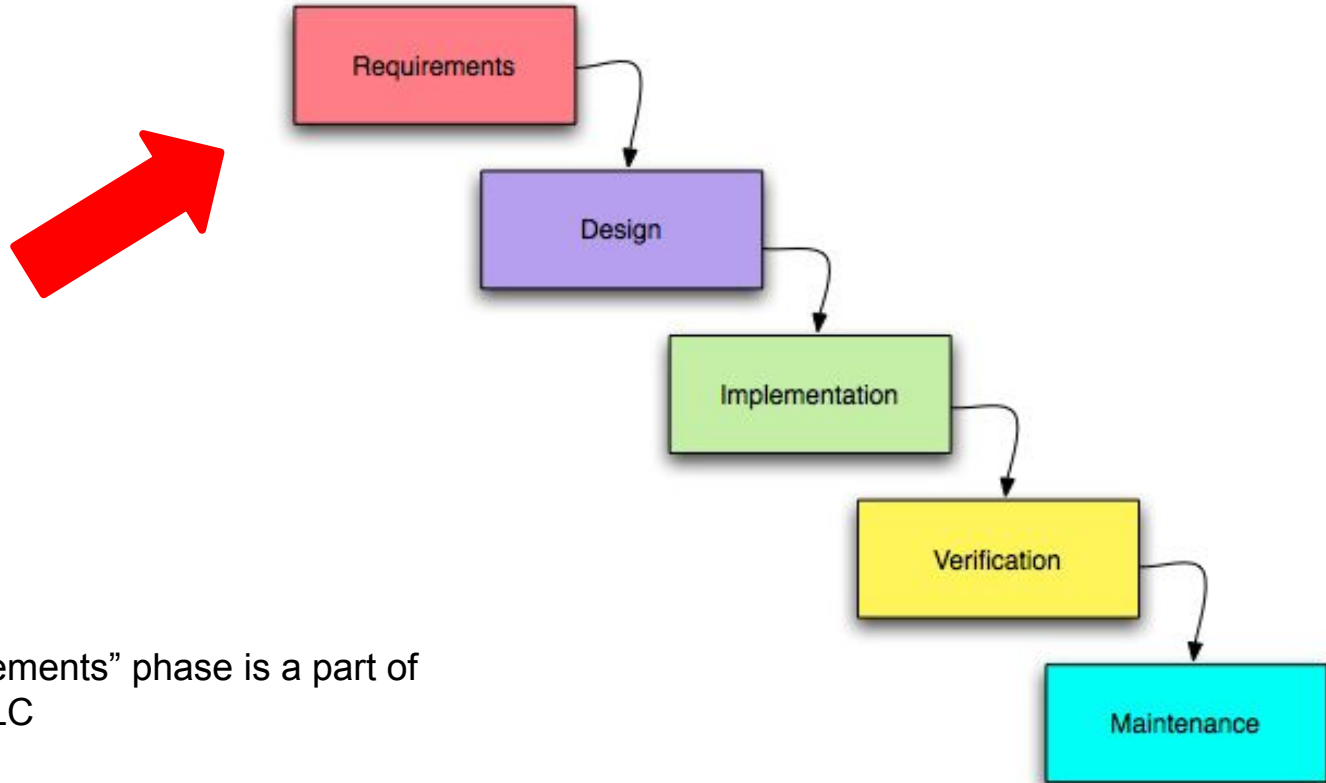


# Requirements

# SDLC - Waterfall



- “Requirements” phase is a part of any SDLC

# Terminology

- “Requirements”
- “Requirements analysis”
- “Requirements engineering”
- “Analysis” only (if the context is clear)

Informally also

- “IT business analysis” (often overlapping with “business analysis”)

# Why requirements engineering?

## Requirement

- A function, constraint or other property that the system must provide to fill the stakeholder needs

