Software Process Requirements

Lecture 4

Functional REQs
the Definition

Statements of services the system should provide, how the system should react to specific inputs and how the system should behave in specific situations.

Functional REQs

a.k.a. **Behavioural REQs** or **Operational REQs**

- Functional requirements is an important category of the real requirements.
- They describe what the system/software must do; functionality or services *(a function is a useful capability provided by one or more components of a system)*. Therefore, they specify an action that a system must be able to perform.
- They are sometimes called **behavioral / operational requirements** because they specify the inputs *(stimuli)* to the system, the outputs *(responses)* from the system, & behavioral relationships between them.
- **Functional User Requirements** may be high-level statements of what the system should do. **Functional System Requirements** should describe the system services in detail.
- May state what the system/software should not do.

for a **Mental Health Care Patient Management System (MHC-PMS);**
A system used to maintain records of people receiving care for mental health problems.

Functional REQs

an Example

- A user shall be able to search the appointments lists for all clinics.
- The system shall generate each day, for each clinic, a list of patients who are expected to attend appointments that day.
- Each staff member using the system shall be uniquely identified by his or her 8-digit employee number.

for a **Mental Health Care Patient Management System (MHC-PMS);**
A system used to maintain records of people receiving care for mental health problems.

Functional REQs

an Example

- A user shall be able to search the appointments lists for all clinics.
- The system shall genera day, for each clinic, a list of patients who are ntments that day.
- Each staff me shall be uniquely identified by his mber.

What do you think is meant by the term *search* in this requirement ?

for a **Mental Health Care Patient Management System (MHC-PMS);**
A system used to maintain records of people receiving care for mental health problems.

Functional REQs
Requirements Imprecision

- Problems arise when requirements are not precisely stated.
- Ambiguous requirements may be interpreted in different ways by developers and users.
- Consider the term 'search' in requirement 1
  - **User intention** – search for a patient name across all appointments in all clinics;
  - **Developer interpretation** – search for a patient name in an individual clinic. User chooses clinic then search.

Non-Functional REQs
the Definition

Non-Functional requirements specify system/software **properties** *(such as reliability and safety)*, and **constraints** on the services or functions offered by the system *(such as timing constraints; response-time)*, or constraints on the development process, I/O device capability, standards, etc. *(e.g., process requirements may also be specified mandating a particular IDE, programming language or development method)*.

- **Often apply to the entire system/software** *(rather than individual features or services)*.
- **Non-functional REQs may be more critical than functional REQs.** If these are not met, the system/software may be useless.

Non-Functional REQs Classifications

Types of Non-Functional Requirements

Numerous ways to classify non-functional requirements exist.

According to Ian Sommerville, they can be grouped into 3 classes:

Product Requirements

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

Organisational Requirements

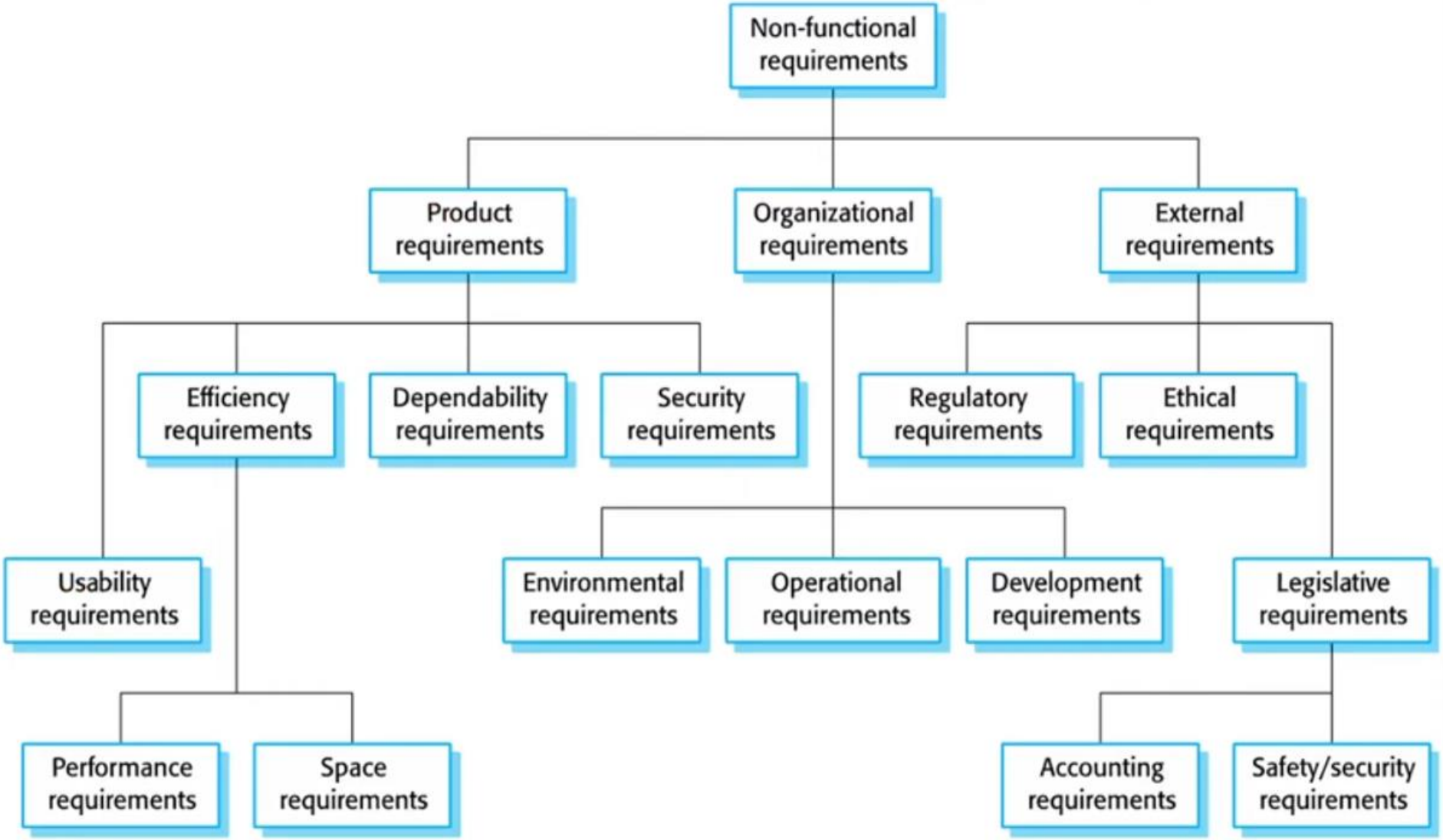
Requirements which are a consequence of organisational policies and procedures *(e.g., process standards used, implementation requirements, etc.)*

