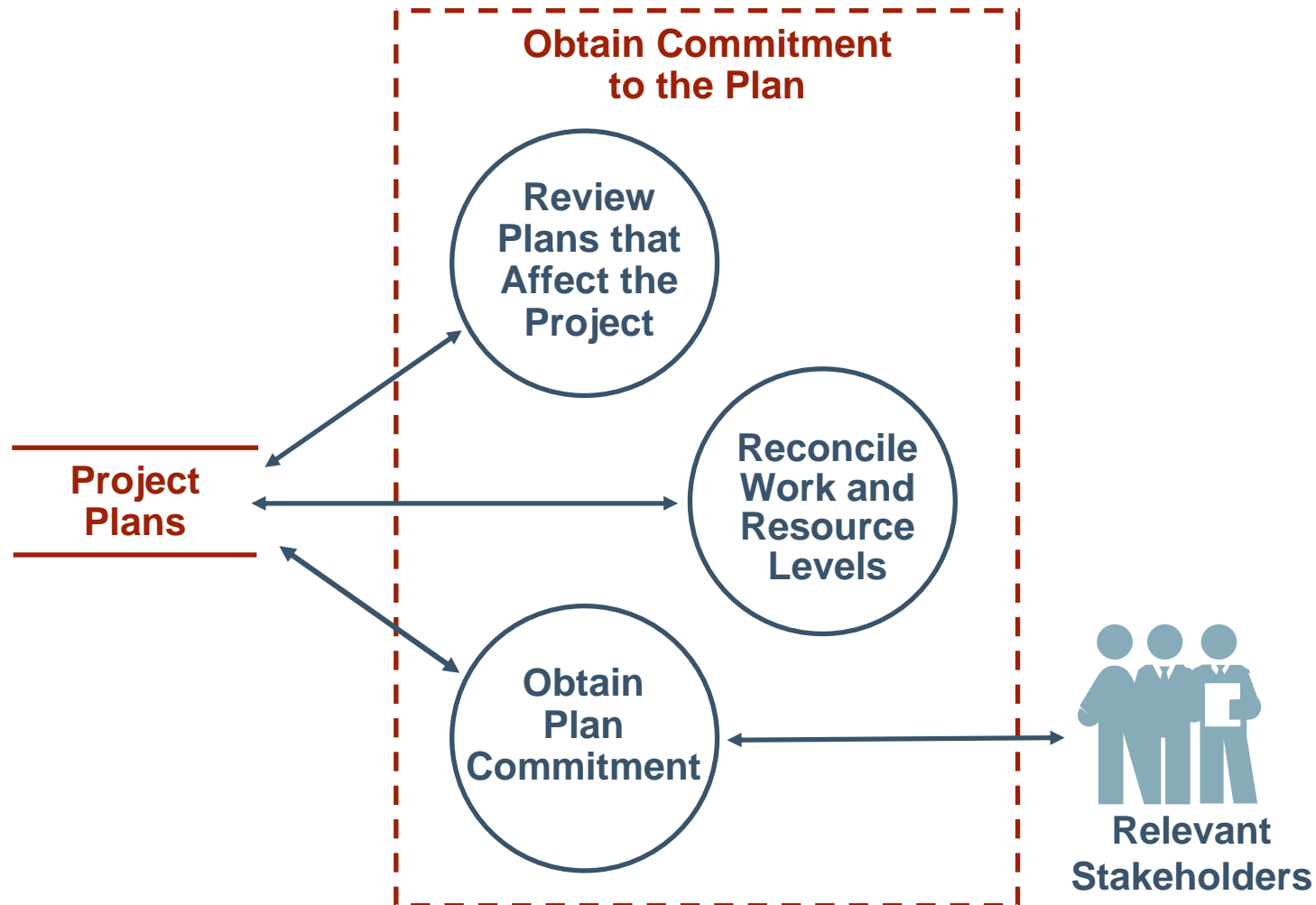
Project Planning Context -3

Planning Data





Project Planning Context -4





Process and Product Quality Assurance (PPQA)

Purpose

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



Process and Product Quality Assurance Goals

SG 1: Objectively Evaluate Processes and Work Products

Adherence of the performed process and associated work products and services to applicable process descriptions, standards, and procedures is objectively evaluated.

SG 2: Provide Objective Insight

Noncompliance issues are objectively tracked and communicated, and resolution is ensured.

The process area also has generic goals to support institutionalization.

Note relationship with

Process and Product Quality Assurance ↔ GP 2.9



Relevant Terminology

Quality Assurance

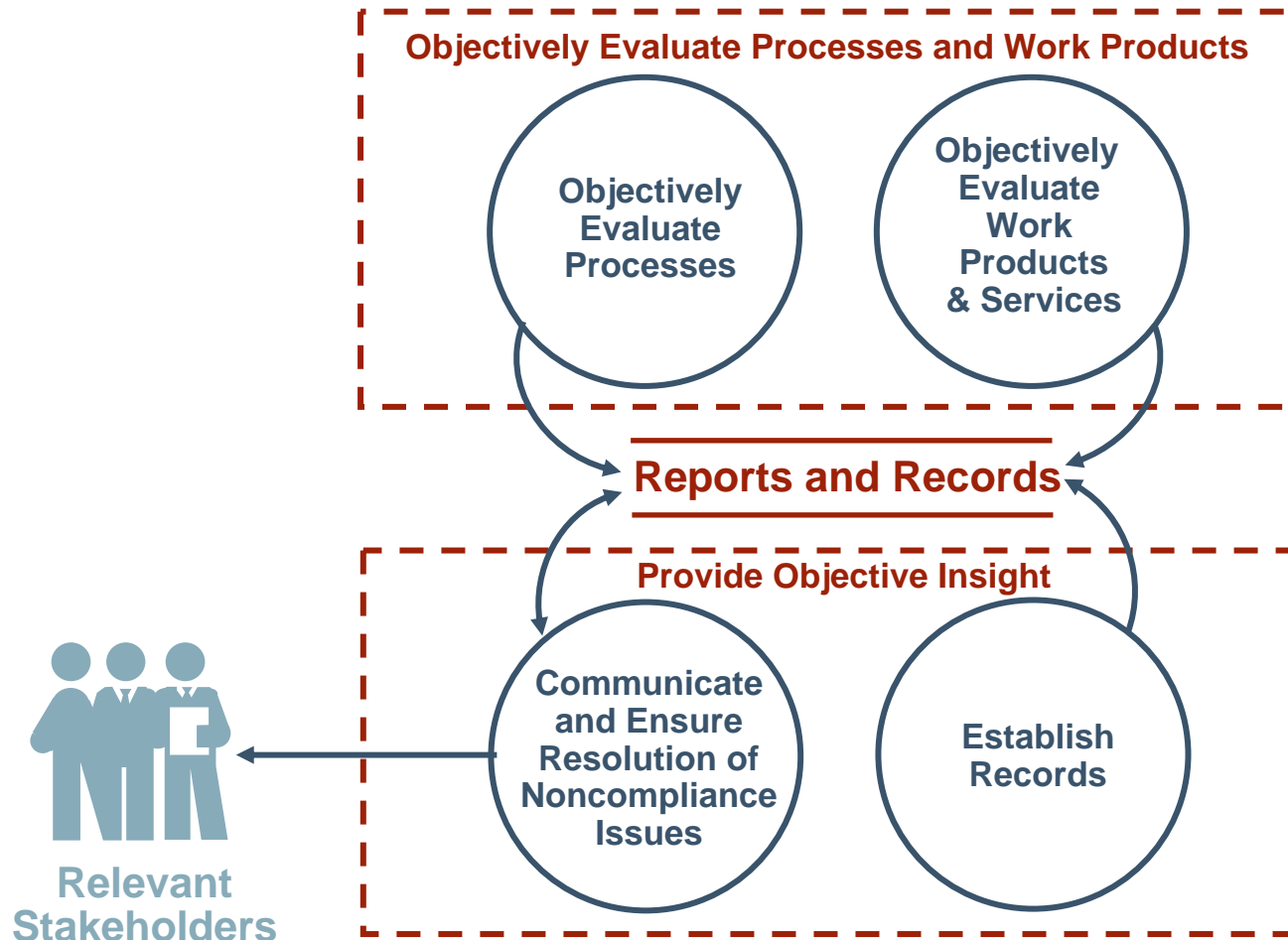
A planned and systematic means for assuring management that defined standards, practices, procedures, and methods of the process are applied.

Objectively Evaluate

To review activities and work products against criteria that minimize subjectivity and bias by the reviewer.



Process and Product Quality Assurance Context





Quantitative Project Management (QPM)

Purpose

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



Quantitative Project Management Goals

SG 1: Quantitatively Manage the Project

The project is quantitatively managed using quality and process-performance objectives.

SG 2: Statistically Manage Subprocess Performance

The performance of selected subprocesses within the project's defined process is statistically managed.

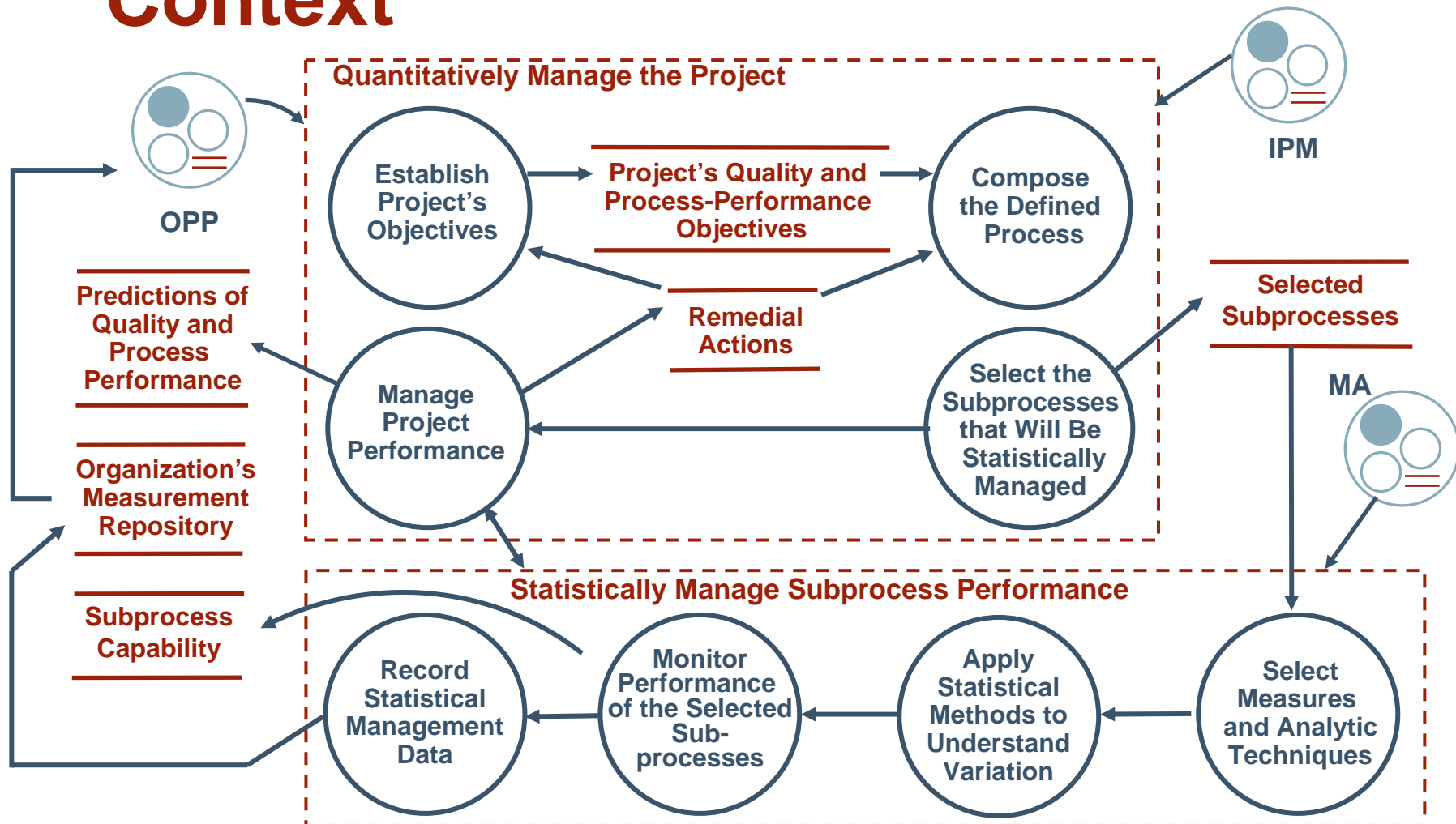
The process area also has generic goals to support institutionalization.

Note relationship with

Quantitative Project Management \Leftrightarrow GP 4.1, GP 4.2



Quantitative Project Management Context





Requirements Development (RD)

Purpose

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



Requirements Development Goals

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.

SG 3: Analyze and Validate Requirements

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

The process area also has generic goals to support institutionalization.