## Engineering

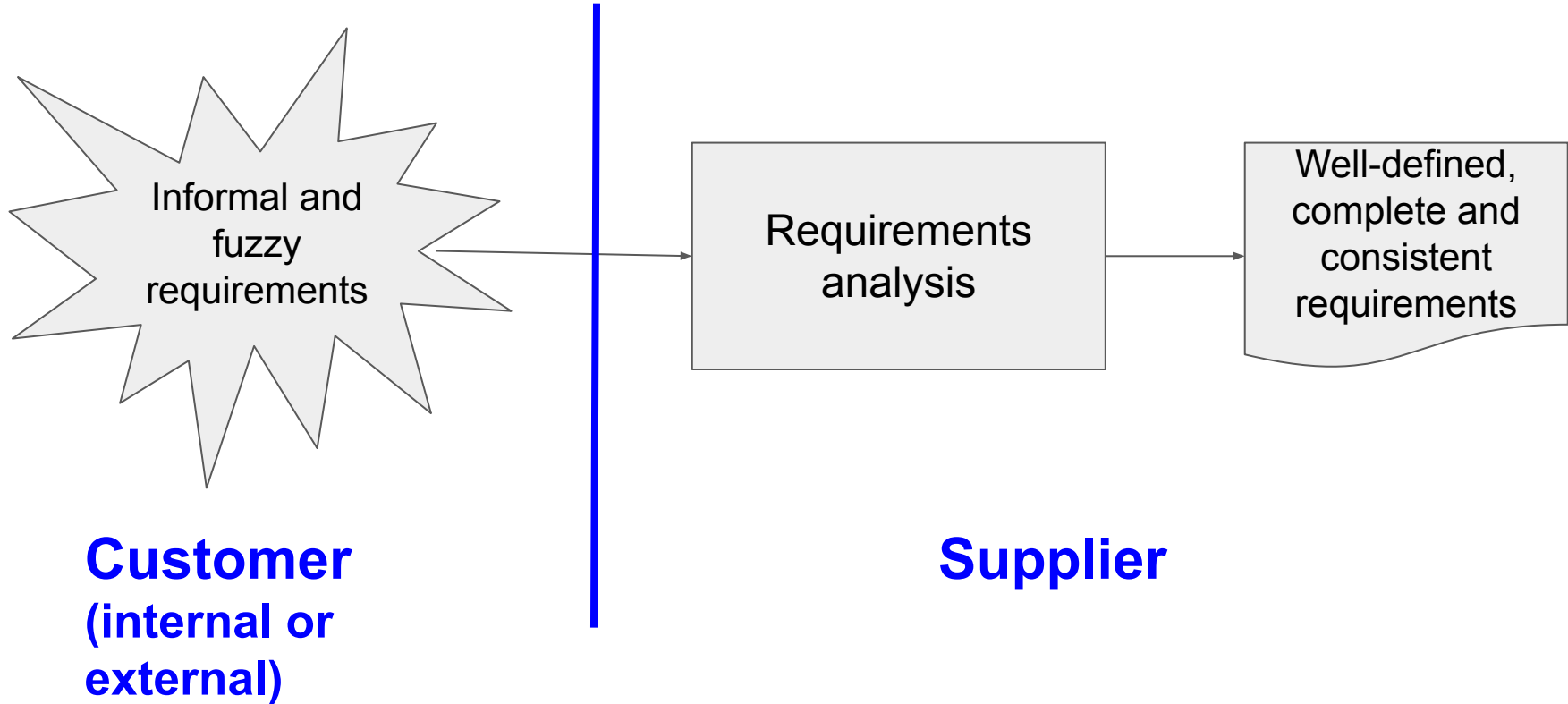
- Implies that a systematic and repeatable techniques should be used

## Requirements engineering

- The systematic process which covers all of the activities involved in discovering, documenting, and maintaining a set of requirements for a computer-based system

○

# Big picture



# Why are requirements important?

**75% of all IT projects fail** due to errors in the set-up phase. According to the study, the most common reasons for the failure of IT projects are **unclear or inadequate requirements**, incorrect time and budget planning, and inadequate communication between project participants.

