# Think about: What Product/SW Development Needs?

Establishing and maintaining sets of requirements

- customer requirements
- product requirements
- product component requirements
- managing the requirements as the product evolves

# CMMI – общо

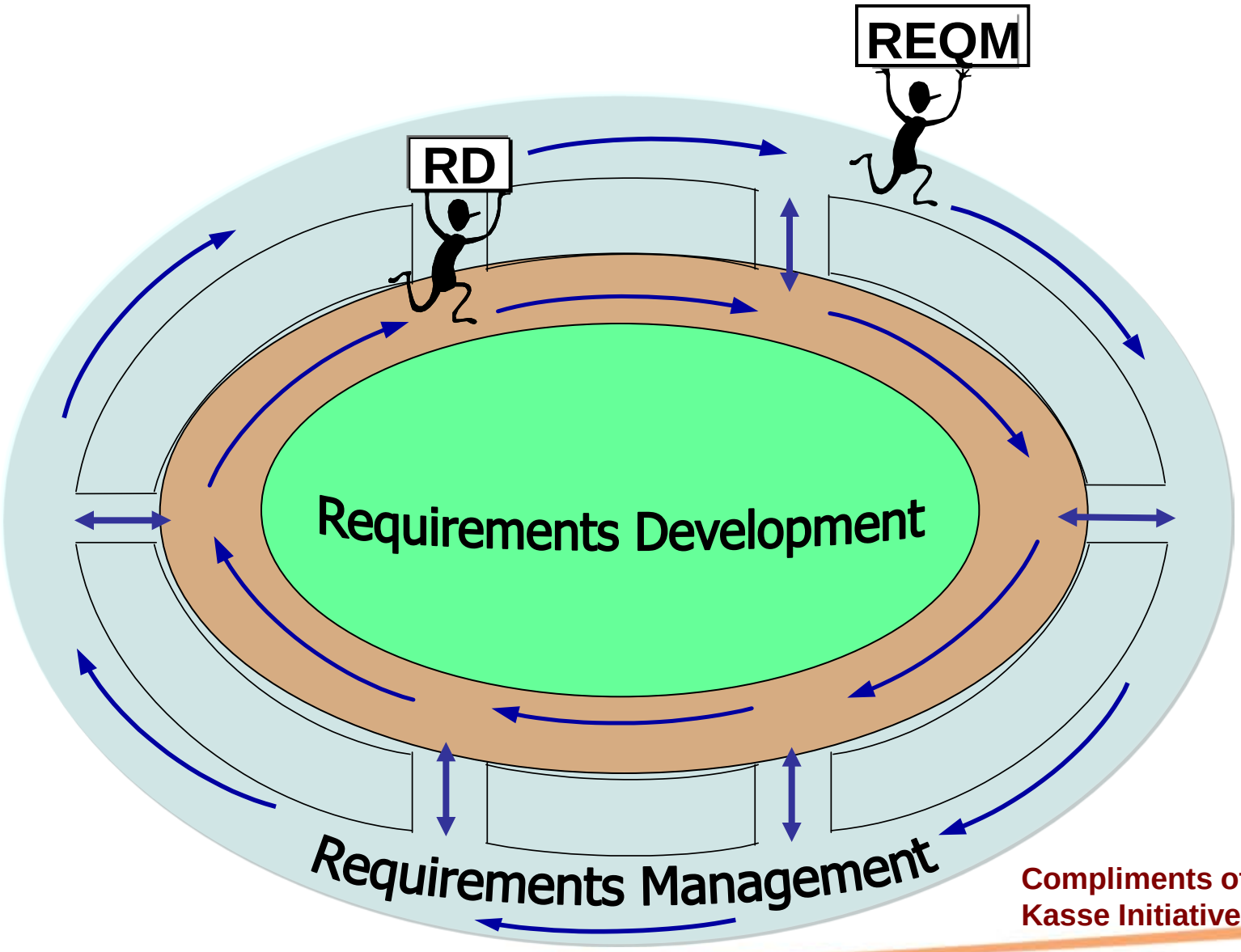
Процесни области, от които използваме различни специфични практики (и цели)

В детайли използваме:
RD (ML3) - ….
REQM (ML2) - …..
PP (ML2) - ??? частично
Елементи от свързани ПО:
VAL (….) – техники за валидиране на изискванията
TS – за решението

# ML3: Requirements Development

The purpose of Requirements Development (RD) is to produce and analyze customer, product, and product component requirements.

# Requirements Management and Requirements Development

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# Importance of Requirements Development

Present complete **clear validated** requirements **understood by all parties**

Establish solid **foundation** for downstream activities

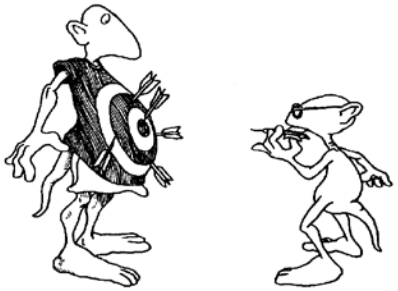
# Benefits of Proper Requirements Development

Development team and customer share the same vision of what is to be developed, tested and supported

Requirements are easily traceable to/from downstream work products

Acceptance by customer of downstream products is easy & swift

Low risk of increased costs to meet customer needs and expectations



# Specific goals of RD

## 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.*

# 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 Requirement** - 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. (See also “product requirements.”)