Relevant Terminology

Allocated requirement

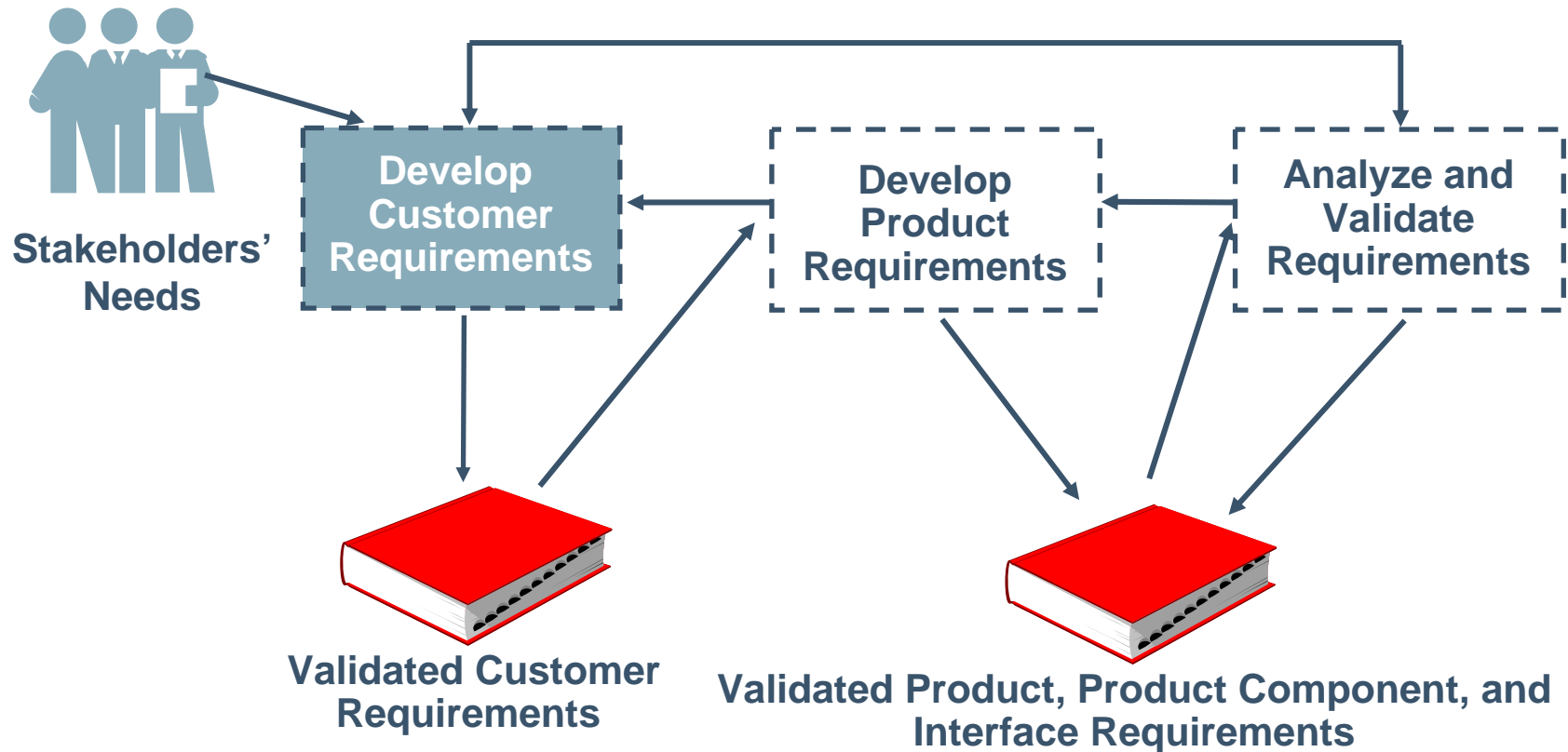
Requirement that levies all or part of the performance and functionality of a higher level requirement on a lower level architectural element or design component.

Derived requirements

Requirements that are not explicitly stated in the customer requirements, but are inferred (1) from contextual requirements (e.g., applicable standards, laws, policies, common practices, and management decisions), or (2) from requirements needed to specify a product component. Derived requirements can also arise during analysis and design of components of the product or system.

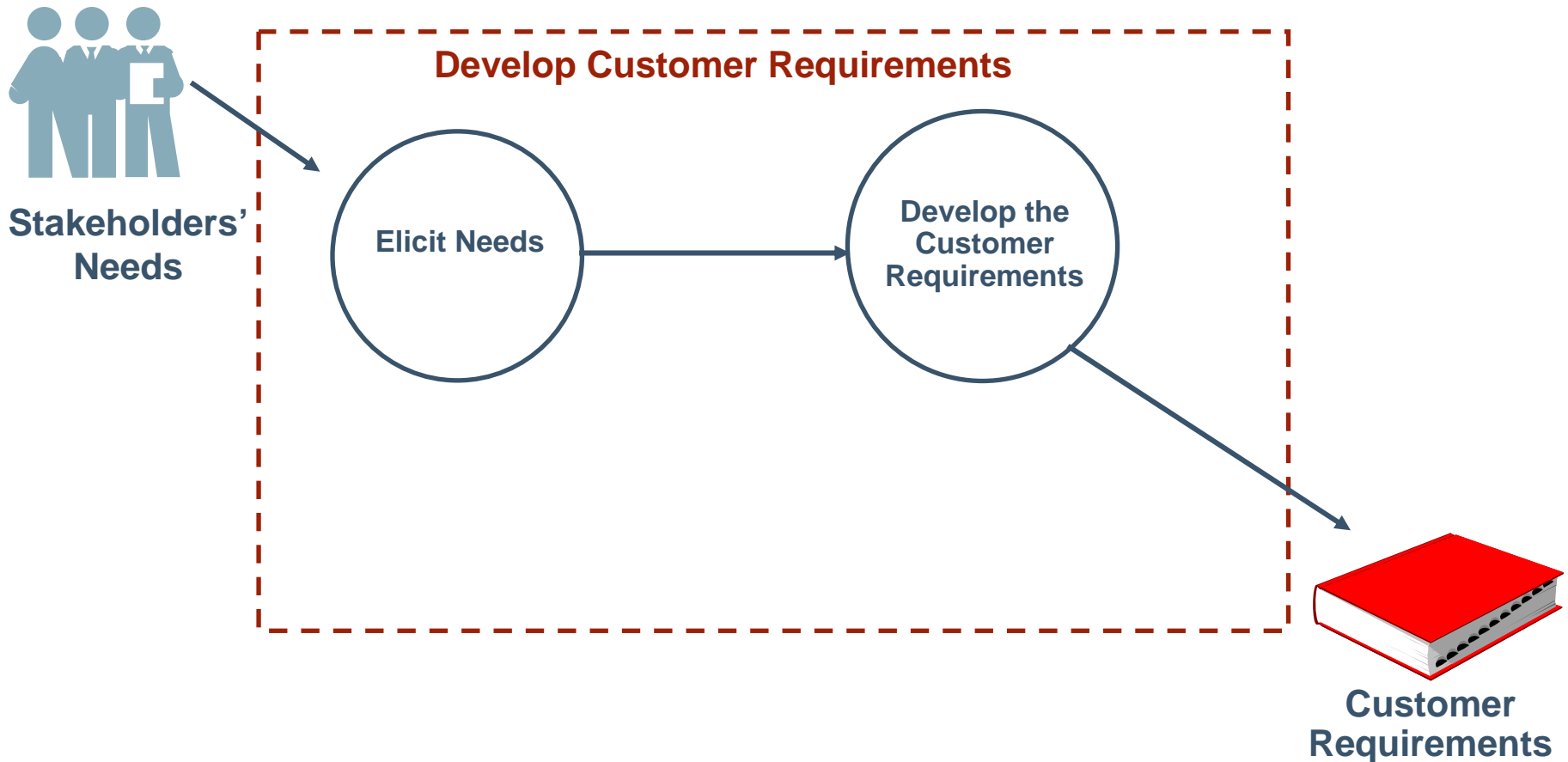


Requirements Development Context -1



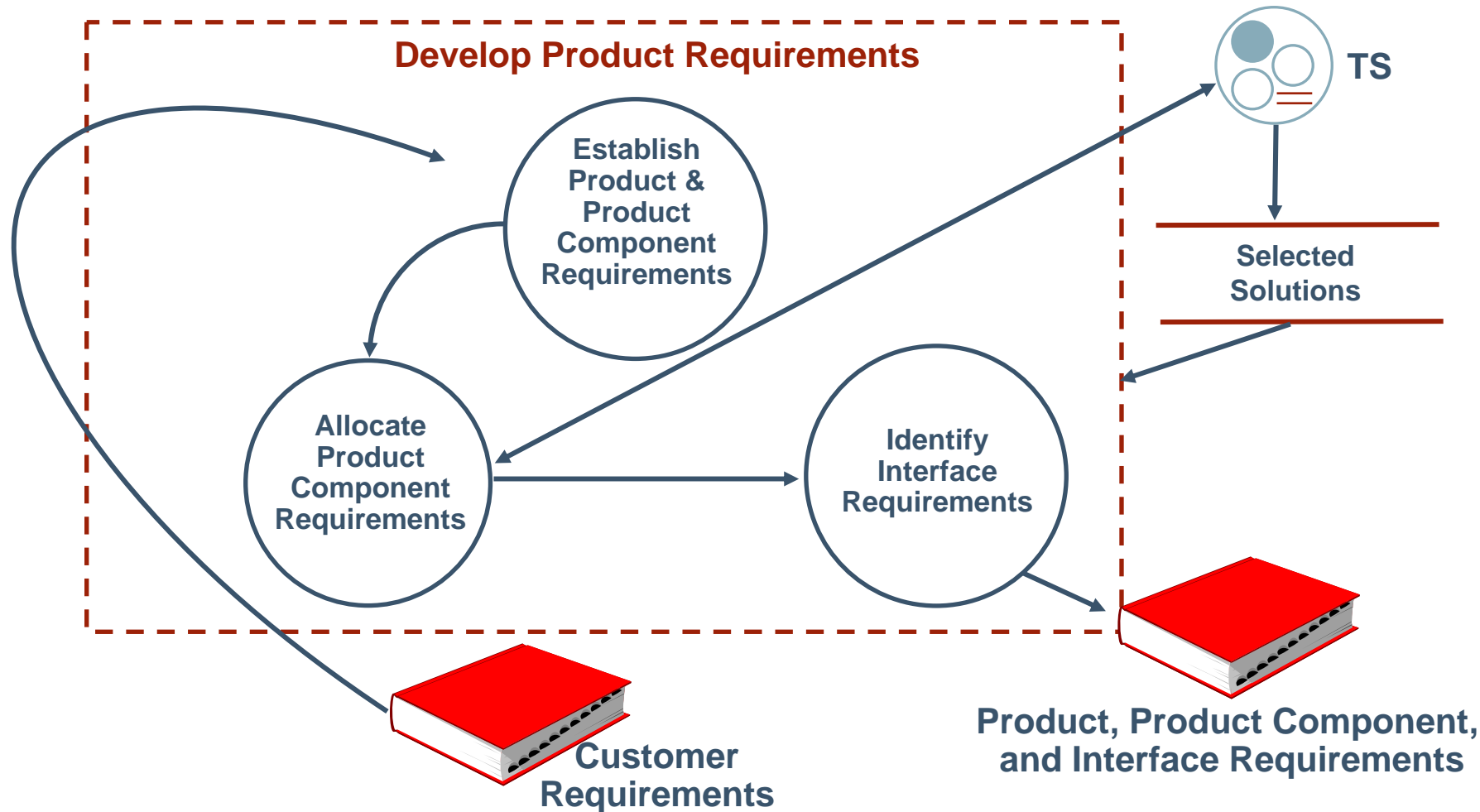


Requirements Development Context -2



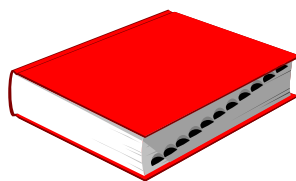
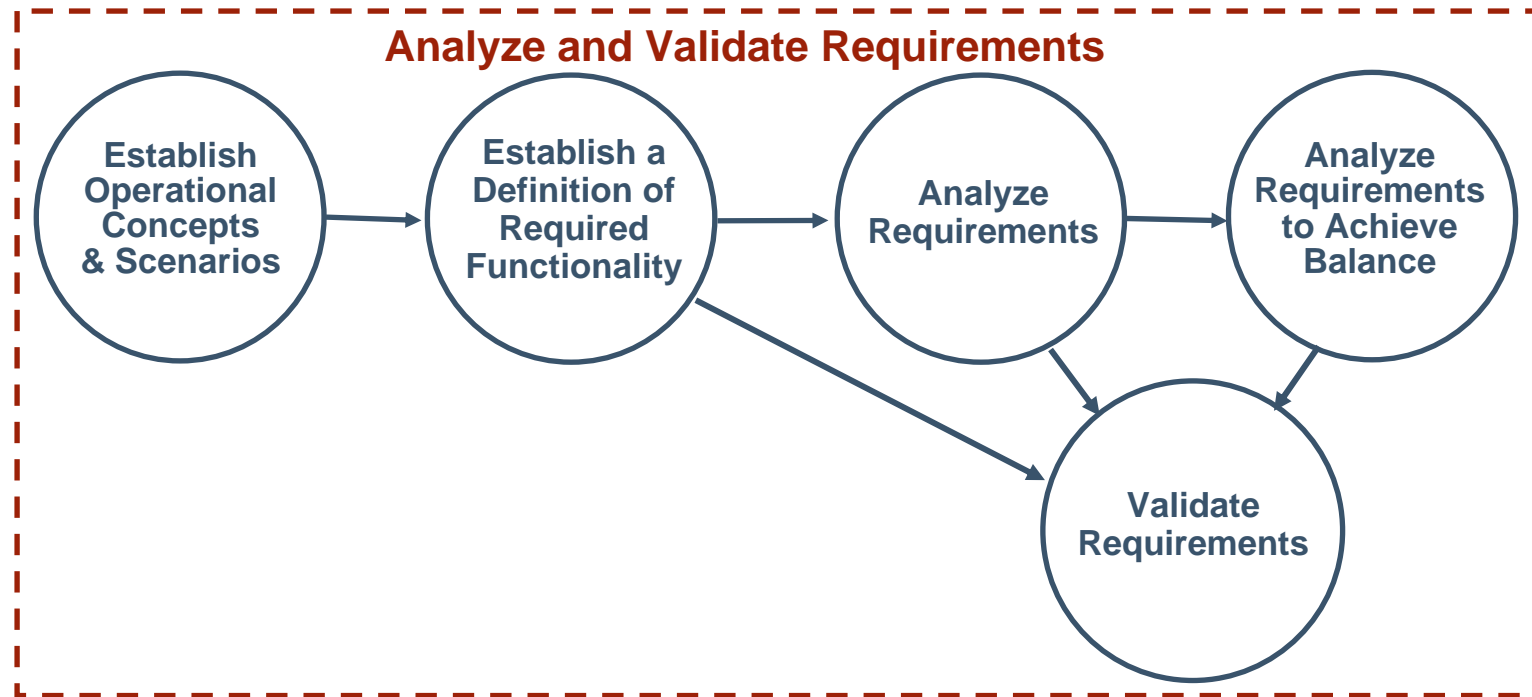


