Requirements Engineering

Chapter 4.1-4.2

Based on slides from Software Engineering 9th ed, Sommerville.

Topics

1) How are requirements stated for the customer vs for the developer?

2) What is the difference between functional and non-functional requirements?

Requirements engineering

- The process of establishing:
  - .. **the service that the customer requires**

    from a system and

  - .. **the constraints under which it operates**

    and is developed.

2 Types of requirement

- **User** requirements
  - High-level description of.. **what the customer needs a system to do**
  - Uses English statements and diagrams.
  - May be basis for bidding on a project.

- **System** requirements (functional specification)
  - Document detailing precisely.. **what should be implemented**

  - Often more formal and technical than the user requirements.
  - May be part of a contract for developing system.

User and system requirements

Medical health care - patient management system

> 1. The MHC-PMS shall generate monthly management reports showing the cost of drugs prescribed by each clinic during that month.

System requirements specification

> 1.1 On the last working day of each month, a summary of the drugs prescribed, their cost and the prescribing clinics shall be generated.
> 1.2 The system shall automatically generate the report for printing after 17.30 on the last working day of the month.
> 1.3 A report shall be created for each clinic and shall list the individual drug names, the total number of prescriptions, the number of doses prescribed and the total cost of the prescribed drugs.
> 1.4 If drugs are available in different dose units (e.g. 10mg, 20 mg, etc.) separate reports shall be created for each dose unit.
> 1.5 Access to all cost reports shall be restricted to authorized users listed on a management access control list.

Exercise: User or System Requirement?

- Classify each requirement for slide-presentation software as a (U)ser, or (S)ystem requirement :
  - As user drags a slide while reordering a slide-deck, other slides move out of way with animation effect lasting 0.25s. **System**
  - System supports reordering slides from a thumbnail view via drag-and-drop. **User**
  - User may animate content onto the slide where it is initially hidden and then appears. **System**
  - Animations for current slide displayed in tree view. **System**
  - Animations may be reordered using up and down arrows at bottom of display window. **User**

Functional
vs
Non-Functional
Requirements

Functional and non-functional requirements

- **<u>Functional</u>** requirements
  - **What functions the system should provide.**
    - Ex: How the system should react to particular inputs and particular situations.
  - May state what the system should not do.

- **<u>Non-functional</u>** requirements
  - Constraints on the system such as timing, development process, or standards compliance.
  - **Often apply to the whole system** rather than individual features.

Functional requirements

- Functional **user** requirements:
  - **high-level** statements of what the system should do.

- Functional **system** requirements:
  - describe the system services... **in detail.**

- Problems arise when..

  requirements are not precisely stated.
  - Ambiguous requirements may be interpreted differently by developers and users:
    - "Police help dog bite victim"
    - "He fed her cat food"
    - "One morning I shot an elephant in my pyjamas"

Requirements & imprecision

- Functional requirements for the MHC-PMS

  A user shall be able to search the appointments lists for all clinics.

  Each staff member shall be uniquely identified by his or her 8-digit employee number.