# Terminology II

**Customer Requirement** - The result of eliciting, consolidating, and resolving conflicts among the needs, expectations, constraints, and interfaces of the product's relevant stakeholders in a way that is acceptable to the customer. (See also “customer.”)

**Product Requirement** - A refinement of the customer requirements into the developers’ language, making implicit requirements into explicit derived requirements. (See also “derived requirements” and “product component requirements.”) The developer uses the product requirements to guide the design and building of the product.

**Product Component Requirements** - A complete specification of a product component, including fit, form, function, performance, and any other requirement.

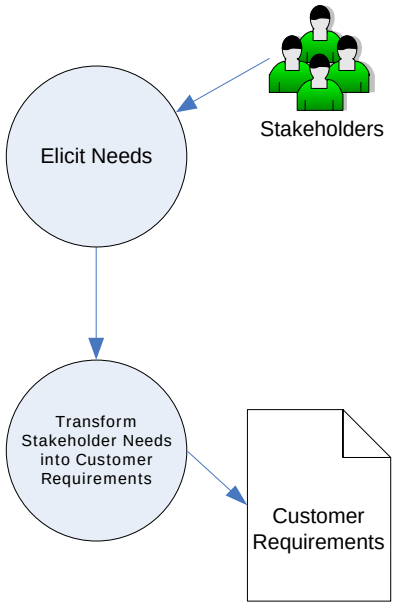
# SG 1 Develop Customer Requirements

## SP 1.1 Elicit Needs

*Elicit stakeholder needs, expectations, constraints, and interfaces for all phases of the product lifecycle.*

## SP 1.2 Transform Stakeholder Needs into Customer Requirements

*Transform stakeholder needs, expectations, constraints, and interfaces into customer requirements.*



# SG 2 Develop Product Requirements

**SP 2.1 Establish Product and Product Component Requirements**

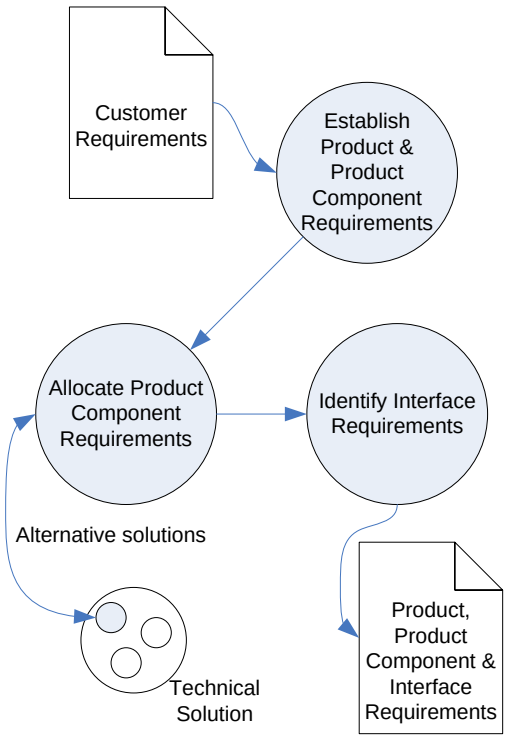
*Establish and maintain product and product component requirements, which are based on the customer requirements.*

**SP 2.2 Allocate Product Component Requirements**

*Allocate the requirements for each product component.*

**SP 2.3 Identify Interface Requirements**

*Identify interface requirements.*



# SG 3 Analyze and Validate Requirements

**SP 3.1 Establish Operational Concepts and Scenarios**

*Establish and maintain operational concepts and associated scenarios.*

**SP 3.2 Establish a Definition of Required Functionality**

*Establish and maintain a definition of required functionality.*

**SP 3.3 Analyze Requirements**

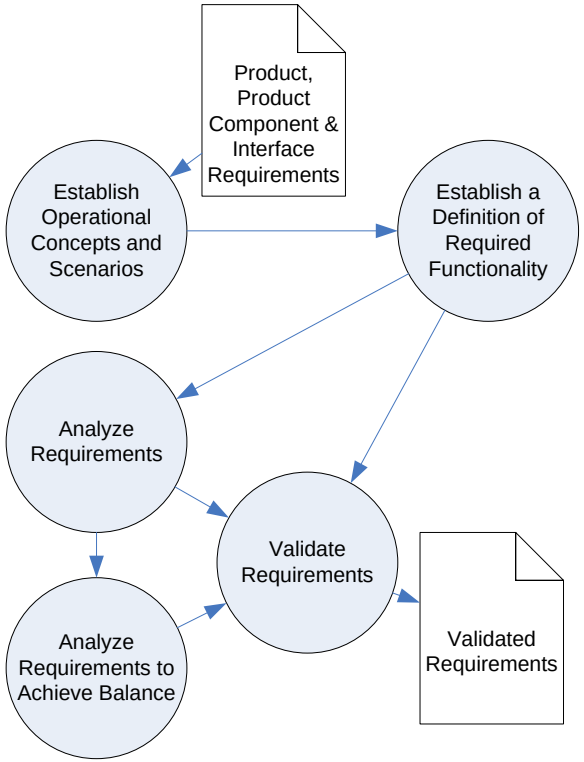
*Analyze requirements to ensure that they are necessary and sufficient. >> REQM SP 1.1, 1.2*