Requirements Development Context -3

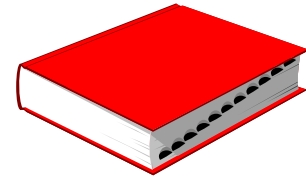




Requirements Development Context -4



**Customer, Product, Product Component, and
Interface Requirements**



**Validated
Requirements**



Requirements Management (REQM)

Purpose

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



Requirements Management Goals

SG 1: Manage Requirements

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

The process area also has generic goals to support institutionalization.



Relevant Terminology

Requirements traceability

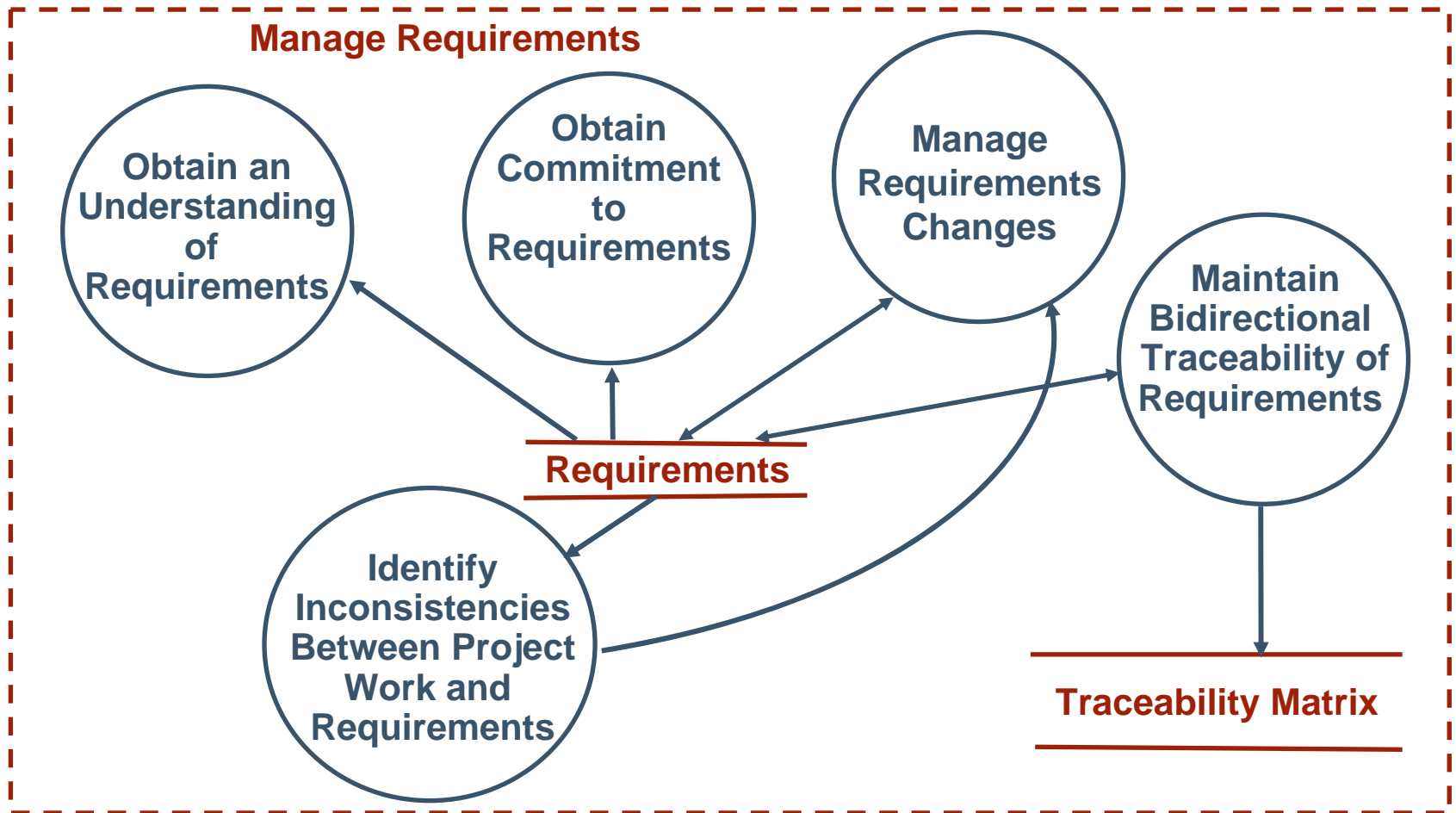
A discernable association between requirements and related requirements, implementations, and verifications.

Bidirectional traceability

An association among two or more logical entities that is discernable in either direction (i.e., to and from an entity).



Requirements Management Context





Risk Management (RSKM)

Purpose

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.



Risk Management Goals

SG 1: Prepare for Risk Management

Preparation for risk management is conducted.

SG 2: Identify and Analyze Risks

Risks are identified and analyzed to determine their relative importance.

SG 3: Mitigate Risks

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

The process area also has generic goals to support institutionalization.



Risk Management Context





Supplier Agreement Management (SAM)

Purpose

Manage the acquisition of products from suppliers.



Supplier Agreement Management Goals

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.

The process area also has generic goals to support institutionalization.



Relevant Terminology

Supplier

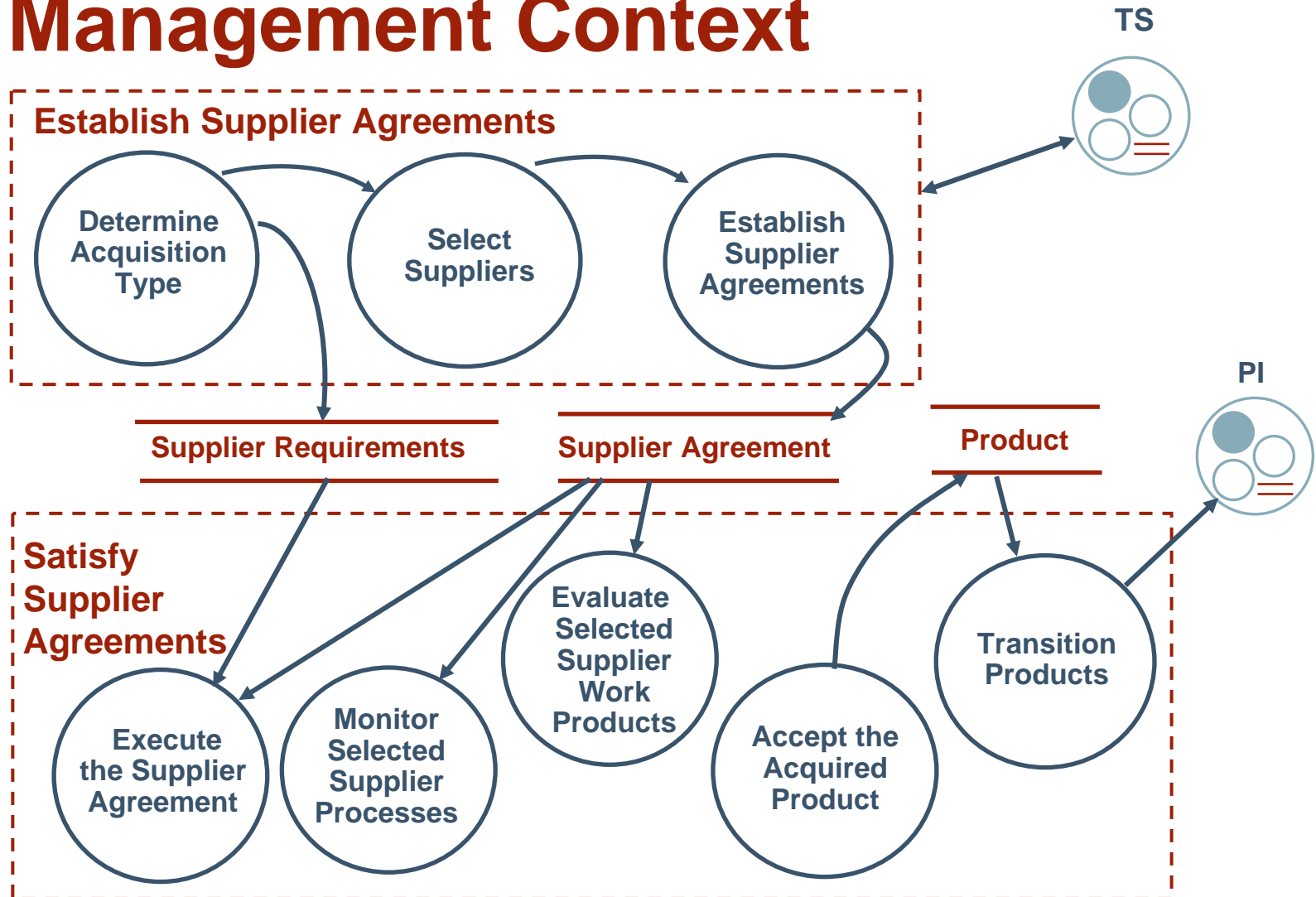
- (1) An entity delivering products or performing services being acquired.
- (2) An individual, partnership, company, corporation, association, or other service having an agreement (contract) with an acquirer for the design, development, manufacture, maintenance, modification, or supply of items under the terms of an agreement (contract).

Formal agreement

Any legal agreement between the organization (representing the project) and the supplier. This agreement may be a contract, a license, or a memorandum of agreement.



Supplier Agreement Management Context





Technical Solution (TS)

Purpose

Design, develop, and implement solutions to requirements. Solutions, designs, and implementations encompass products, product components, and product-related lifecycle processes either singly or in combinations as appropriate.



Technical Solution Goals

SG 1: Select Product Component Solutions

Product or product component solutions are selected from alternative solutions.

SG 2: Develop the Design

Product or product component designs are developed.

SG 3: Implement the Product Design

Product components, and associated support documentation, are implemented from their designs.

The process area also has generic goals to support institutionalization.



Relevant Terminology

Product-related lifecycle processes

Processes associated with a product throughout one or more phases of its life (e.g., from conception through disposal), such as the manufacturing and support processes.