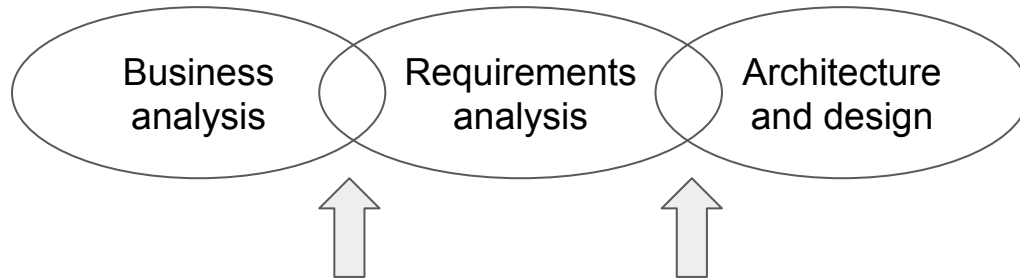
*BITKOM e.V. (Germany digital association), 2021*

# Requirements vs other phases

Requirements define **WHAT** the system should do

- not **WHY** it should be developed
- not **HOW** it should do it

In practice, “requirements” phase **overlaps** with neighboring phases:

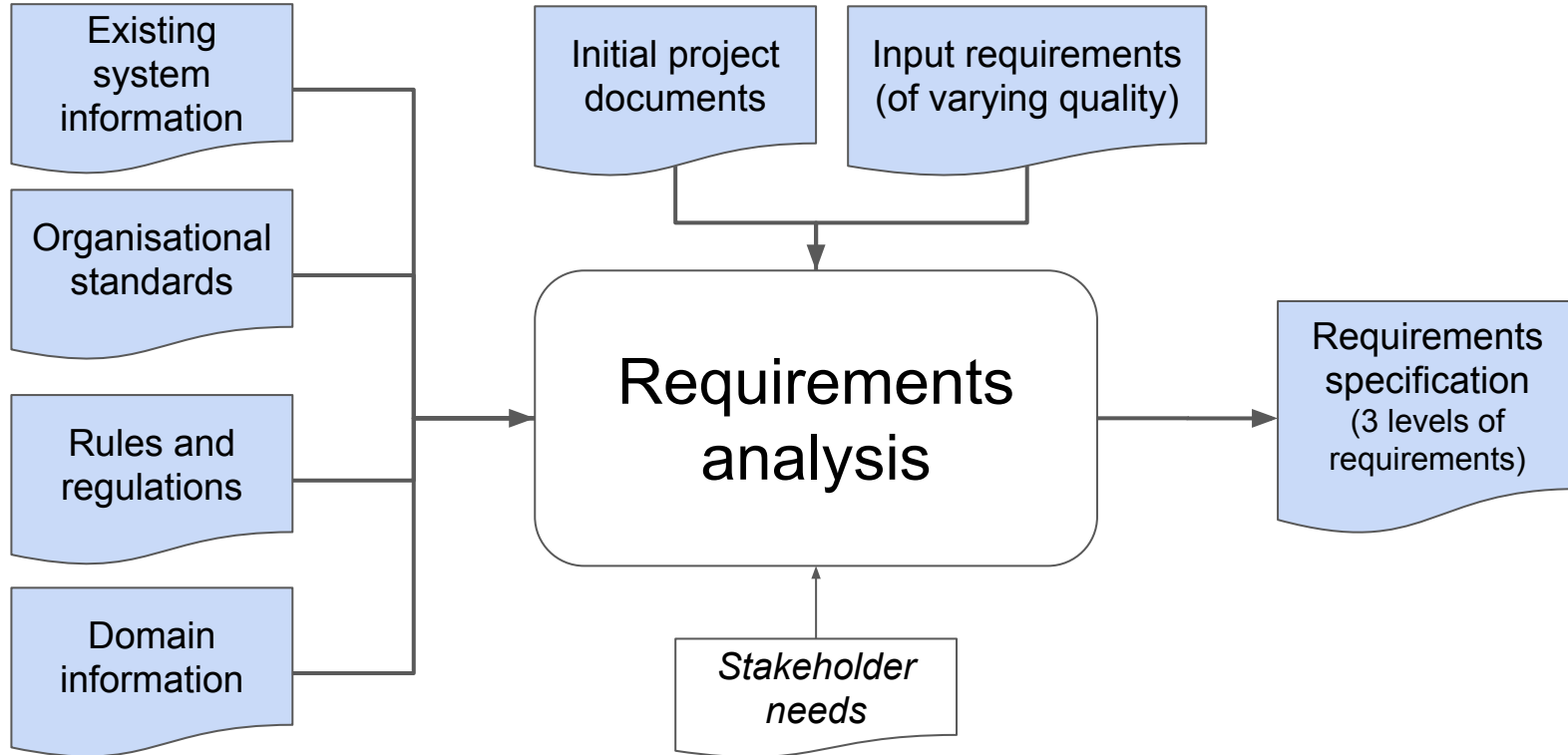


Business  
requirements

Examples:

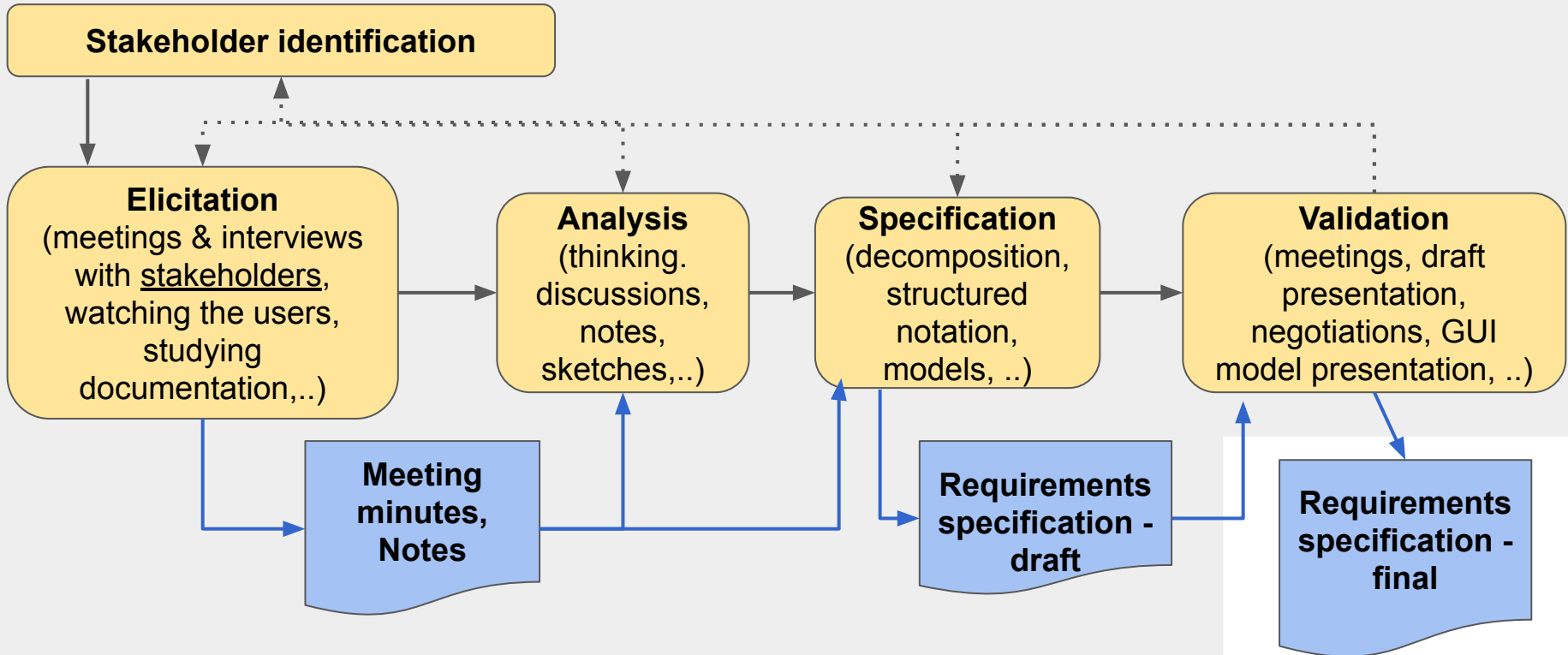
- GUI design as a part of requirements specification
- Using system architecture to structure requirements