**SP 3.4 Analyze Requirements to Achieve Balance**

*Analyze requirements to balance stakeholder needs and constraints.*

**SP 3.5 Validate Requirements**

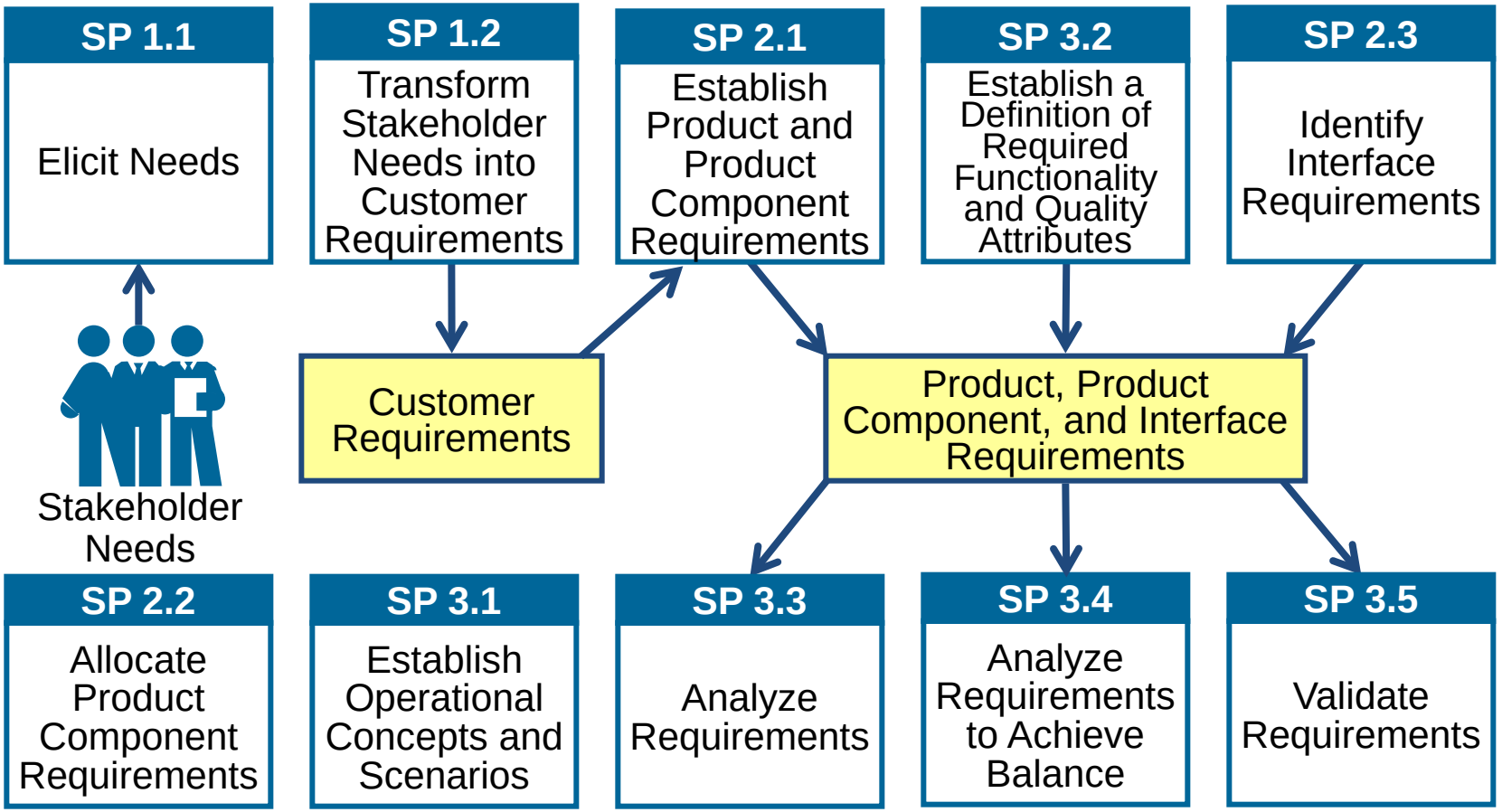
*Validate requirements to ensure the resulting product will perform as intended in the user's environment.*




***>>>> REQ M SP 1.3 (Manage changes)***

*<<<< VAL (ML3)*

# Requirements Development
# Sampling of Work Products



# How Requirements Development interacts with other Process Areas

Who does RD depend upon?

