Requirement Engineering

CSE 3223

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Requirements

IEEE Standard 729 defines it as

- "A *condition or capability* needed by a user to solve a problem or achieve an objective"

The requirements for a system

- Are the descriptions of the *services provided by the system* and its *operational constraints*.

These requirements reflect the

- Needs of customers for a system that helps solve some problem such as controlling a device, placing an order or finding information.

Requirement Engineering

- *“The process of finding out, analyzing, documenting and checking these services and constraints is called requirements engineering (RE).”*

Why Requirements?

- System Customers
  - Specify the requirements and read them to check if they meet their needs
- Project Managers
  - Use the requirements document to plan a bid for system and to plan the system development process
- System Engineers
  - Use the requirements to understand what system is to be developed
- System Test Engineers
  - Use the requirements to develop validation tests for the system
- System Maintenance Engineers
  - Use the requirements to help understand the system and the relationships between its parts

Different Levels of Abstraction

- User requirements
  - are statements, in a natural language plus diagrams, of **what services the system is expected to provide** and the constraints under which it must operate.
- System requirements
  - System requirements set out the *system's functions, services and operational constraints* in detail.
  - The system requirements document (sometimes called a functional specification) should define exactly what is to be implemented.
  - It may be part of the contract between the system buyer and the software developers.

Example

- *User requirement:* The library system should provide a way to allow a student to borrow a book from the library.
- *System requirement:* The library system should provide a withdraw interaction that allows a student to withdraw a book given the *isbn* and copy *number* of the book to be withdrawn.

Types Of Requirements

Business Requirements

- These are used to state the *high-level business objectives* of the organization or customer requesting the system or product.

Software system requirements are often classified as

- Functional requirements
- Non-functional requirements

Functional Requirements

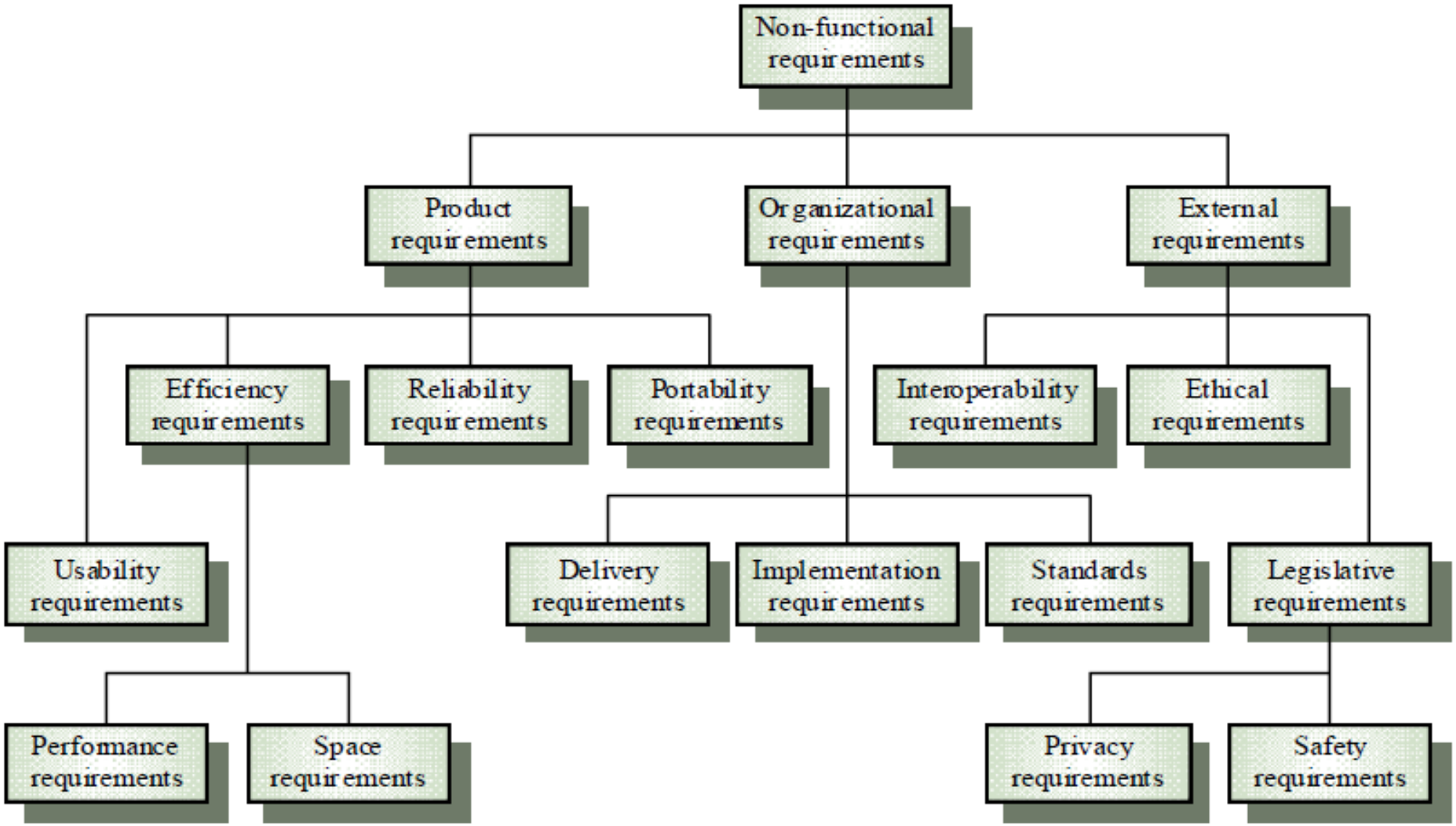
- These are statements of services the system should provide.
- They bring in the *system's view and define from the system's perspective.*
  - Services the system should provide
  - How the system should react to particular input
  - How the system should behave in a particular situations