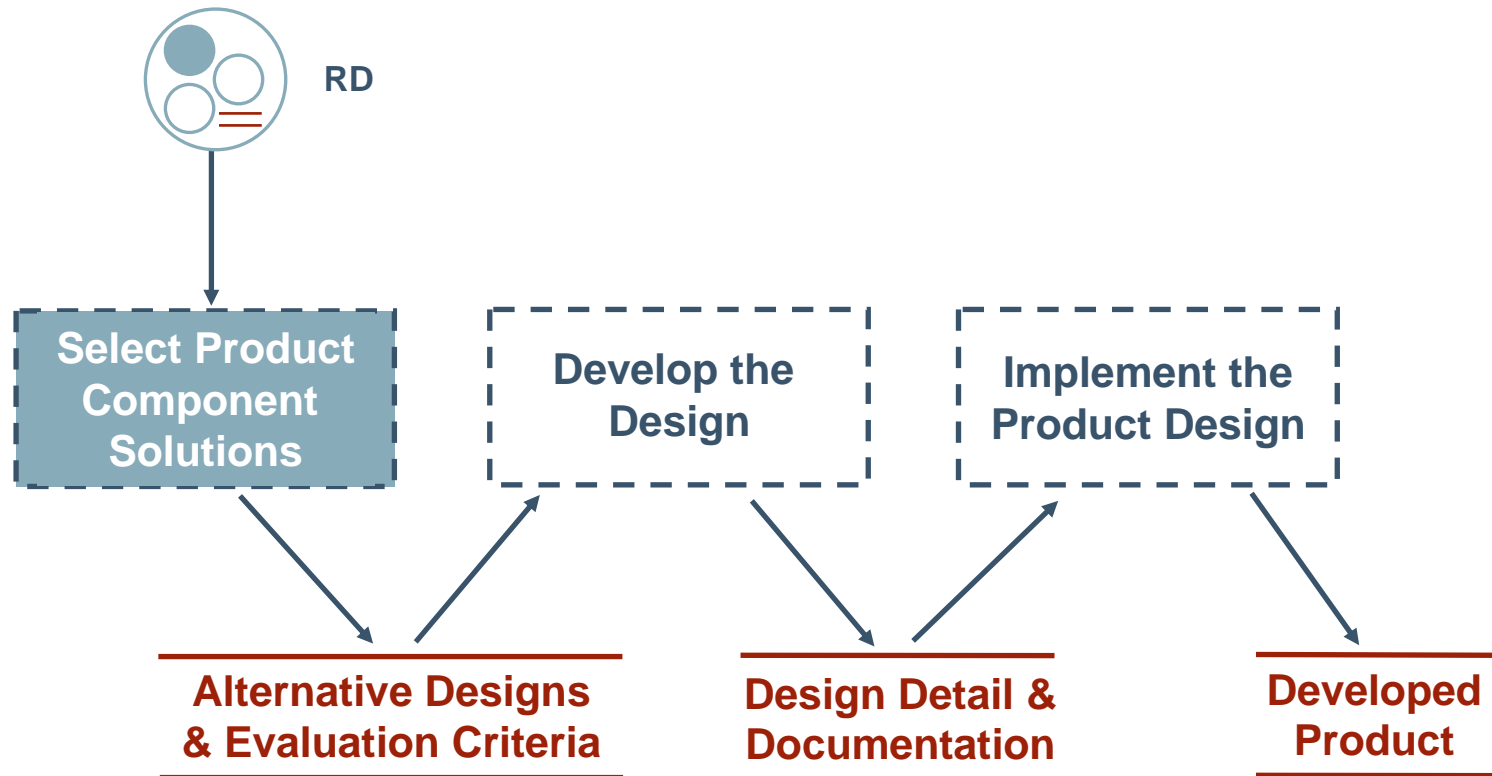
Sustainment

The processes used to ensure that a product can be utilized operationally by its end users or customers.

Sustainment ensures that maintenance is done such that the product is in an operable condition whether or not the product is in use by customers or end users.

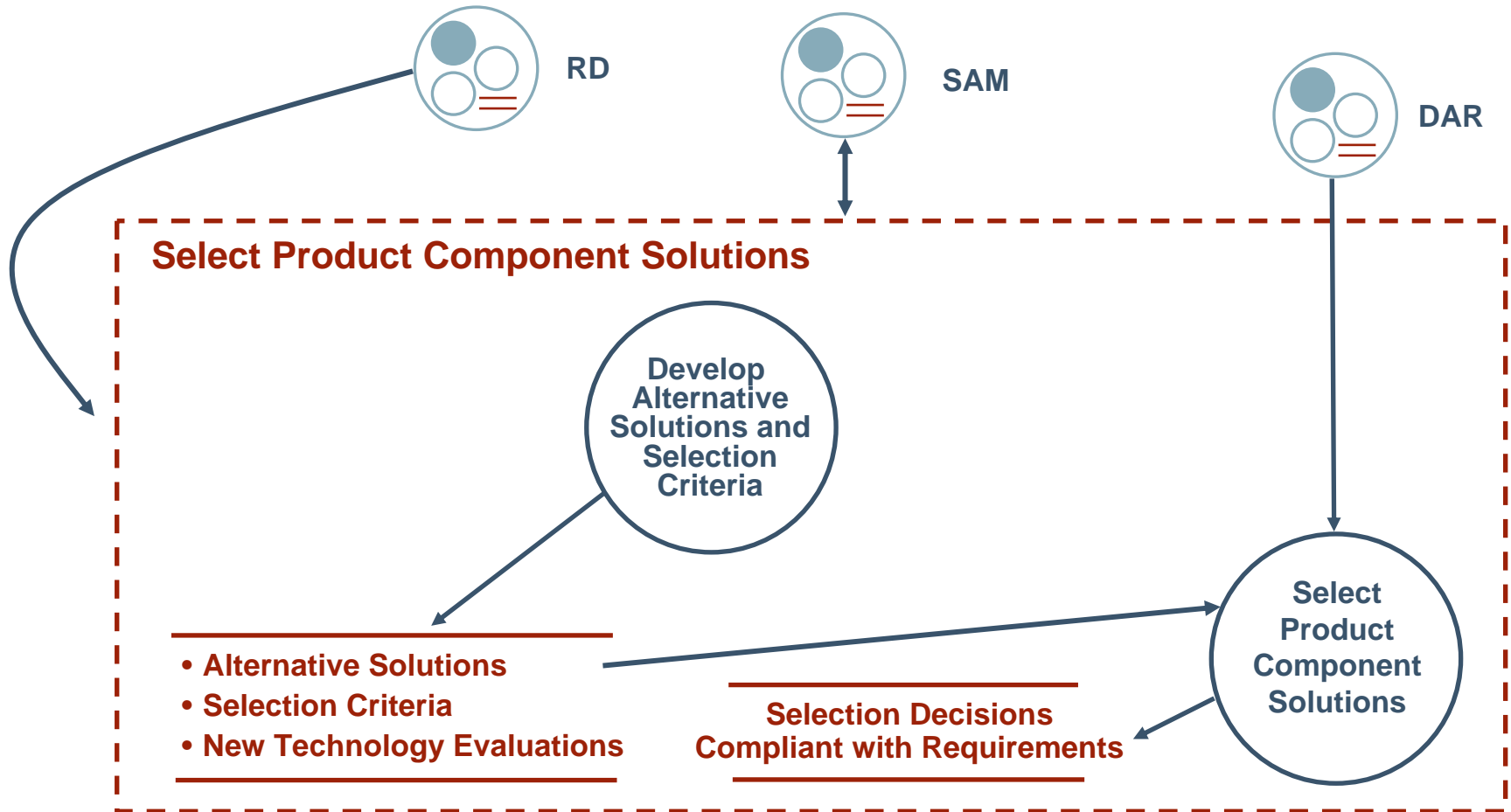


Technical Solution Context -1



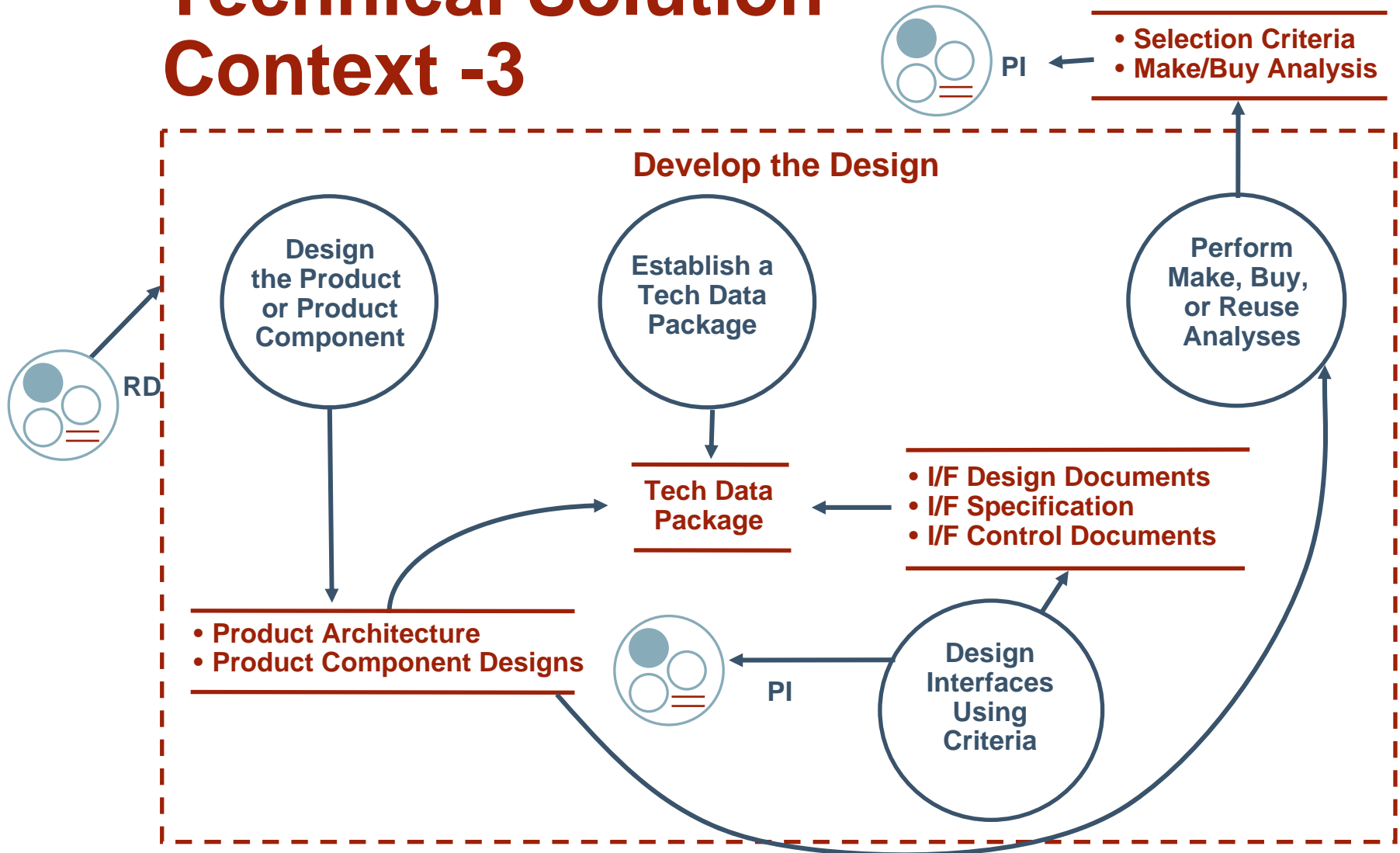


Technical Solution Context -2



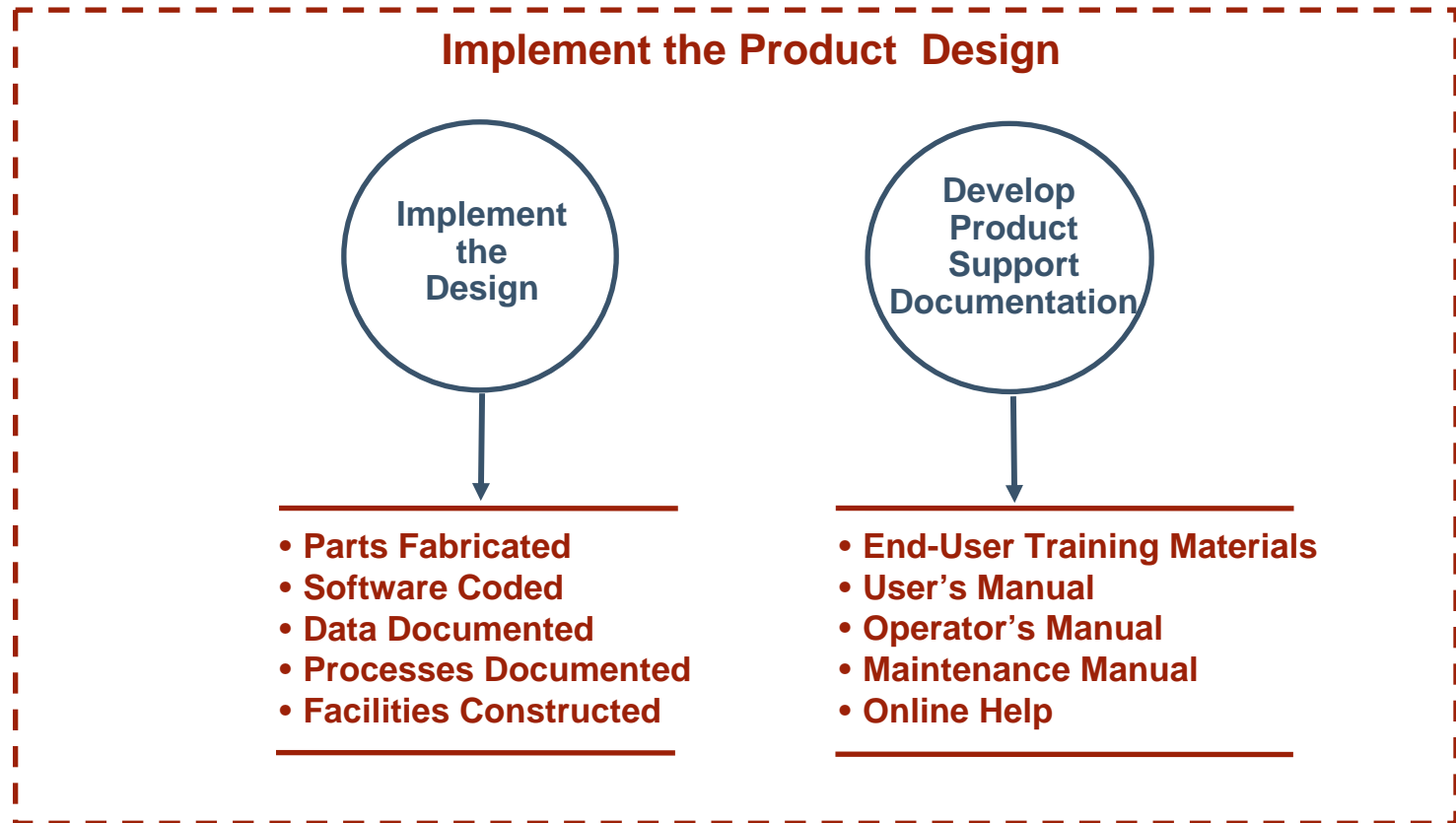


Technical Solution Context -3





Technical Solution Context -4





Validation (VAL)

Purpose

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



Validation Goals

SG 1: Prepare for Validation

Preparation for validation is conducted.