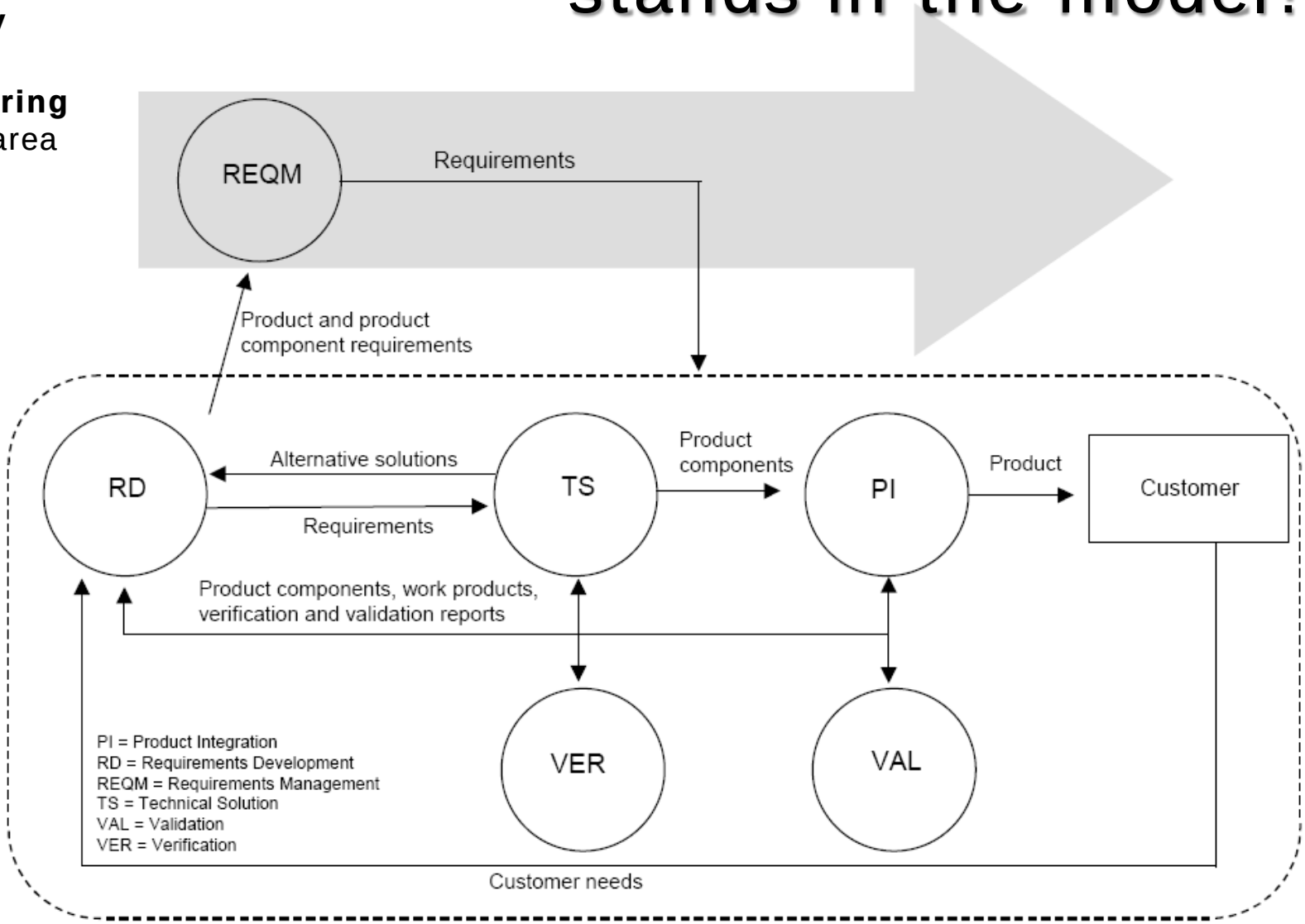
- Requirements Management (ML2:REQM) for managing requirements
- Technical Solution (ML3:TS) for development of alternative solutions and identification of product components
- Risk Management (ML3:RSKM) for identification and management of requirements risks

Who depends on RD?

- Requirements Management (ML2:REQM) takes requirements from RD
- Product Integration (ML3:PI) takes interface requirements
- Verification & Validation (ML3: VER & VAL)