# Requirements analysis - inputs and outputs





# Requirements analysis - how it works inside



# Stakeholder identification

**Stakeholder:** an individual, group or organization who may affect or be affected by the result of the project

## Principles

- To identify stakeholders as soon as possible
  - Various stakeholders in various domains / companies / environments
  - Checklists exist for IT projects
  - Include project team members
- To identify specific representatives
  - We need to communicate with real people
- Some stakeholders are discovered later
  - We do our best to make “later” as soon as possible
  - Rework may be needed
- Business stakeholders vs technological (IT) stakeholders

# Stakeholder examples

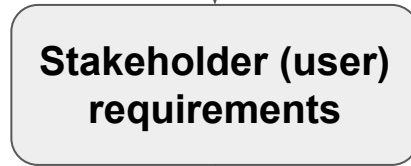
- Company management / various levels
- Project team members
  - Project manager, Analysts, UX designers, Architects, Developers, Testers, Document writers, ...
- Project customer
- Product users (may be represented by product manager)
- Other teams
  - Sales representative, Marketing representative, Legal dept. representative, IT support, IT operations, ....

**Project owner:** bears business responsibility for successful project implementation. Typically head of the business unit receiving the product.

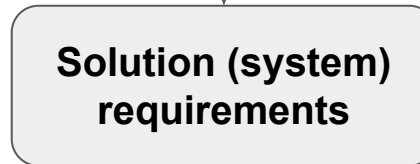
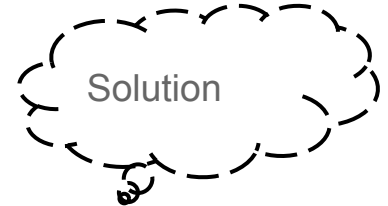
# Three levels of requirements



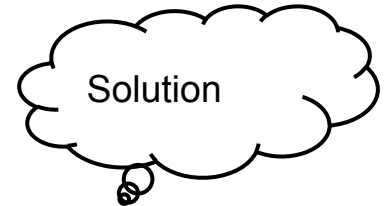
These do not describe the solution sufficiently



Even these do not describe the solution sufficiently



These describe the solution quite well (we still abstract from the architecture & design)



# Three levels of requirements

## Business requirements

- Describe high-level objectives of the organization itself
- Written for management (but also basis for next phases)

## Stakeholder (user) requirements

- Describe stakeholder/user needs
- Statements in natural language plus diagrams
- Written for stakeholders (but also input for next steps)

## Solution (system) requirements

- Describe system's functions, services and operational constraints in detail
- Technical language, diagrams, models
- Basis for designing the system
- May be incorporated into contract

### Business Analysis vs. Requirements Analysis

- These two activities overlap especially at the level of business requirements
- Ideally, business requirements should be provided as a business analysis output.

# Example

## **Business**

BR1: Reduce incorrectly processed orders by 50% by the end of next quarter

BR2: increase repeat orders from customer by 10% within six months after deployment

## **Stakeholder (user)**

SR1: Create new user account.

SR2: View order history.

SR3: Check order status.

SR4: Create new order.

## **Solution (system)**

FR1: Create new user account with the following attributes: e-mail address, first name, last name, address line 1, address line 2, city, postal code, phone number, password, timestamp.

FR2: Log in into an existing account using an e-mail address and a password.