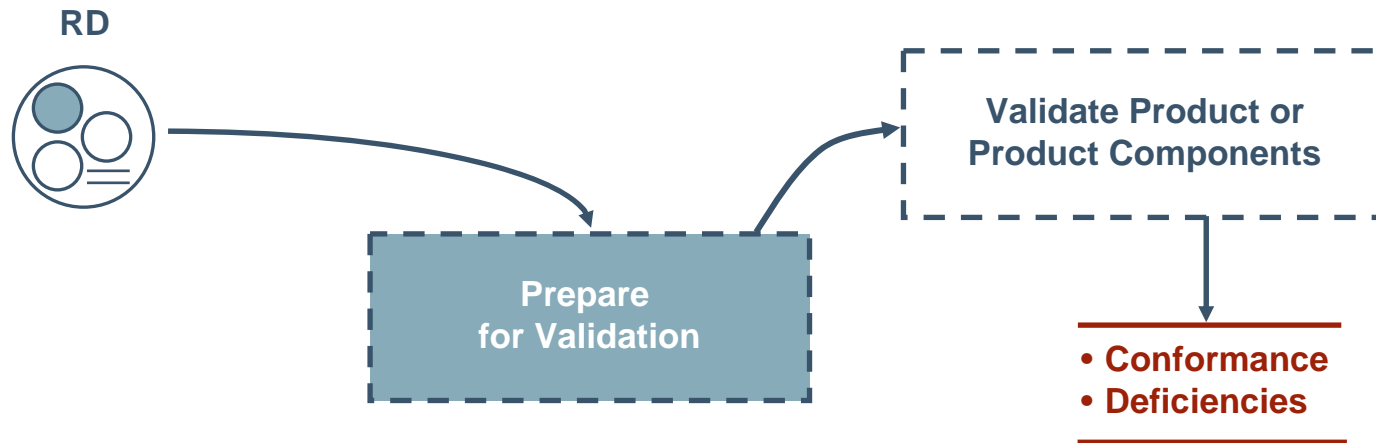
SG 2: Validate Product or Product Components

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

The process area also has generic goals to support institutionalization.

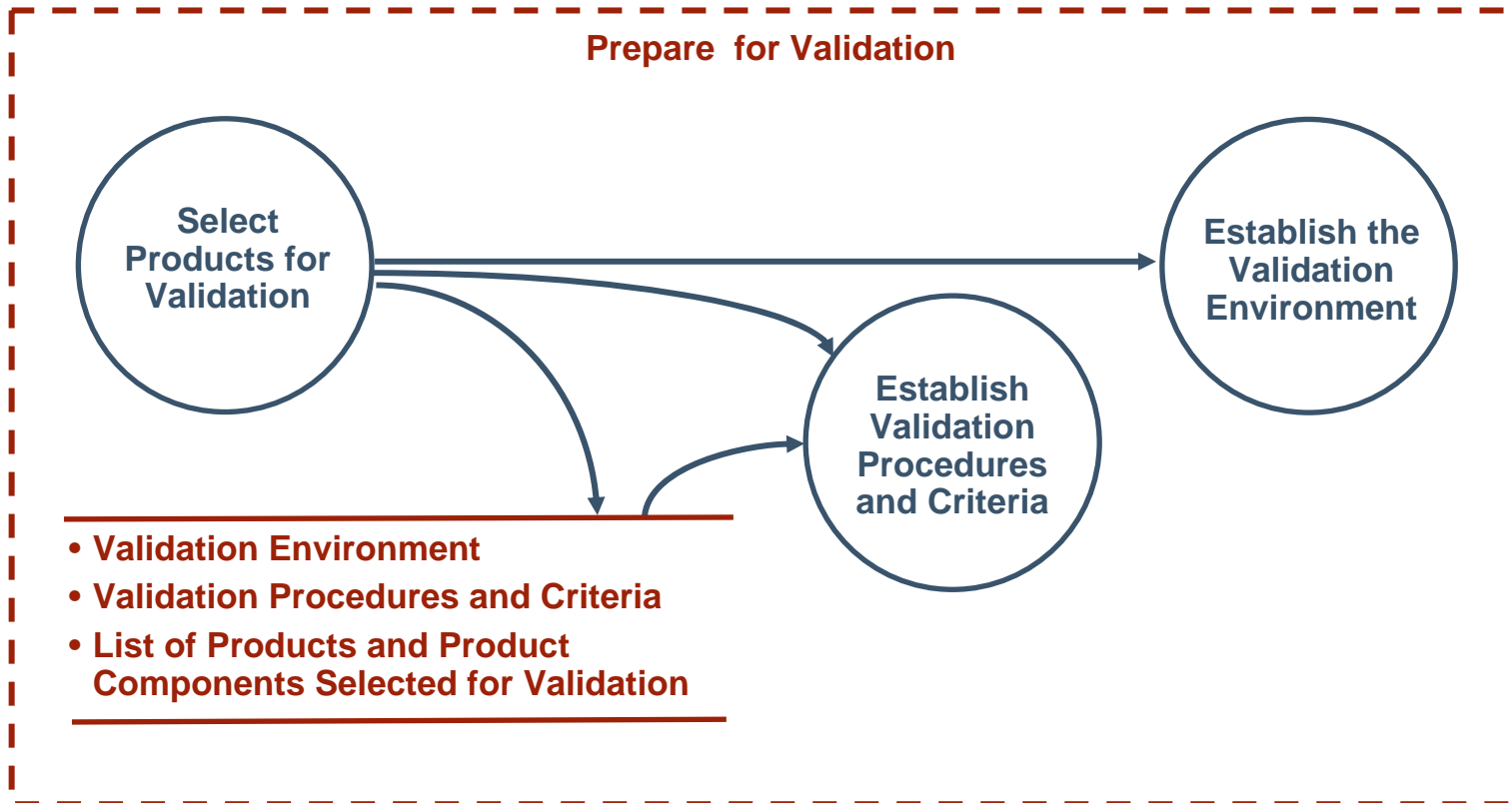


Validation Context -1



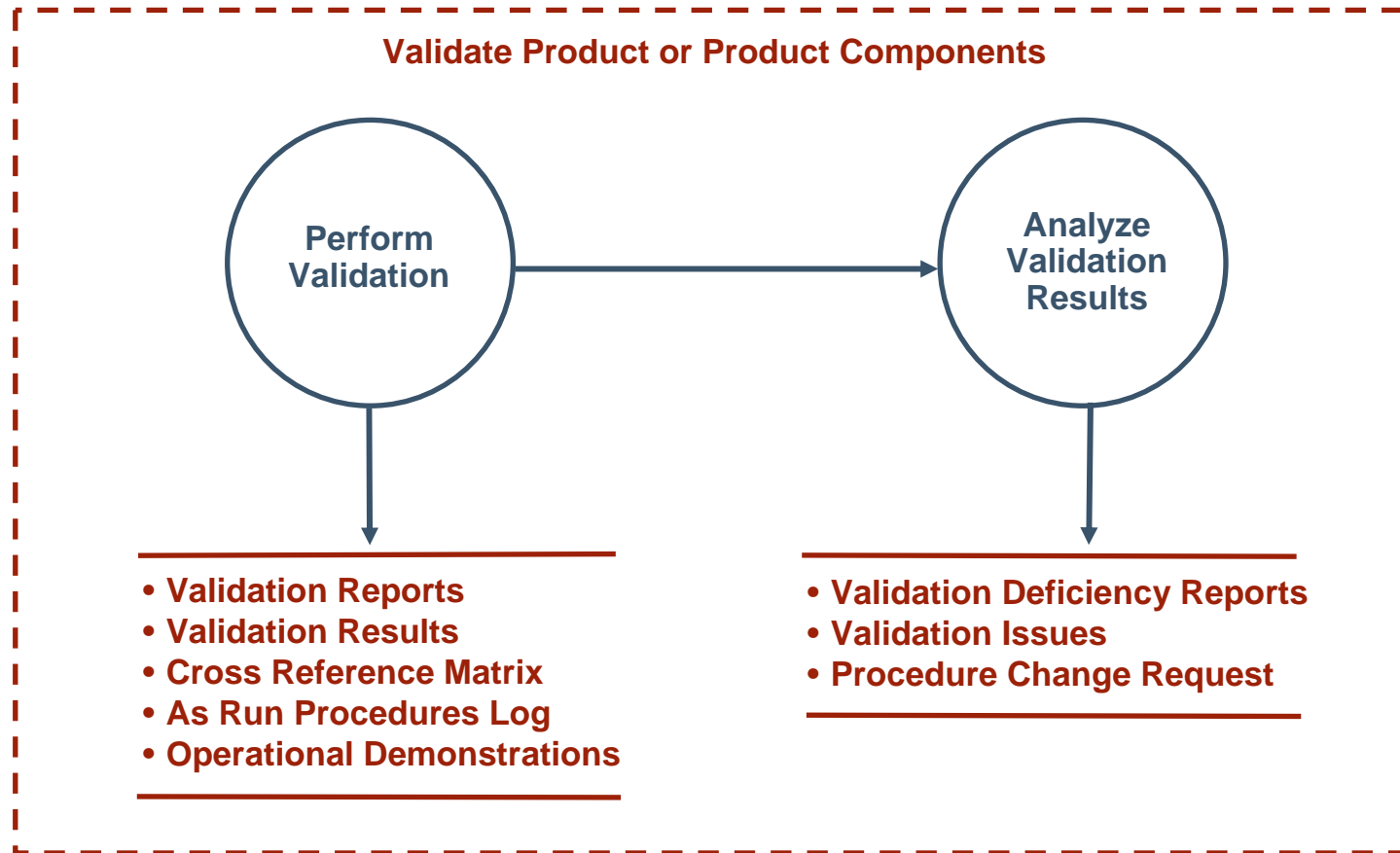


Validation Context -2





Validation Context -3





Verification (VER)

Purpose

Ensure that selected work products meet their specified requirements.



Verification Versus Validation

Verification

- Are you building the **product right**?
- That is, are you meeting the specified requirements?

Validation

- Are you building the **right product**?
- That is, are you meeting the operational need?

Both are applicable throughout the product development lifecycle.



Verification Goals

SG 1: Prepare for Verification

Preparation for verification is conducted.

SG 2: Perform Peer Reviews

Peer reviews are performed on selected work products.

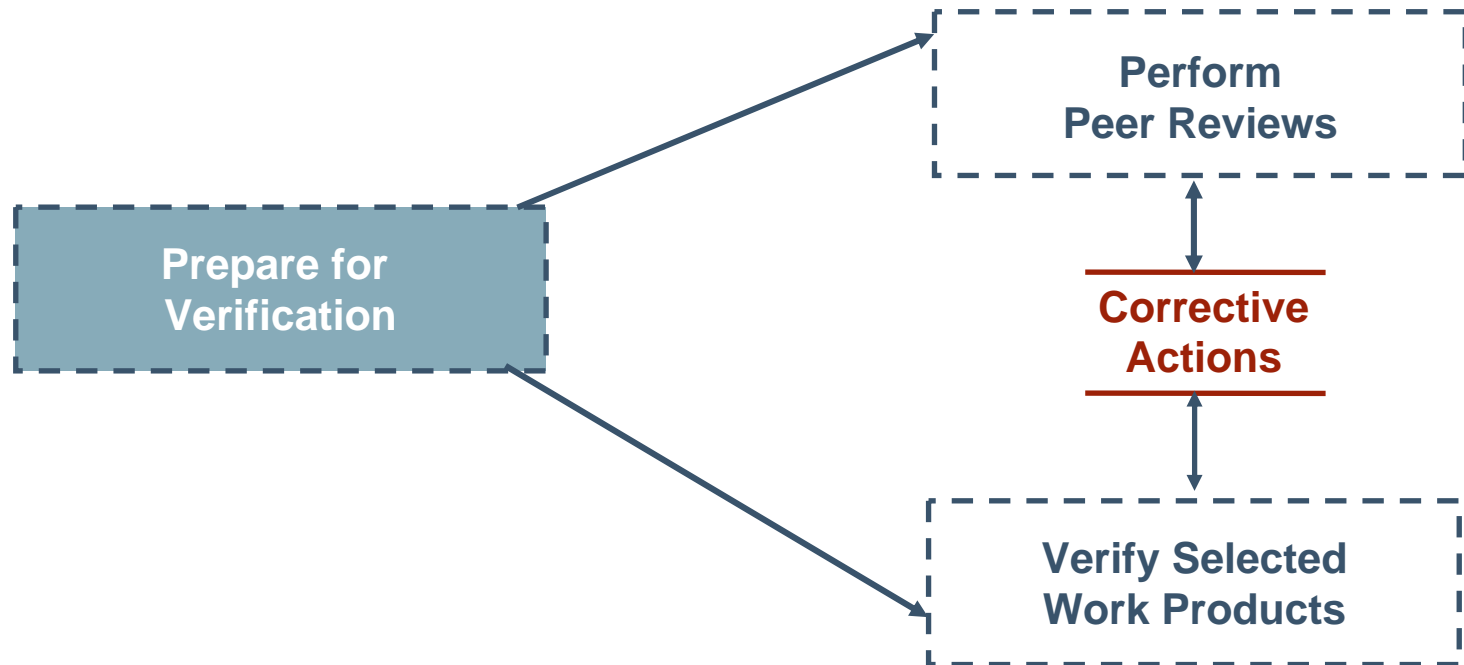
SG 3: Verify Selected Work Products

Selected work products are verified against their specified requirements.