# Where Requirements Development stands in the model?

- **Maturity level 3**
- **Engineering** process area



# Verification Versus Validation

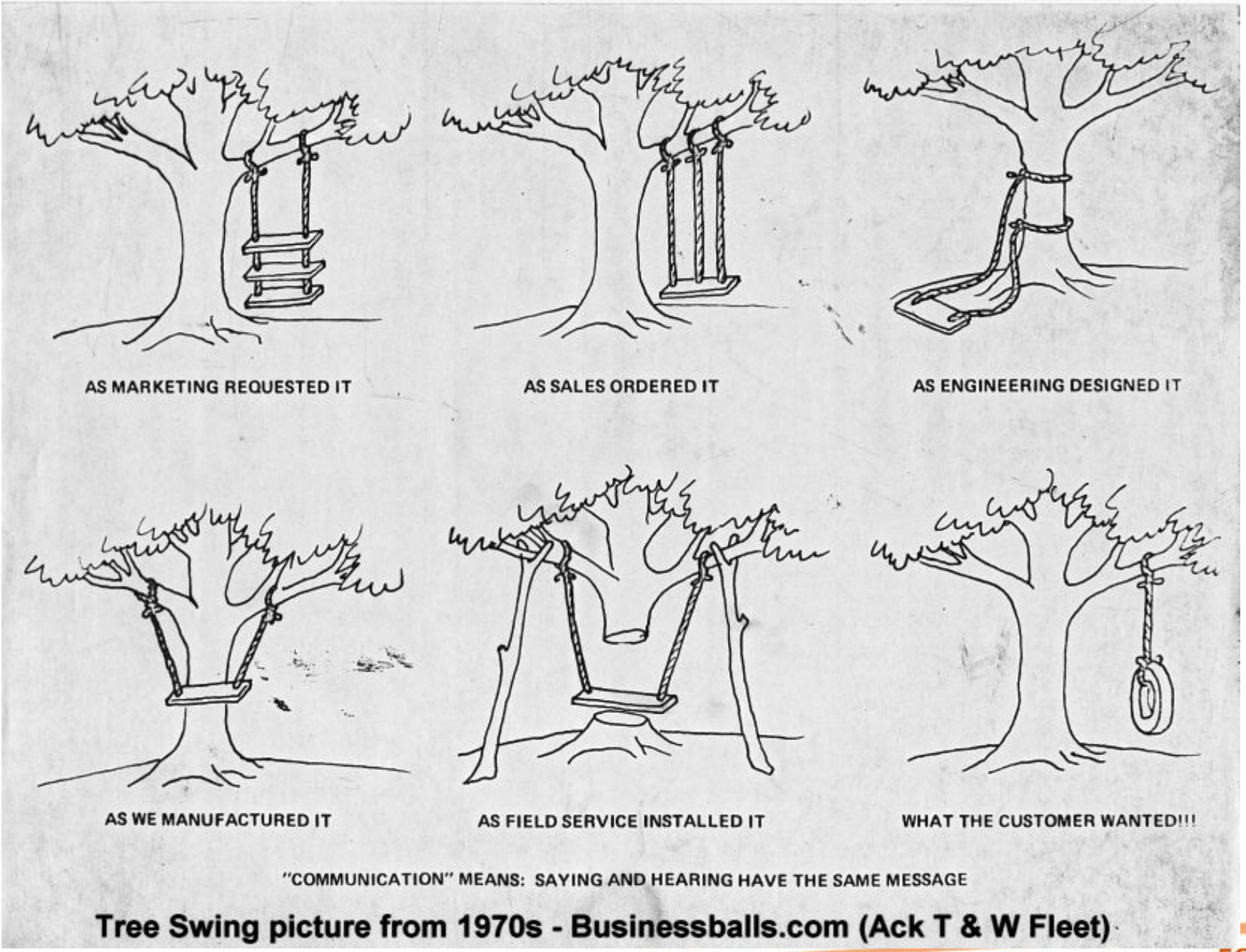
Verification (ML3:VER)

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

Validation (ML3:VAL)

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

Both are applicable throughout the product development lifecycle.




**Tree Swing picture from 1970s - Businessballs.com (Ack T & W Fleet)**

# ML3: Validation (VAL)

## Purpose

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

# When Validation Is Not Done Well...

There are **arguments** among the technical staff as to **what the user really wants**.

The released product **does not meet user expectations**.

**Customers do not pay** for products that do not meet their needs.

**End users refuse** to use the product as delivered.

# Validation Goals

## SG 1: Prepare for Validation

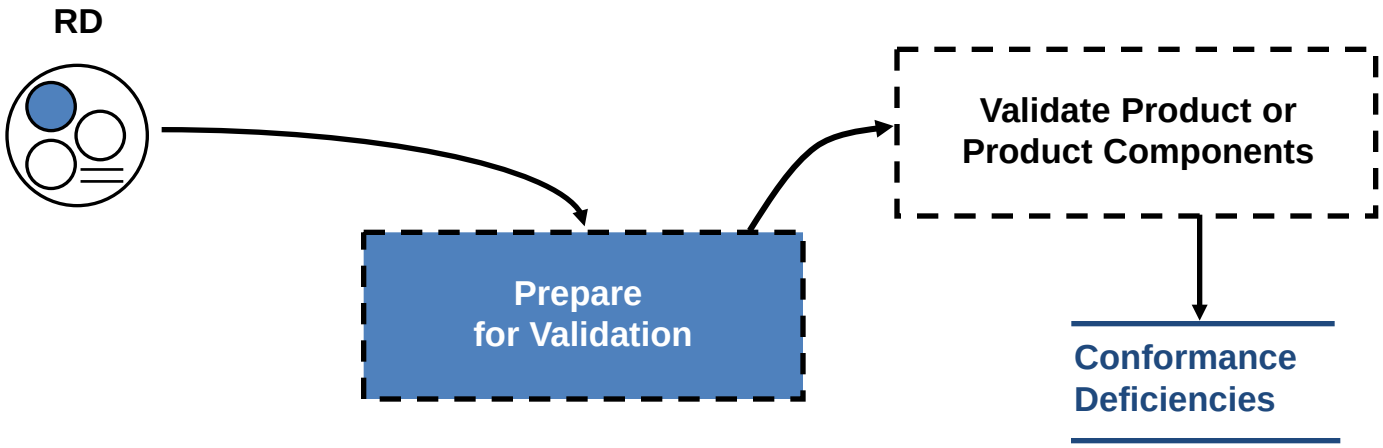
Preparation for validation is conducted.