  or
  - What the system should not do

Non-functional Requirements

- These are ***constraints on the services or functions*** offered by the system.
- They include ***timing constraints, constraints on the development process*** and constraints imposed by standards.
- Non-functional requirements ***often apply to the system as a whole***. They do not usually just apply to individual system features or services.

Types of NFR's



Types of NFR’s (Cont...)

Product requirements

- Requirements which specify that the delivered product must behave in a particular way.
  - e.g. execution speed, reliability, usability etc.

Organizational requirements

- Requirements which are a consequence of organizational policies and procedures in the customer’s and developer's organization.

External requirements

- Requirements which arise from factors which are external to the system and its development process.
  - e.g. legislative requirements etc.

Types of NFR's (Cont...)

Reliability Requirements

- Reliability requirements deal with the *failure to provide service*.

Example :

- The failure frequency of a **heart-monitoring unit** that will operate in a hospital's intensive care ward is required to be less than one in 20 years. Its heart attack detection function is required to have a failure rate of less than one per million cases.

Types of NFR's (Cont...)

Efficiency Requirements:

- Deals with the hardware resources needed to perform the functions of the software.
- The main hardware resources to be considered are the **computer's processing capabilities** (measured in MIPS – million instructions per second, MHz or megahertz etc.), its **data storage capability** in terms of memory and disk capacity (measured in MBs – megabytes, GBs – gigabytes, etc.) and the **data communication capability** of the communication lines (usually measured in KBPS – kilobits per second., etc)
- The requirements may include the maximum values at which the hardware resources will be applied in the developed software system.

Types of NFR's (Cont...)

Portability Requirements:

- Portability requirements tend to the adaptation of a software system to other environments consisting of different hardware, different operating systems, and so forth.

Interoperability Requirements:

- Interoperability describes the extent to which systems and devices can exchange data, and interpret that shared data.
- For two systems to be interoperable, they must be able to exchange data and present that data such that it can be understood by a user.

Types of NFR's (Cont...)

- **Integrity** – deal with system security that prevent unauthorized persons access.
- Example:

> The Engineering Department of a local municipality operates a geographic information system (GIS). The department is planning to allow citizens access to its GIS files through the Internet. The software requirements include: the possibility to view and copy information, but not to make changes to maps of the citizens' own assets, and neither to those of any other asset in the municipality area ("read only" permit). Access will be denied to plans in progress, and to those maps defined by the department head as having "limited access."

Types of NFR's (Cont...)

- **Usability** – deals with the scope of staff resources needed to train new employees and to operate the software system.
- Example:

> The software usability requirements for the new help desk system initiated by a home appliance manufacturing company lists the following specification requirements: (1) A staff member should be able to handle at least 60 service calls a day. (2) Training a new employee will take no more than 2 days (16 training hours), at the end of which the trainee will be able to handle 45 service calls a day.

Example: A Word Processor

- Let us assume that we have a word-processing system that does not have a spell checker. In order to be able to sell the product, it is determined that it must have a spell checker.

Example: A Word Processor (cont....)

- **Business Requirement** could be stated as:
  - *User will be able to correct spelling errors in a document efficiently.* Hence, the Spell checker will be included as a feature in the product.
  - In the next step we need to describe what tasks must be included to accomplish the above-mentioned business requirement.
- The resulting **User Requirement** could be as follows:
  - *Finding spelling errors in the document and deciding whether to replace each misspelled word with one chosen from a list of suggested words.* It is important to note that this requirement is written from a user's perspective.

Example: A Word Processor (cont…)

- After documenting the user's perspective in the form of user requirements, we look at the system's perspective:
- What is the functionality provided by the system and how will it help the user to accomplish these tasks.
- The **functional requirement** for the same user requirement could be written as follows:
  - *The spell checker will find and highlight misspelled words.*
  - *It will then display a dialog box with suggested replacements.*
  - *The user will be allowed to select from the list of suggested replacements.*
  - *Upon selection it will replace the misspelled word with the selected word.*
- Finally, a **non-functional requirement** of the system could require that it must be integrated into the existing word-processor that runs on windows platform.