The process area also has generic goals to support institutionalization.

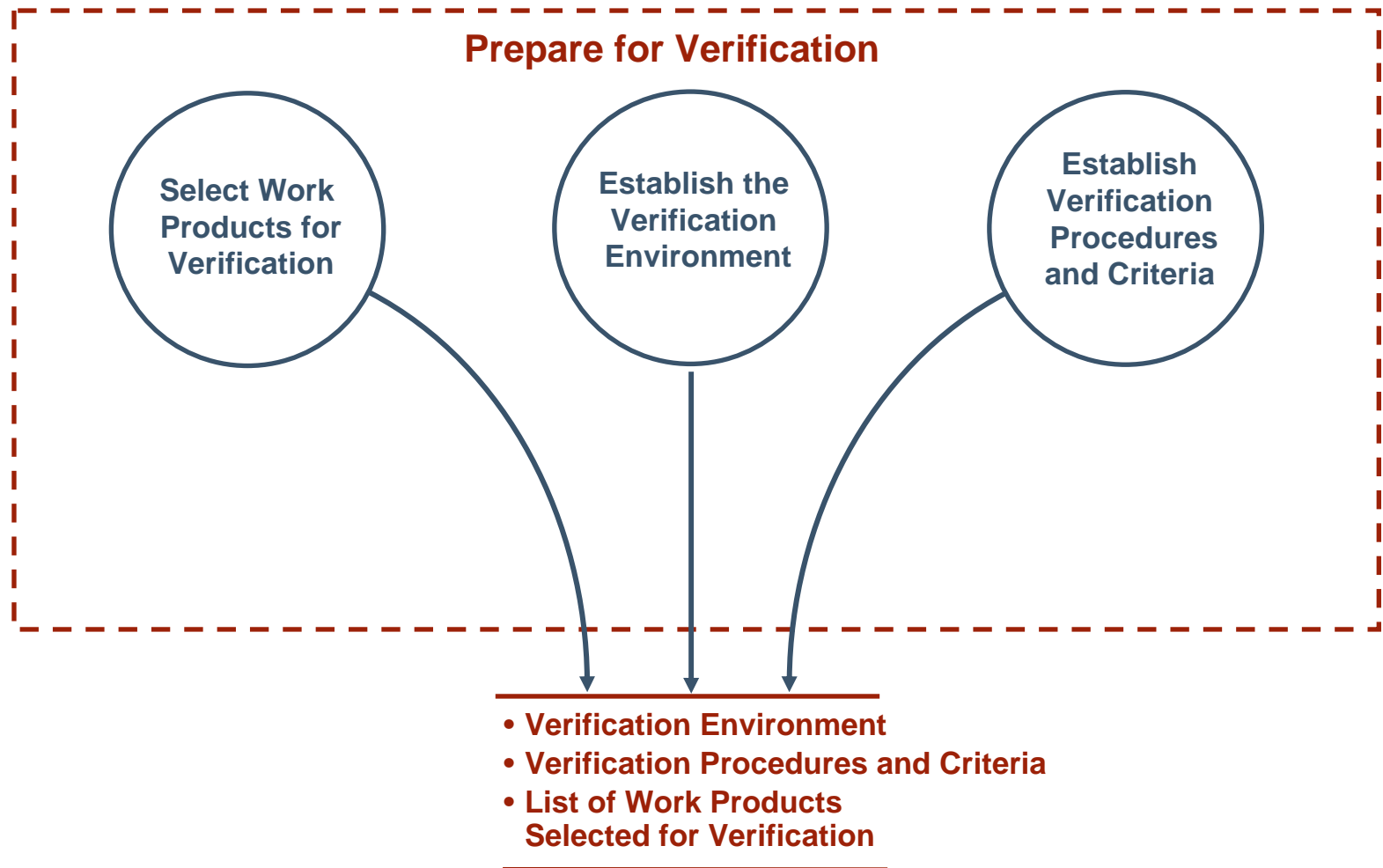


Verification Context -1



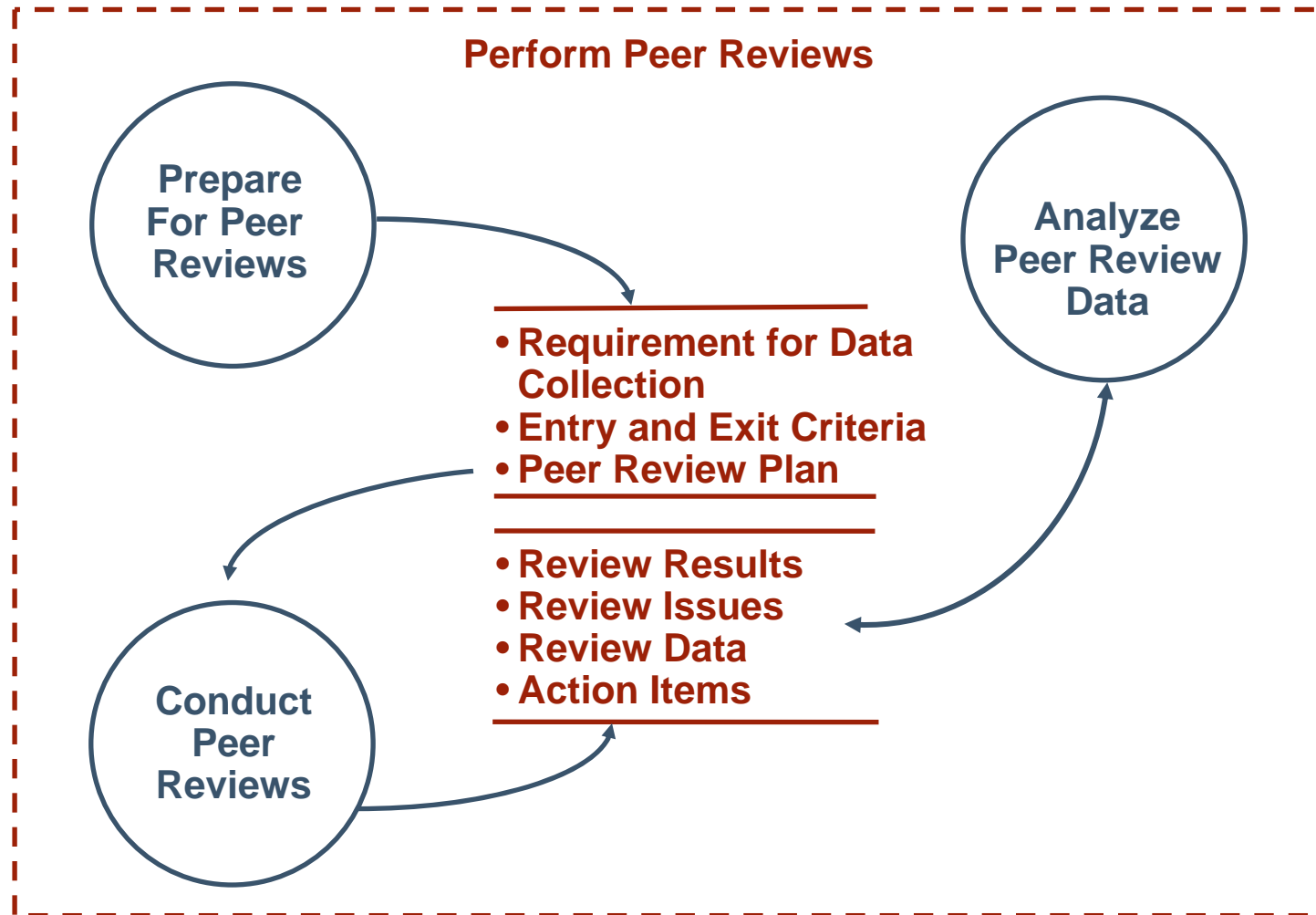


Verification Context -2



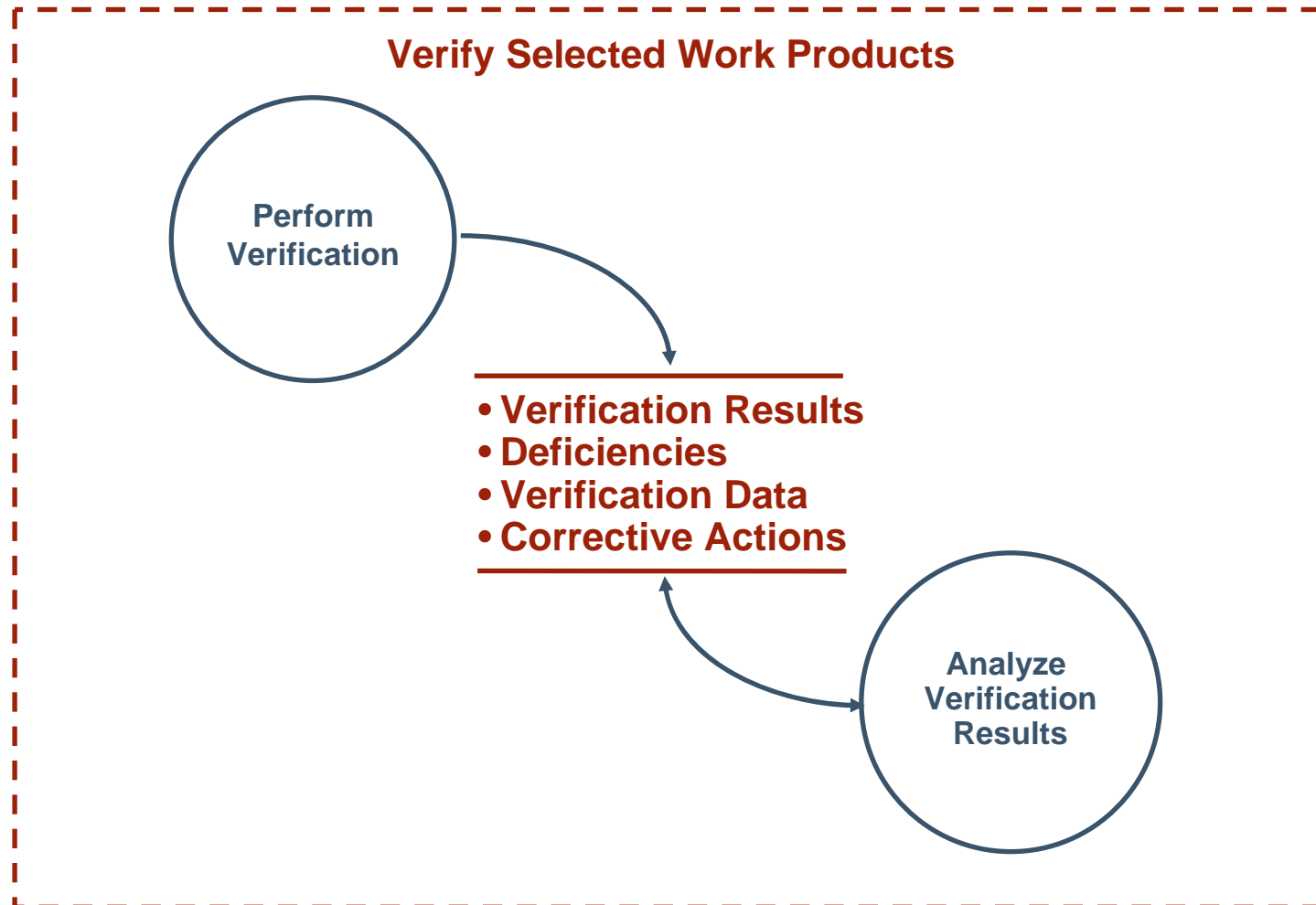


Verification Context -3





Verification Context -4





IPPD Affects All Process Areas

IPPD is a way of doing business.

It is employed in conjunction with other CMMI disciplines (e.g., software and systems engineering).

It shapes how you perform the work in these disciplines.



Relationships Among Process Areas

Some process areas are classified as **basic** and others as **advanced**.

Basic process areas should be implemented before the advanced process areas to ensure that the prerequisites are met to successfully implement the advanced process areas.