...

NFR1: Require passwords of at least 8 characters in length containing a minimum of one non-alphabet character.

NFR2: Must run on all Java platforms including 64-bit versions

...

# Types of solution (system) requirements

## Functional requirements

- Describes **services (functions)** the system should provide, how the system should react to particular inputs and how the system should behave in particular situations

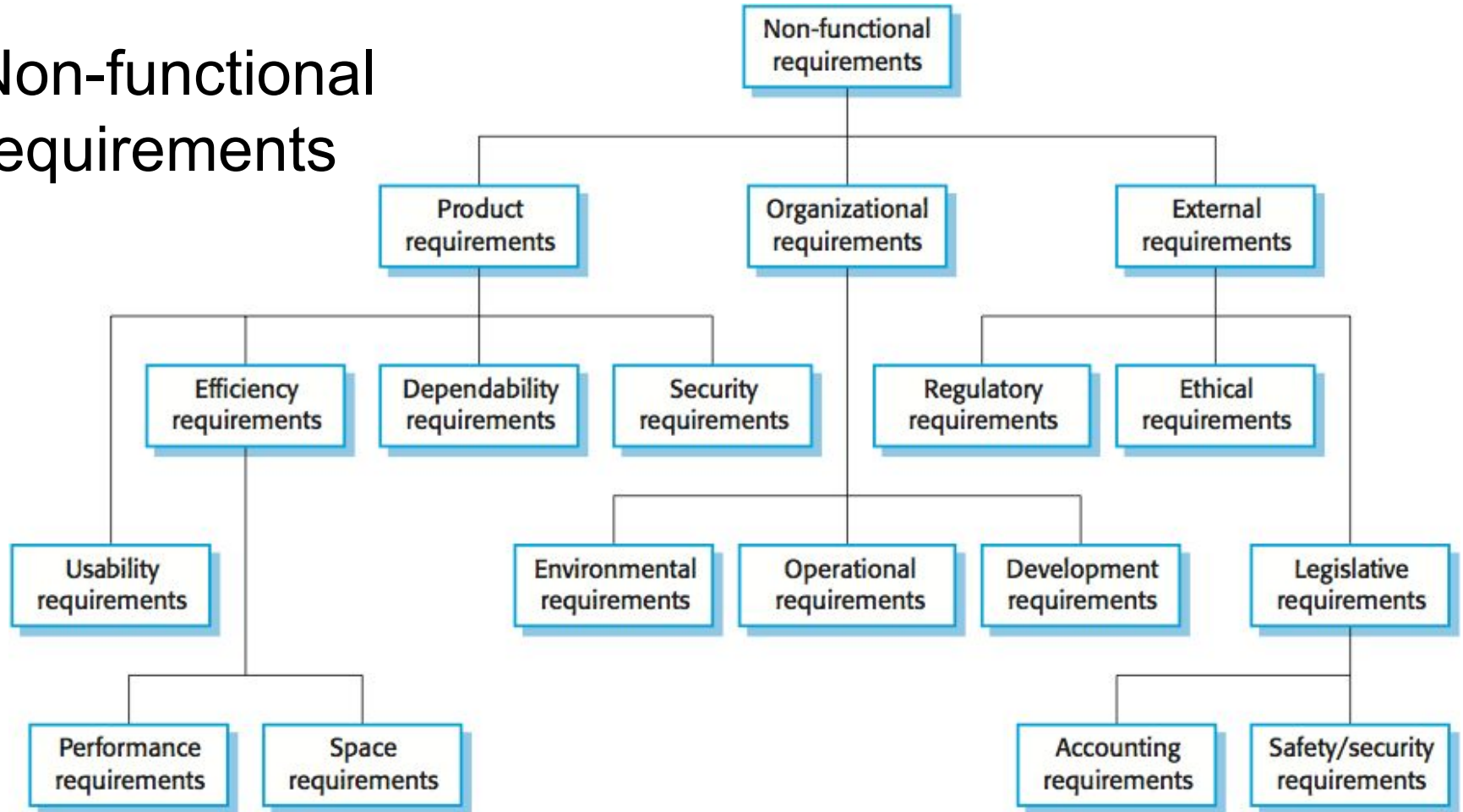
## Non-functional requirements

- Describes **constraints** put on the services (functions) offered by the system
- E.g., interface requirements, GUI requirements, localization requirements