## SG 2: Validate Product or Product Components

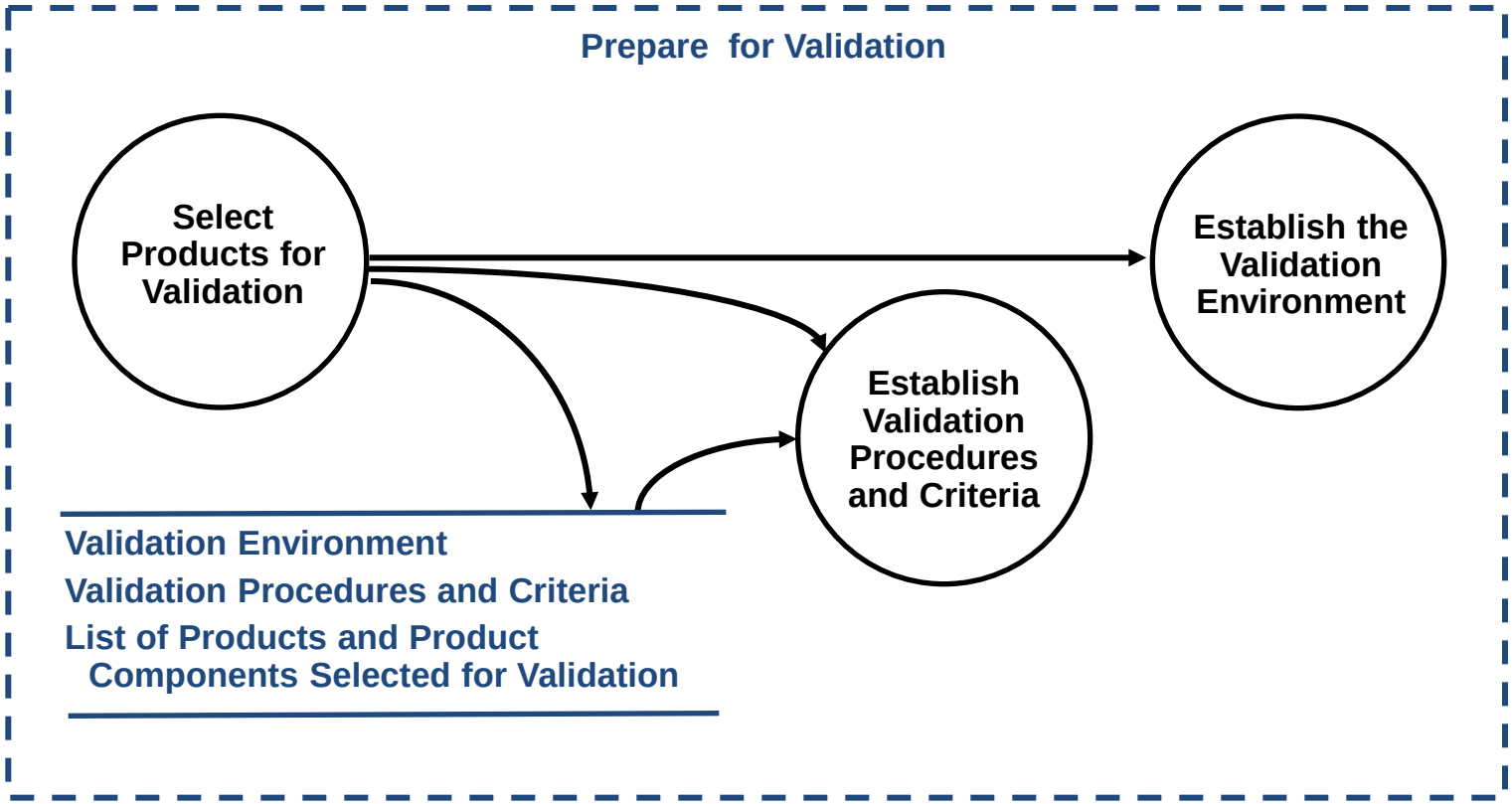
The product or product components are validated to ensure that they are suitable for use in their intended operating environment.

The process area also has generic goals to support institutionalization.