- Consider the term 'search':
  - User intention:
    - search for a patient across
      all appointments in all clinics.
  - Developer interpretation:
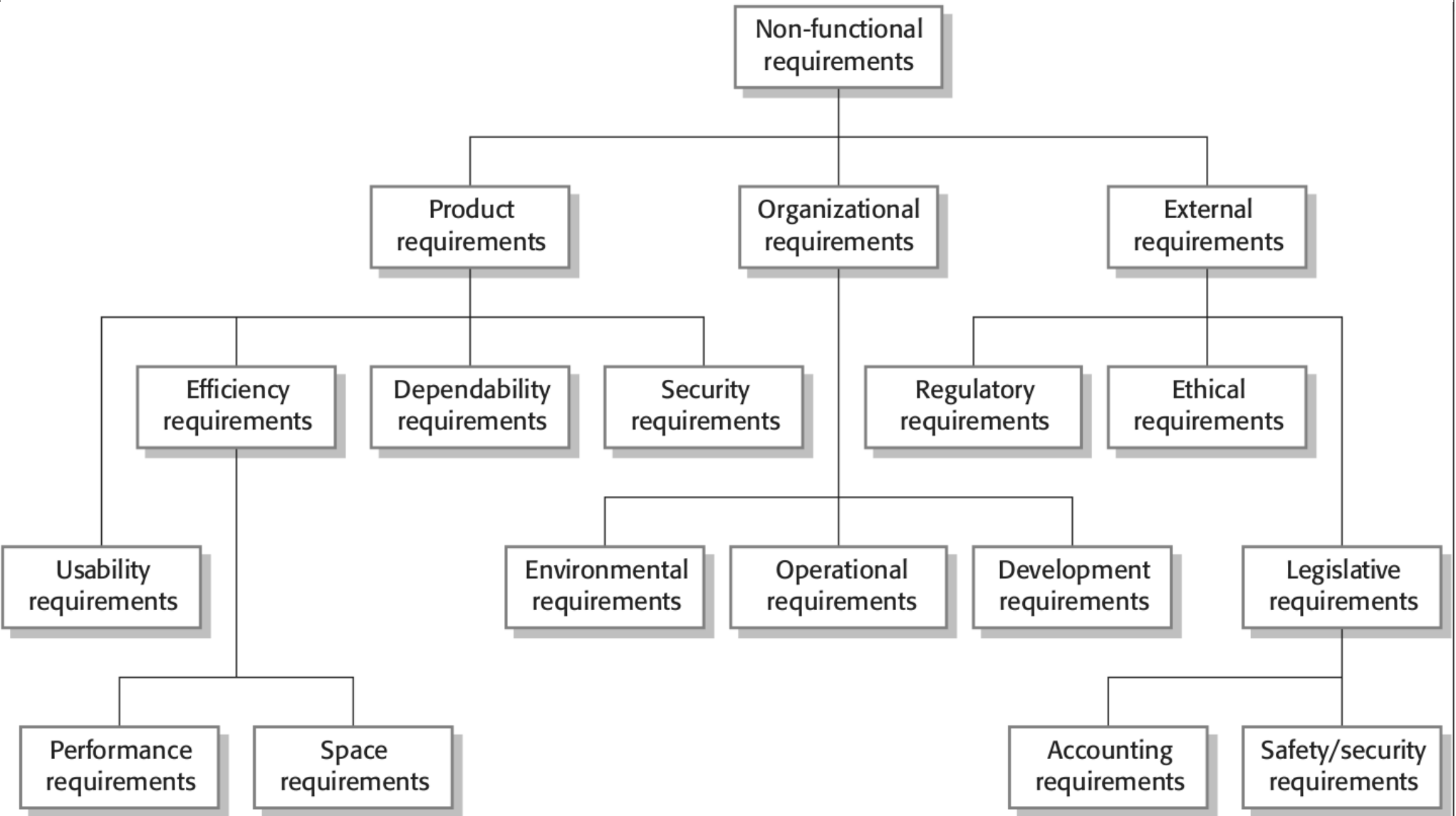   - search for a patient in any one specific clinic.

Requirements completeness and consistency

- In principle, requirements should be both complete and consistent.
    - Complete:

        describes all required functionality.

    - Consistent:

        no conflicts or contradictions

        in the requirements.

- Practically impossible to produce a complete and consistent requirements document.

Non-functional requirements

- Non-Functional requirements:
    - **Define system level properties and constraints**
        - reliability, response time and storage space.

    - **Development process constraints**
        - programming language or development method.

- Non-functional requirements may be more critical than functional requirements.
    - If they are not met, the system may be useless.

Types of nonfunctional requirement

Non-functional requirements implementation

- Non-functional requirements may affect..

  the overall system architecture
  (rather than single components).
  - Ex: organize system to minimize communication to meet performance requirements.

- A non-functional requirement may..

  impose a number of functional requirements
  - Ex: security needs may dictate numerous features to meet those needs.

Quantitative Non-Functional Requirements

- Write non-functional requirements quantitatively:
    - User goal:
        - "The system should be easy to use and organized such that user errors are minimized."
    - Verifiable requirement:
        - "After 4 hours of training, average user error shall be less than 2 per hour."

Metrics for specifying nonfunctional requirements

Property	Measure
Speed	**Transactions / second**
	User response time
	Screen refresh rate **- games**
Ease of use	**Training time**
Reliability	Mean time between failure
	Rate of failure occurrence
Robustness	Time to restart after failure
	Probability of data corruption on failure

Exercise

- Fill in the following grid with example requirements for a mine-sweeper game on the computer.

	Functional Requirement	Non-Functional Requirement
User Requirement	Click on cells to reveal Clicking on menu button works	-Grade 10 student should be able to play -Shouldnt crash while playing
System Requirement	Pressing back from main menu exits the app	Version of android it runs on Response time of clicking button (specific)

Summary

- Requirements define
  - what the system should do and
  - constraints on its operation and implementation.

- Functional requirements:
  - the services that the system must provide.

- Non-functional requirements:
  - constrain the system or development process.
  - Often relate to emergent properties of the system.
  - Apply to the system as a whole.