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..
    from a system and
  - the..
    and is developed.

2 Types of requirement

- User requirements
  - High-level description of what the..
  - Uses English statements and diagrams.
  - May be basis for bidding on a project.
- System requirements (functional specification)
  - Document detailing precisely what..
  - Often more formal and technical than the user requirements.
  - May be part of a contract for developing system.

User and system requirements

User requirement definition

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.

Functional
vs
Non-Functional
Requirements

Functional and non-functional requirements

- Functional requirements
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    - Ex: How the system should react to particular inputs and particular situations.
  - May state what the system should not do.
- Non-functional requirements
  - Constraints on the system such as timing, development process, or standards compliance.
  -

    rather than individual features.

Functional requirements

- Functional user requirements:
  - statements of what the system should do.
- Functional system requirements:
  - describe the system services...
- Problems arise when..
  - Ambiguous requirements may be interpreted differently by developers and users.

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

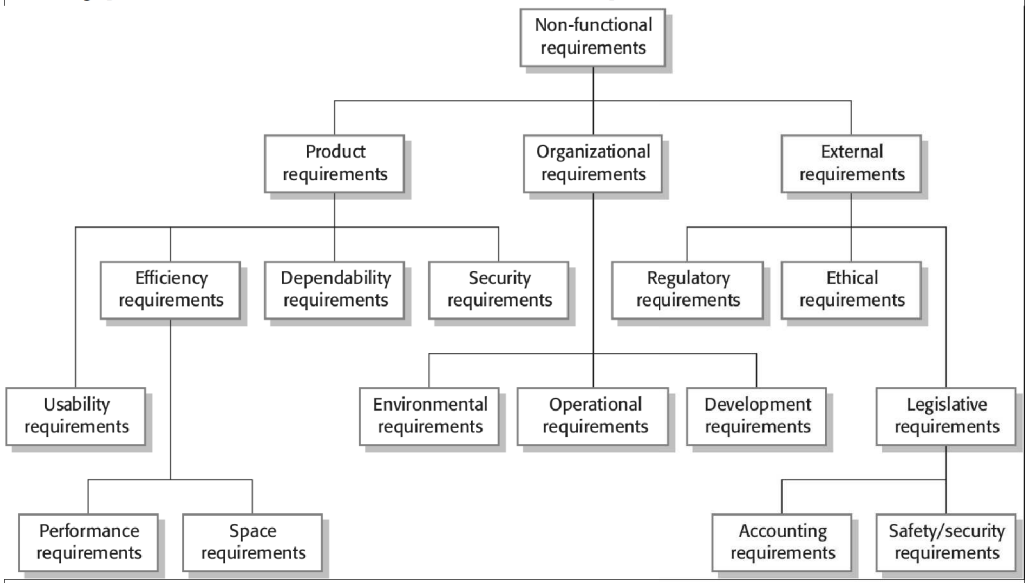
- In principle, requirements should be both complete and consistent.
  - Complete:
  - Consistent:

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

Non-functional requirements

- Non-Functional requirements:
  -
    - reliability, response time and storage space.
  -
    - 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..

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

- A non-functional requirement may..
  - Ex: security needs may dictate numerous features to meet those needs.

Non-functional requirements in the MHC-PMS

- Product requirement
  - Specify that the delivered product must..
    - e.g. execution speed, reliability, etc.

  "The MHC-PMS shall be available to all clinics during normal working hours (Mon–Fri, 0830–17.30). Downtime within normal working hours shall not exceed five seconds in any one day."
- Organizational requirement
  - Constraints from organizational policies
    - e.g. process standards used, etc.

  "Users of the MHC-PMS system shall authenticate themselves using their health authority identity card."

Non-functional requirements in the MHC-PMS

- External requirement
  - From factors external to the system:
    - e.g. ...
      interoperability requirements, etc.

  "The system shall implement patient privacy provisions as set out by law in HStan-03-2006-priv."

Goals and requirements

- Challenge:
  - Non-functional requirements may be..

  –
- 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	
	User response time Screen refresh rate
Size	Megabytes
Ease of use	
Reliability	Mean time between failure Rate of failure occurrence
Robustness	Time to restart after failure

Domain requirements problems

- Understandability problem
  - Requirements are expressed in..
  - Often hard to understand for software engineers developing the system.
- Implicitness problem
  - Domain specialists understand the area so well that they do not think of..
  - Simplified example:
    "Use the mouse to click on the icon."
    -
    -

Exercise

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

	Functional Requirement	Non-Functional Requirement
User Requirement		
System Requirement		

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.