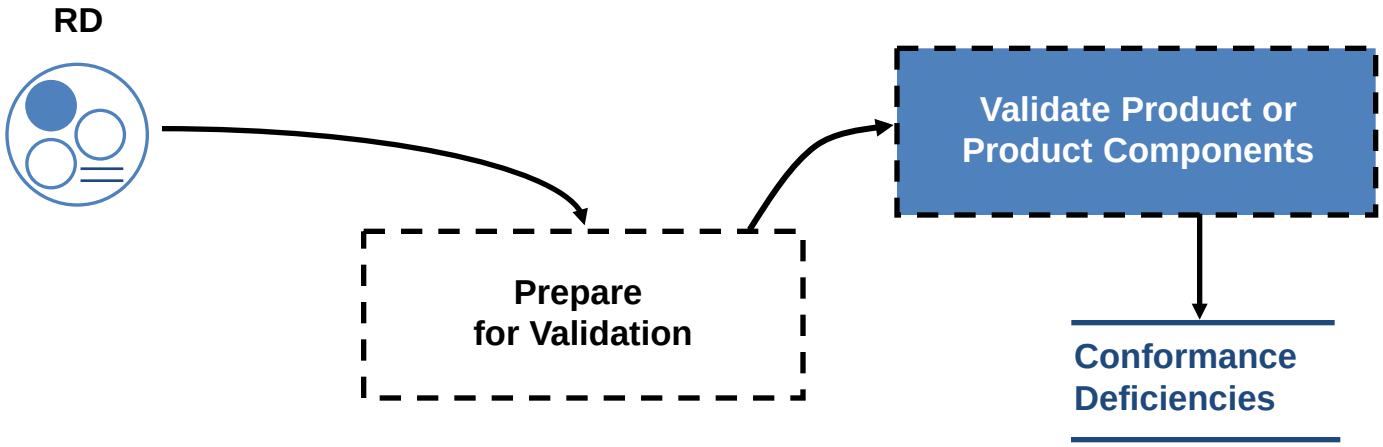
# Validation Context -1



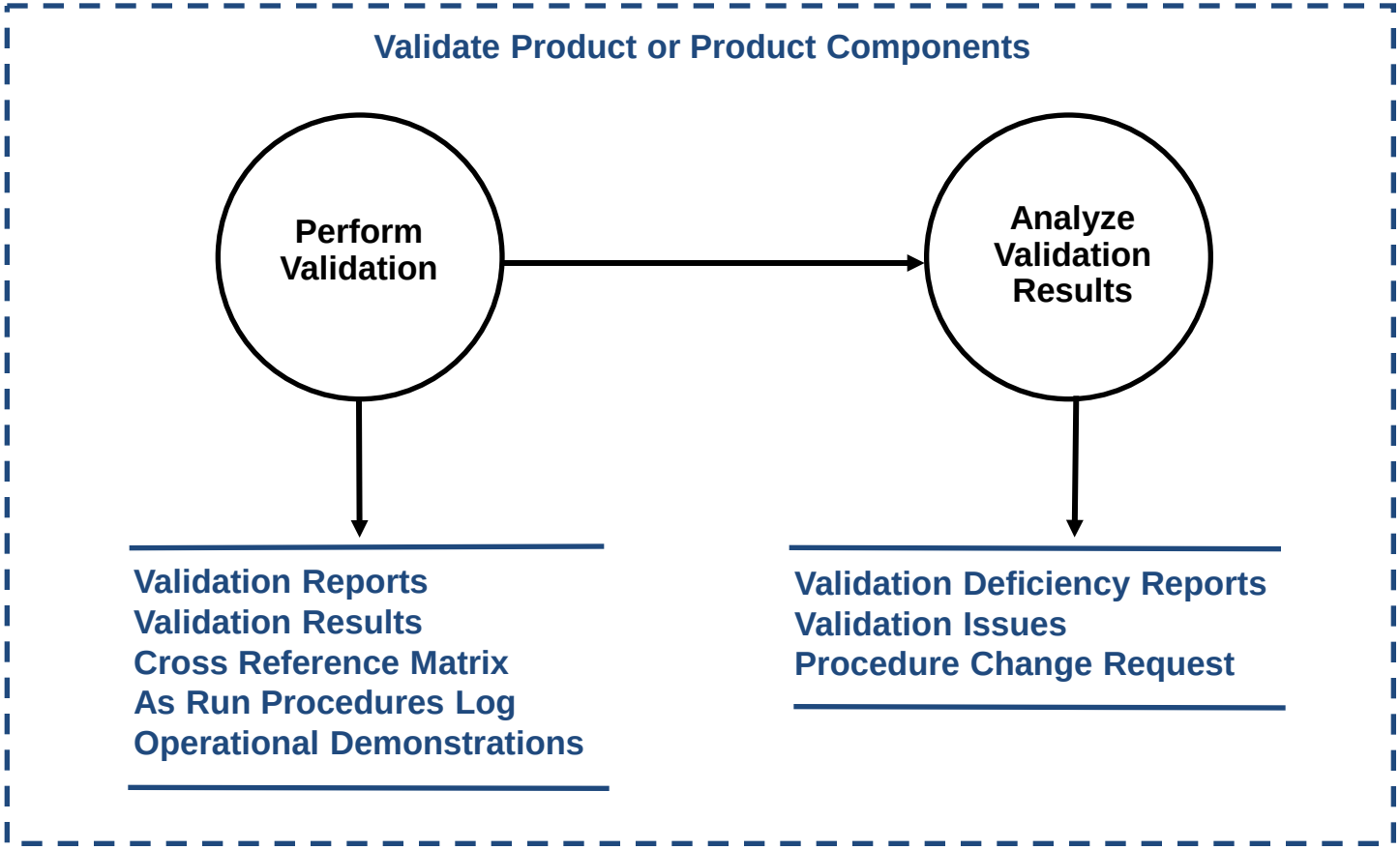
# Validation Context -2



# Validation Context -3



# Validation Context -4



# Requirements Management (REQM)

*The purpose of Requirements Management (REQM) is to **manage the requirements** of the project's products and product components and to identify inconsistencies between those requirements and the project's plans and work products.*


SG1: 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.*

# When Requirements Management Is Not Done Well...

Requirements are accepted by staff from **any source** they deem to be authoritative.