Specifying the Requirements

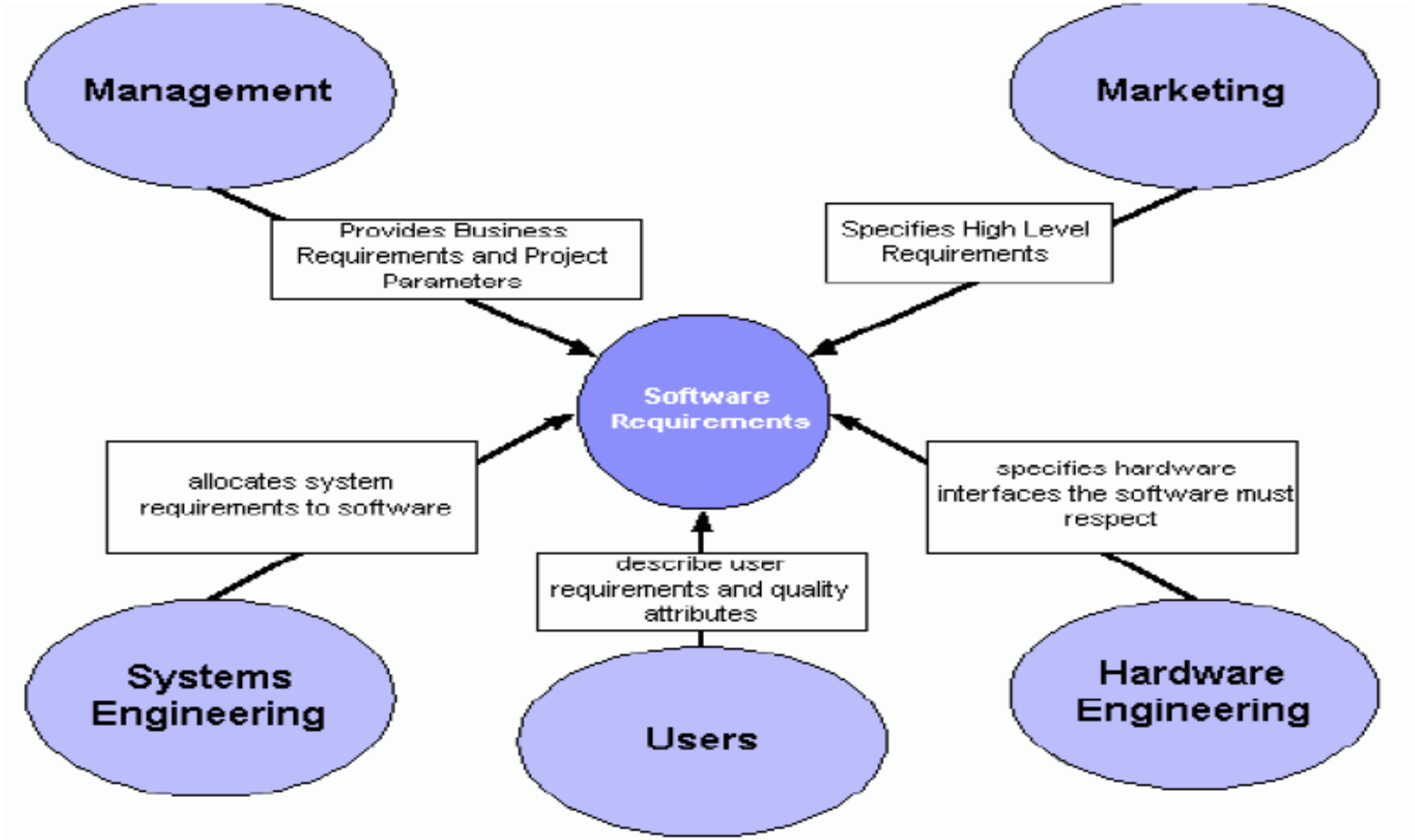
- Functional and nonfunctional requirements should be specified in such a way that they are **understandable by system users who don’t have detailed technical knowledge.**
- These requirements are defined using natural language, tables and diagrams as these can be understood by all users.

Guidelines

- While specifying or writing the requirements, following guidelines must be followed:
  - Invent a **standard format** and use it for all requirements.
  - Use language in a **consistent way**.
  - Avoid the use of **computer jargons**.
  - **Separate** functional and non-functional requirements.
  - Distinguish requirements priorities
    - Example: MoSCoW (Must, Shall, Could, Want/Will (no TBD))

Stakeholders

- Stakeholders are different people who would be interested in the software.



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