## Domain requirements

- Requirements that come from the application domain of the system and that reflect characteristics of that domain

# Non-functional requirements

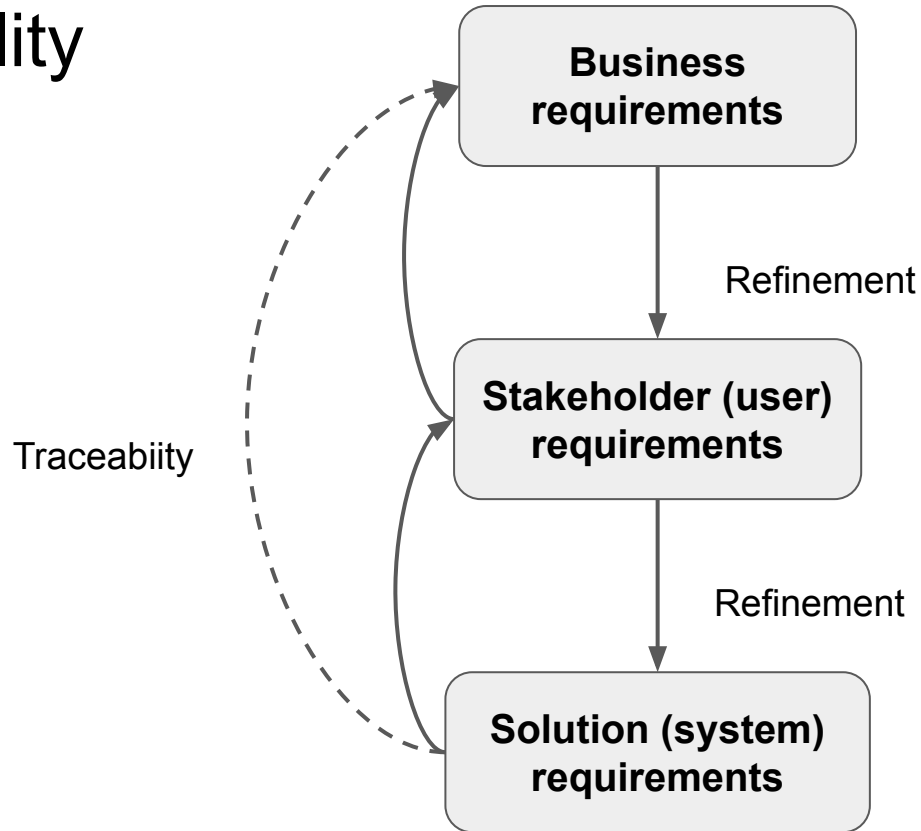




# More examples

- Non-functional requirements:
  - PRODUCT REQUIREMENT: The user interface should be implemented as simple HTML without frames or Java applets.
  - ORGANIZATIONAL REQUIREMENT: The system development process and deliverable documents shall conform to the process and deliverables defined in XYZCo-SP-STAN-14.
  - EXTERNAL REQUIREMENT: The system shall not disclose any personal information about customers apart from their name and reference number to the operators of the system.
- Domain requirement:
  - The deceleration of the train shall be computed as:  $D(\text{train}) = D(\text{control}) + D(\text{gradient})$ , where  $D(\text{gradient})$  is  $9.81\text{ms}^2 * \text{compensated gradient}/\alpha$  and the values of  $9.81\text{ms}^2 / \alpha$  are known for different types of train.

# Requirements traceability



# Requirements traceability

**Business requirements**

**Stakeholder requirements**

**Solution requirements**

**Test Cases**