Basic and Advanced Groupings

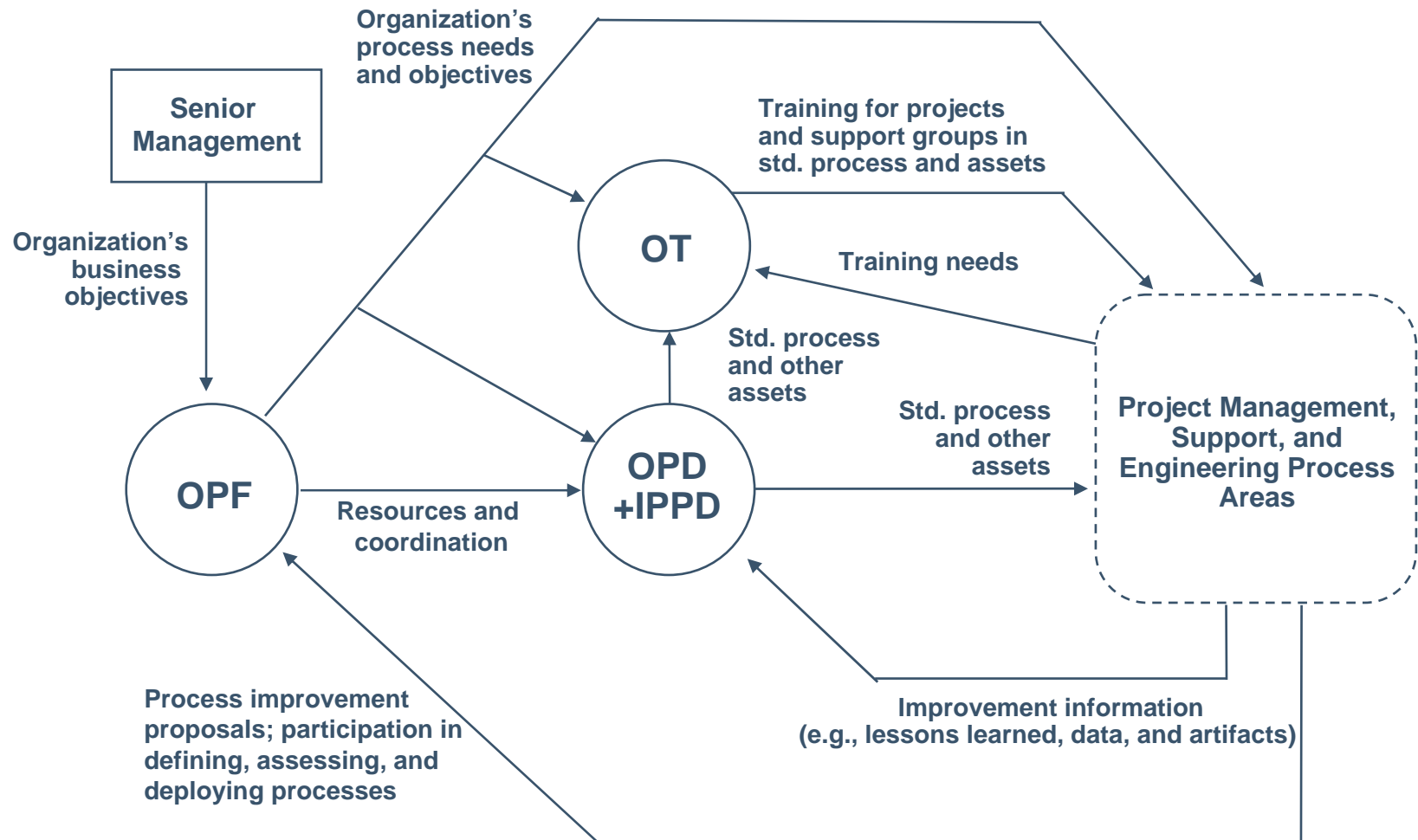
The interactions of PAs can be grouped as follows:

- Basic Process Management (OPF, OPD+IPPD, OT)
- Advanced Process Management (OID, OPP)
- Basic Project Management (PP, PMC, SAM)
- Advanced Project Management (IPM+IPPD, QPM, RSKM)
- Basic Support (PPQA, CM, MA)
- Advanced Support (CAR, DAR)

Note: The Engineering PAs are not organized into Basic and Advanced groupings.