The project experiences a high level of **requirements changes**.

There are high levels **of rework** throughout the project.

There is an inability to prove that the **product meets the approved requirements**.

Lack of requirements traceability often results **in incomplete or incorrect testing** of the product.

# 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 (REQM) Specific Practices

SP 1.1 Obtain an **Understanding** of Requirements

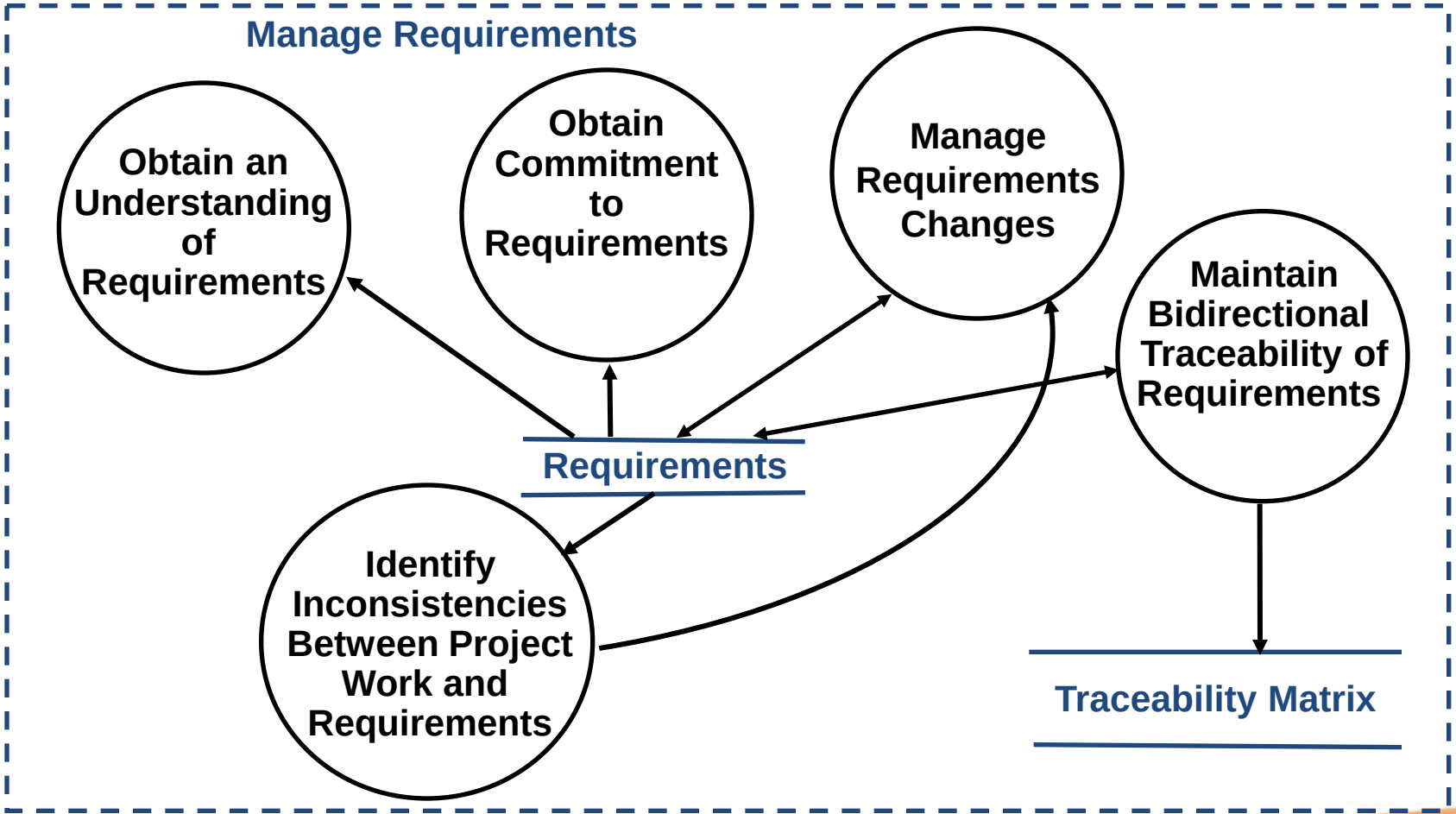
SP 1.2 Obtain **Commitment** to Requirements

SP 1.3 Manage Requirements **Changes**

SP 1.4 Maintain **Bidirectional Traceability** of Requirements

SP 1.5 **Identify Inconsistencies** between project work and requirements

# Requirements Management Context



# REQM Practices implementation:

- Acceptance criteria in place?
- Requirements comply to criteria?
- Is understanding reached and is it documented? How?
- Who are the relevant stakeholders?
- Did they agree to requirements?
- Is the commitment documented? How?
- All requirements and their changes documented?
- Requirements change history and rationale documented?
- Are changes evaluated by affected stake holders?
- Bi-directional traceability among the requirements and the project plans and work products maintained?
- Are the project plan/activities/work products reviewed to assess the consistency with the (changed) requirements?
- If inconsistencies have been are corrective actions initiated to solve them?