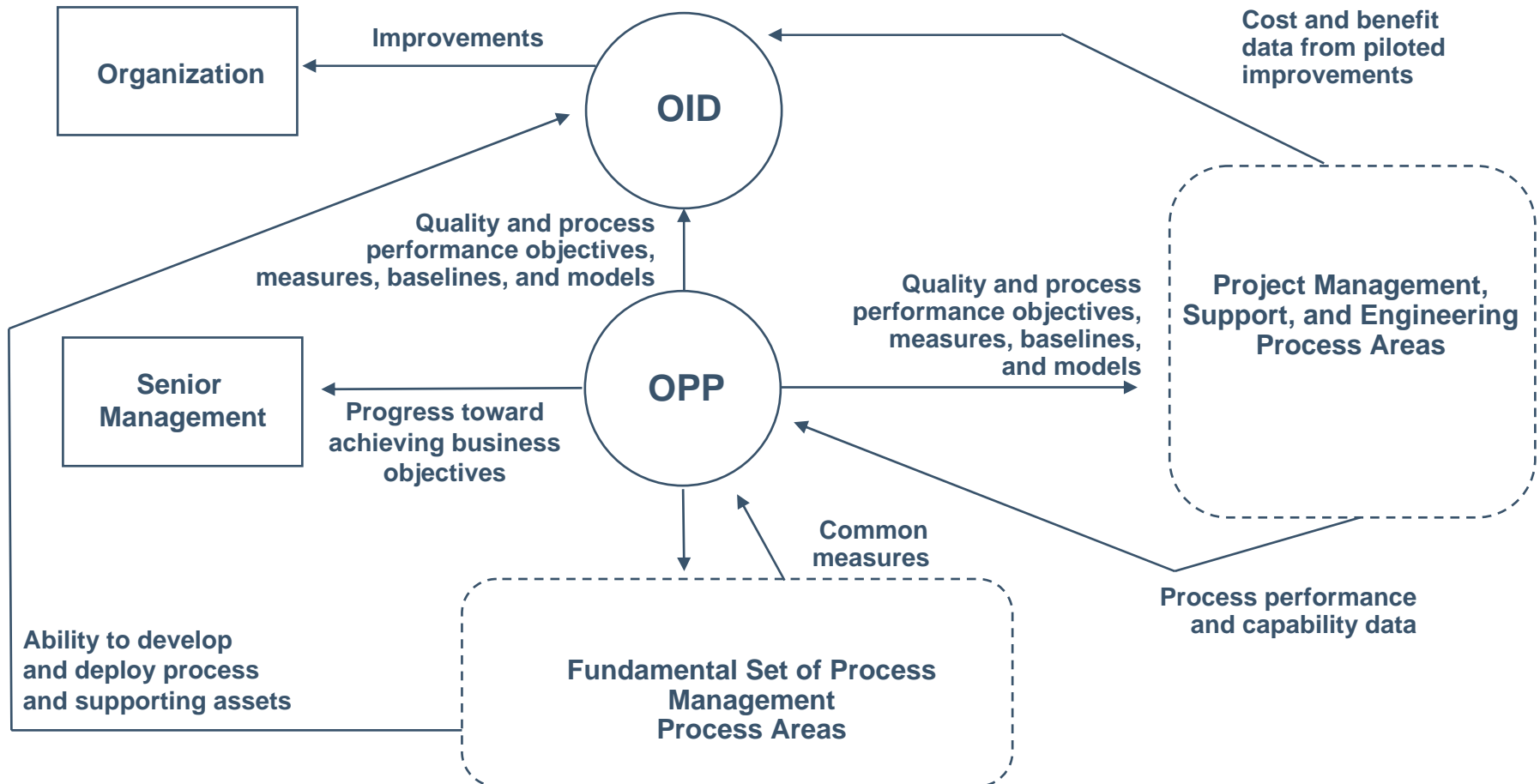


Basic Process Management PAs



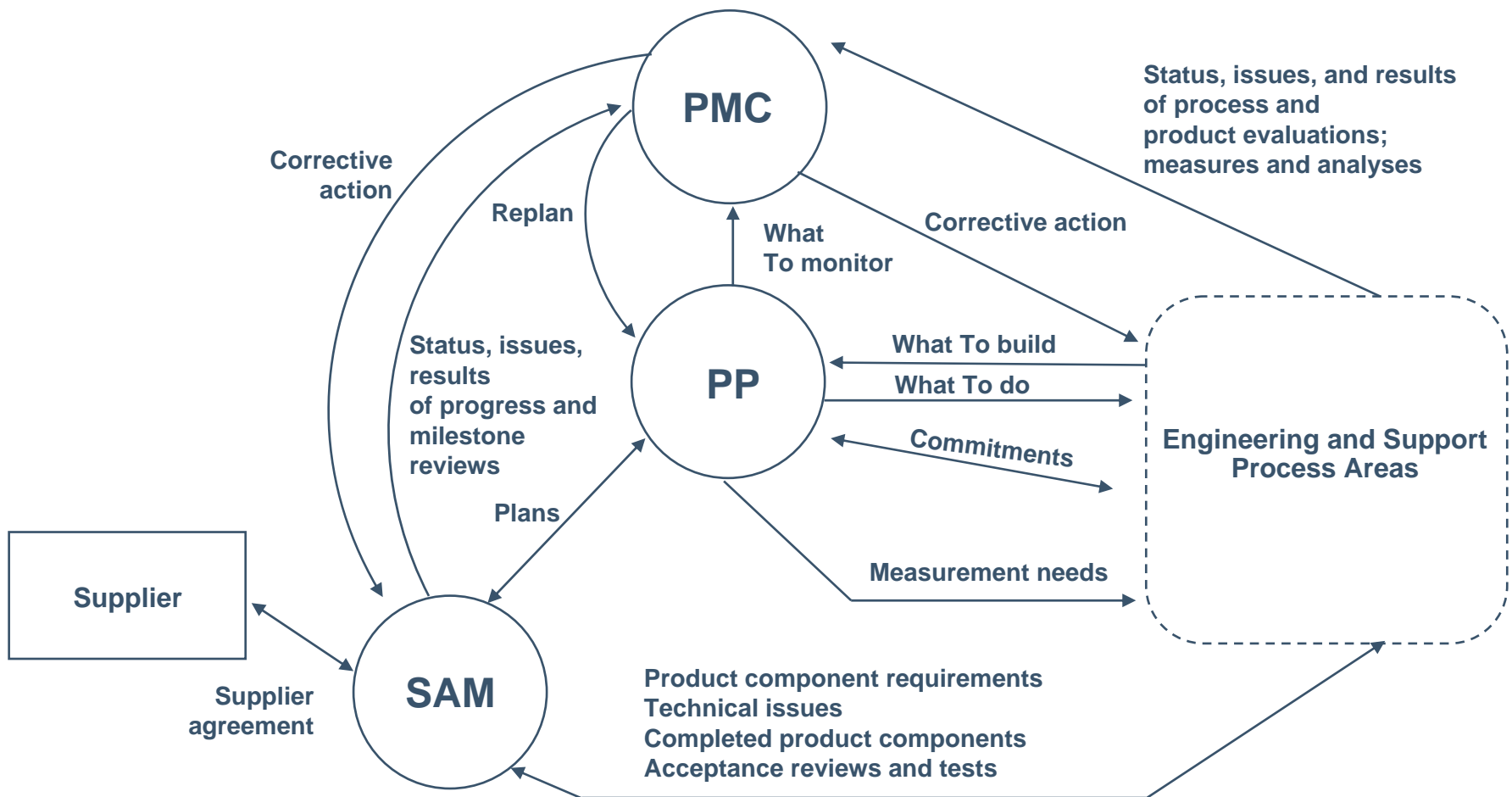


Advanced Process Management PAs



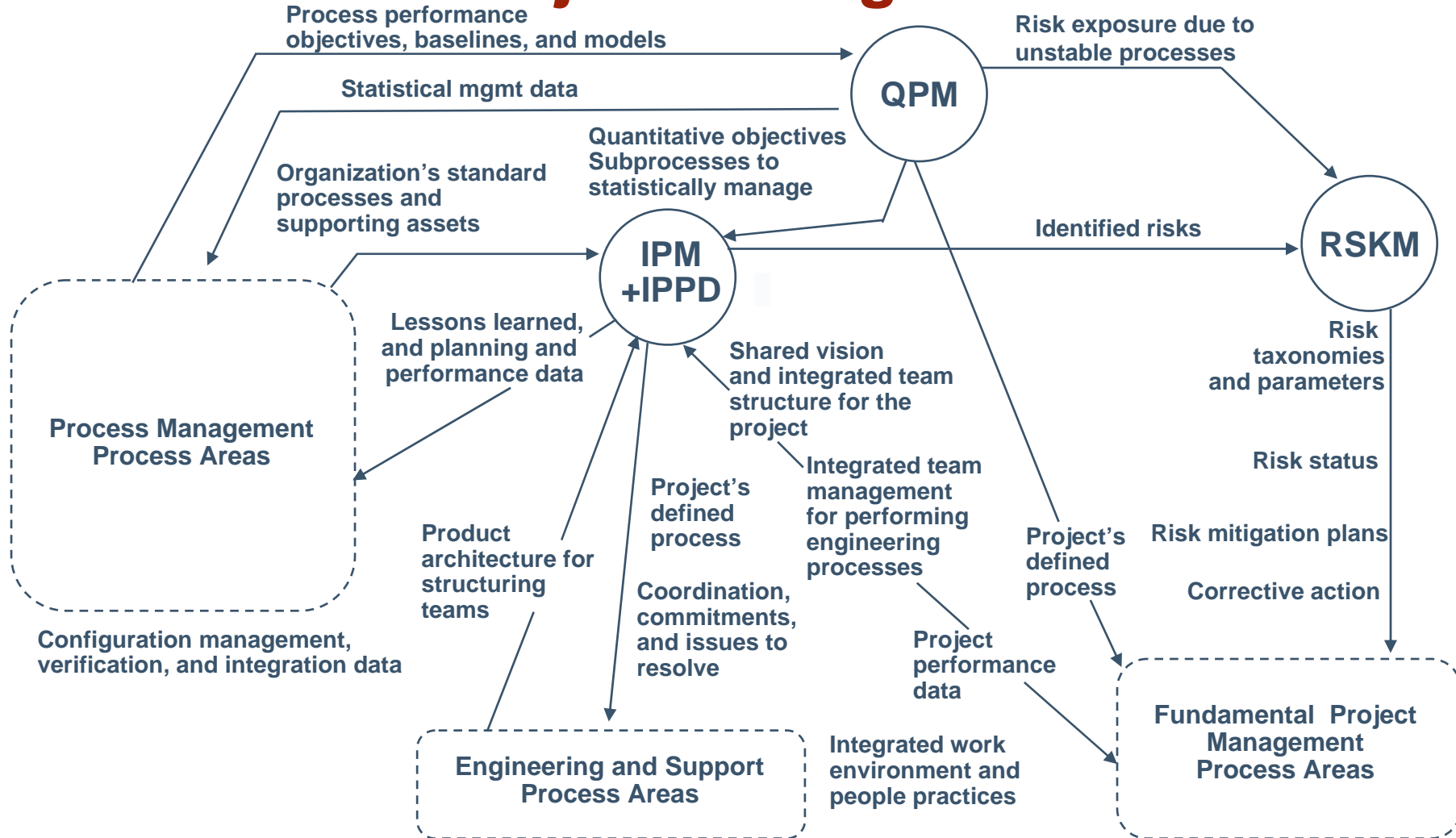


Basic Project Management PAs



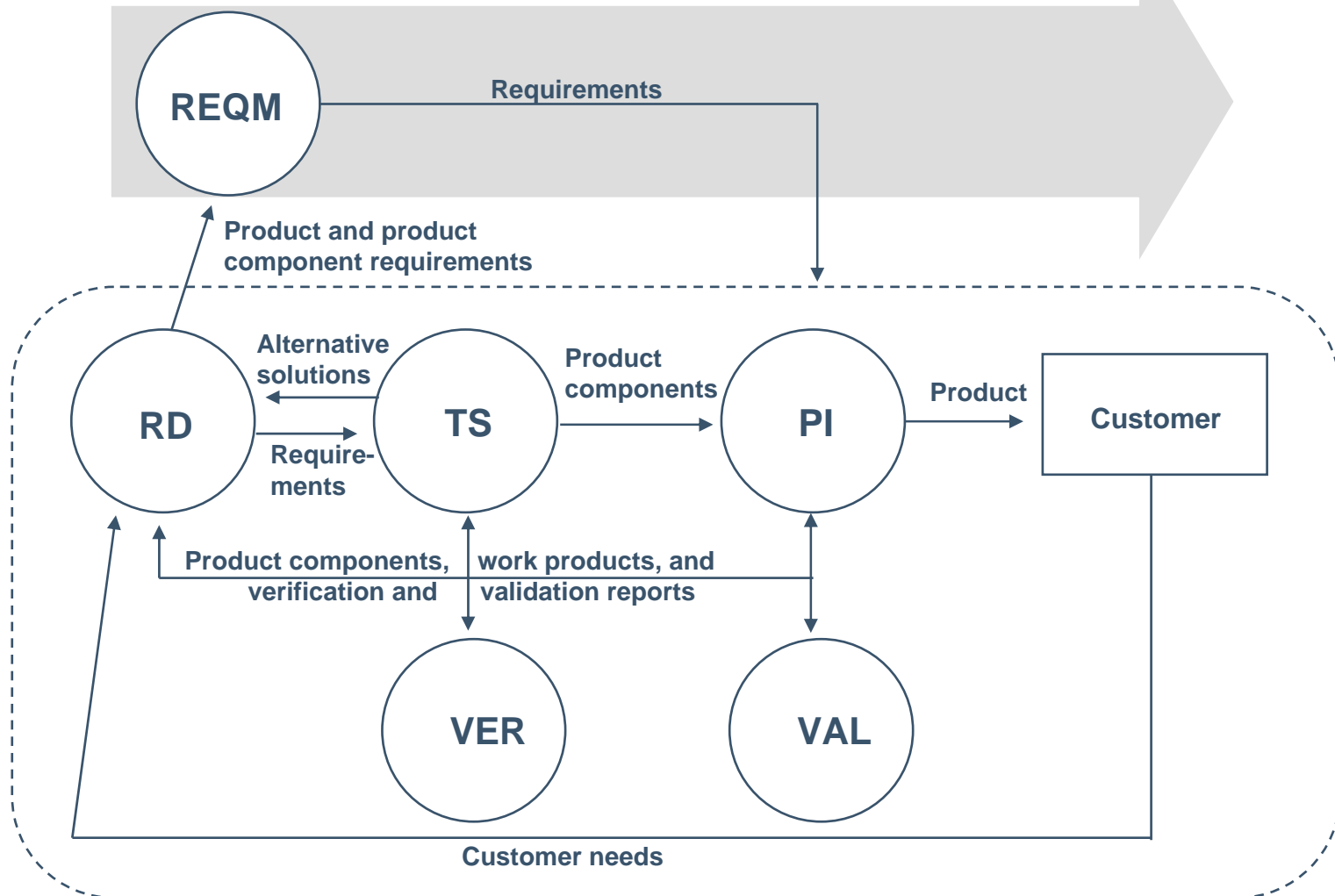


Advanced Project Management PAs



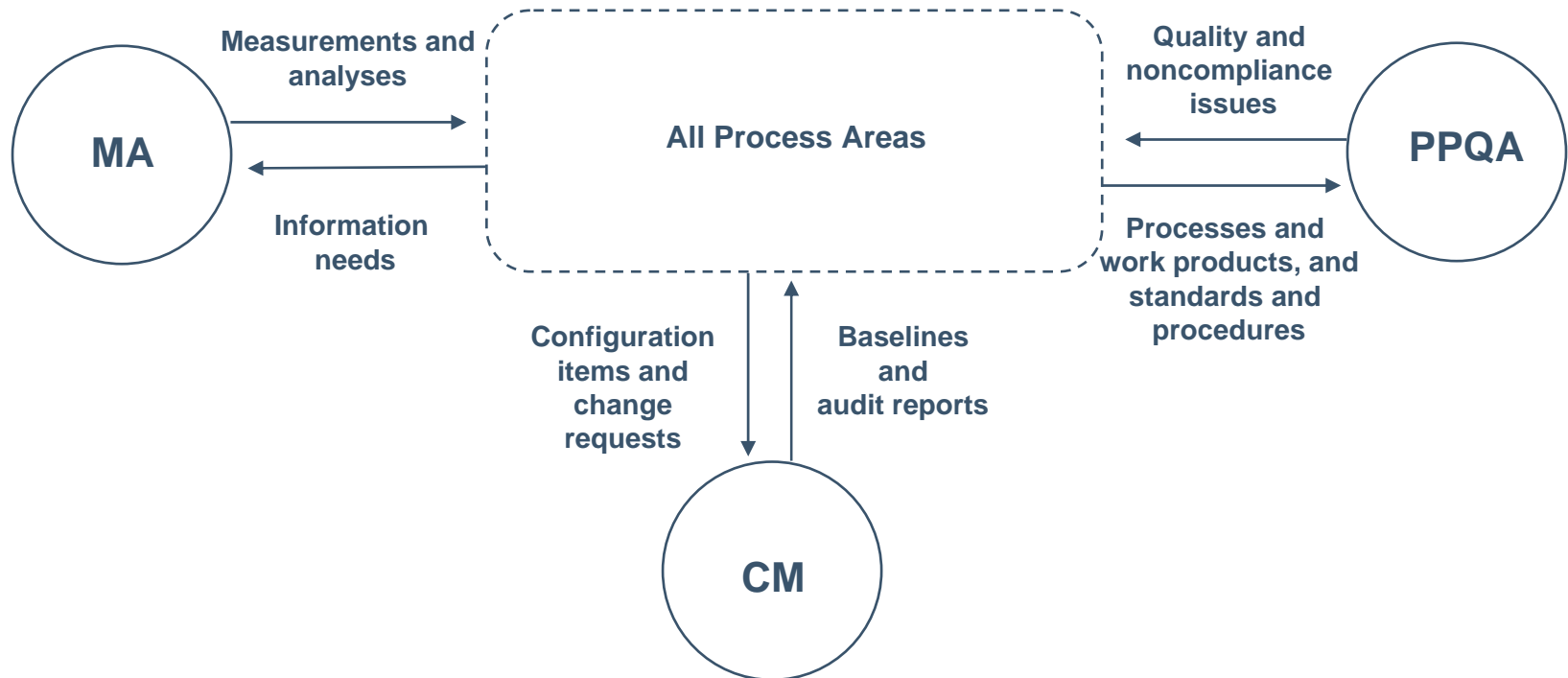


The Engineering Process Areas





Basic Support PAs





Advanced Support PAs





GP to PA Relationships

Some process areas address critical aspects of institutionalization. These process areas provide one or more practices that are typically done for generic practice implementation.

Process areas provide additional details that help with the implementation of a related generic practice.

Generic practices are used to institutionalize a process across the organization.

The generic practice and the associated process area addressed in combination enable an organization to address the institutionalization concept as a whole.



GP-PA Relationships

GP 2.2, GP 2.3, and GP 2.4 to Project Planning

GP 2.5 to Organizational Training and Project Planning

GP 2.6 to Configuration Management

GP 2.7 to Project Planning, Project Monitoring and Control, and Integrated Project Management

GP 2.8 to Measurement and Analysis and Project Monitoring and Control

GP 2.9 to Process and Product Quality Assurance

GP 2.10 to Project Monitoring and Control

GP 3.1 to Organizational Process Definition and Integrated Project Management

GP 3.2 to Organizational Process Focus, Organizational Process Definition, and Integrated Project Management

GP 4.1 to Organizational Process Performance and Quantitative Project Management

GP 4.2 to Organizational Process Performance and Quantitative Project Management

GP 5.1 to Organizational Innovation and Deployment

GP 5.2 to Causal Analysis and Resolution



Do You Need to Understand the Model Better?

Consider establishing discussion groups within your organization. Discuss one process area each week. Through contact, you will develop more familiarity.

- Discuss the practices.
- Look at some of the subpractices.
- Identify processes you currently have.
- Identify processes you currently use.
- Identify work products you currently produce.

Consider enrolling in the Intermediate Concepts of CMMI course offered at the SEI:

<http://www.sei.cmu.edu/products/courses/a02b.html>

Consider joining a Yahoo group devoted to CMMI.



Summary

Knowing the model is just one element of a process improvement initiative.

Process improvement needs to be planned and managed like a project.



For More Information About CMMI

Go to the following CMMI websites:

<http://www.sei.cmu.edu/cmmi/>

<http://www.sei.cmu.edu/cmmi/results.html>

<http://seir.sei.cmu.edu/seir/>

<https://bscw.sei.cmu.edu/pub/bscw.cgi/0/79783>

<http://www.ndia.org> (CMMI Technology Conferences)

<http://seir.sei.cmu.edu/pars> (publicly released SCAMPISM summaries)



Module Review -1

Please list the differences between the staged and continuous representations.

Please define required, expected, and informative components. What model components belong to each group?

How are the process areas ordered in v1.2?

What process areas have a close relationship?

How many process areas are there?

Please list the process areas by maturity level.



Module Review -2

Please list the process areas by process area category.

What two PAs contain IPPD goals?

If an organization chooses not to use IPPD what parts of the model can be ignored?

Where is shared vision addressed?

Where is work environment addressed?

What PA allows QPM to establish quantitative objectives?

What PA establishes process performance models and baselines for the organization?



Module Review -3

Where is integrated teaming addressed?

Where is COTS addressed?

Where is selecting and monitoring supplier processes addressed?

Where are subprocesses selected?

Where is evolving operational concepts and scenarios addressed?

Where are requirements created?

Where is bidirectional traceability addressed?

Please list some PA to GP relationships.



Module Review -4

Please list the basic and advanced process management process areas.

Please list the basic and advanced project management process areas.

Please list the basic and advanced support process areas.



Module Review References -1

Please list the differences between the staged and continuous representations. (slide 12)

Please define required, expected, and informative components. What model components belong to each group? (slides 27-31)

How are the process areas ordered in v1.2? (slide 33)

What process areas have a close relationship? (slides 58, 64, 96, 104, 122, 136)

How many process areas are there? (slide 25)

Please list the process areas by maturity level. (slide 11)



Module Review References -2

Please list the process areas by process area category. (slide 10)

What two PAs contain IPPD goals? (slides 50 and 67)

If an organization chooses not to use IPPD what parts of the model can be ignored? (slides 50-52 and 66-68)

Where is shared vision addressed? (slide 52)

Where is work environment addressed? (slide 65)

What PA allows QPM to establish quantitative objectives? (slide 104)

What PA establishes process performance models and baselines for the organization? (slide 76)



Module Review References -3

Where is integrated teaming addressed? (slide 52)

Where is COTS addressed? (slide 128, See Module 3 also.)

Where is selecting and monitoring supplier processes addressed?
(slide 122)

Where are subprocesses selected? (slides 78 and 104)

Where is establishing operational concepts and scenarios
addressed? (slide 111)

Where are requirements created? (slide 108)

Where is bidirectional traceability addressed? (slide 114)

Please list some PA to GP relationships. (slide 153)



Module Review References -4

Please list the basic and advanced process management process areas. (slides 144, 145 and 146)

Please list the basic and advanced project management process areas. (slides 144, 147 and 148)

Please list the basic and advanced support process areas. (slides 144, 150 and 151)