External Requirements

Requirements which arise from factors which are external to the system and its development process *(e.g., interoperability requirements, legislative requirements, etc.)*

Non-Functional REQs Classifications

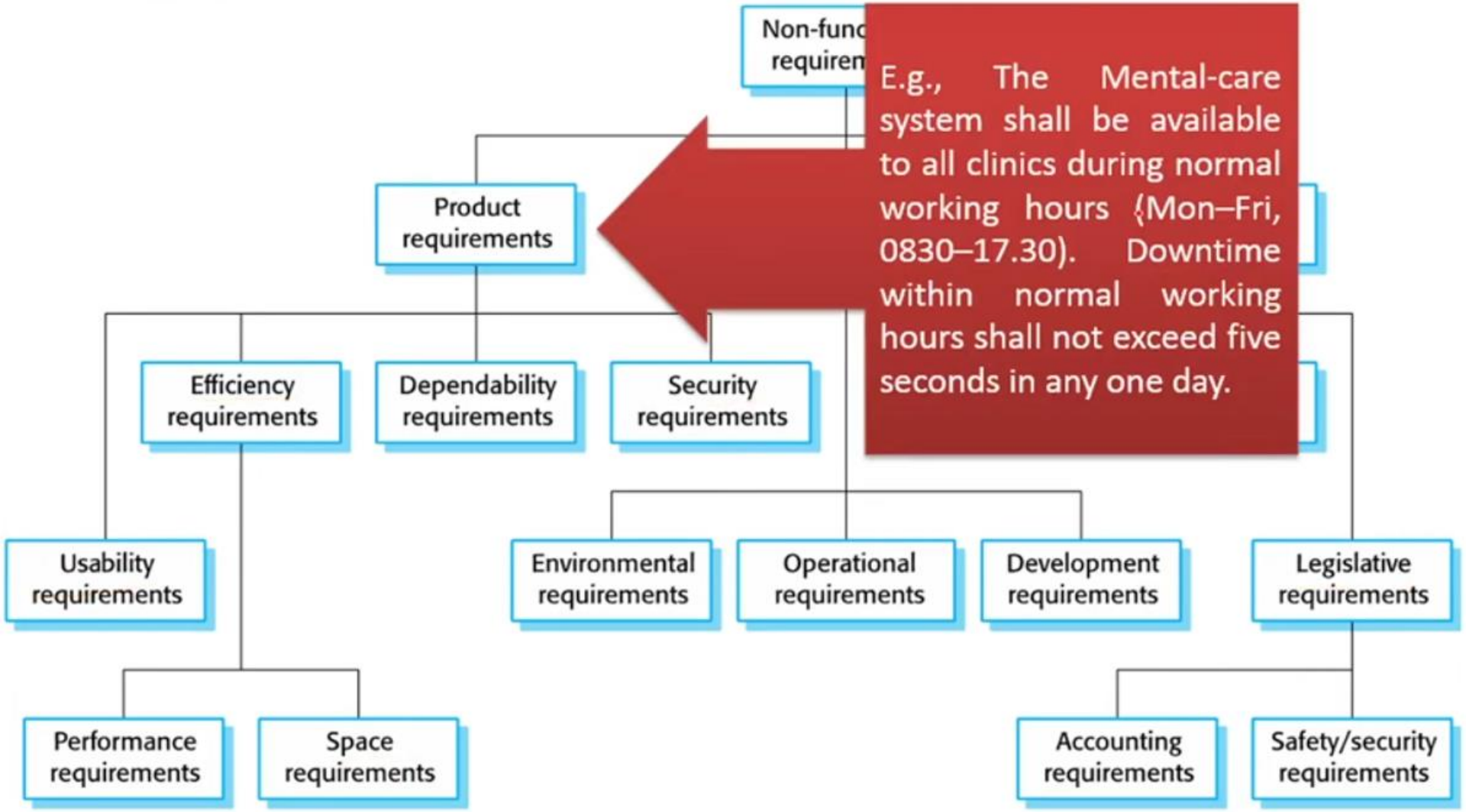
Types of Non-Functional Requirements



for a **Mental Health Care Patient Management System (MHC-PMS);**
A system used to maintain records of people receiving care for mental health problems.

Non-Functional REQs Classifications

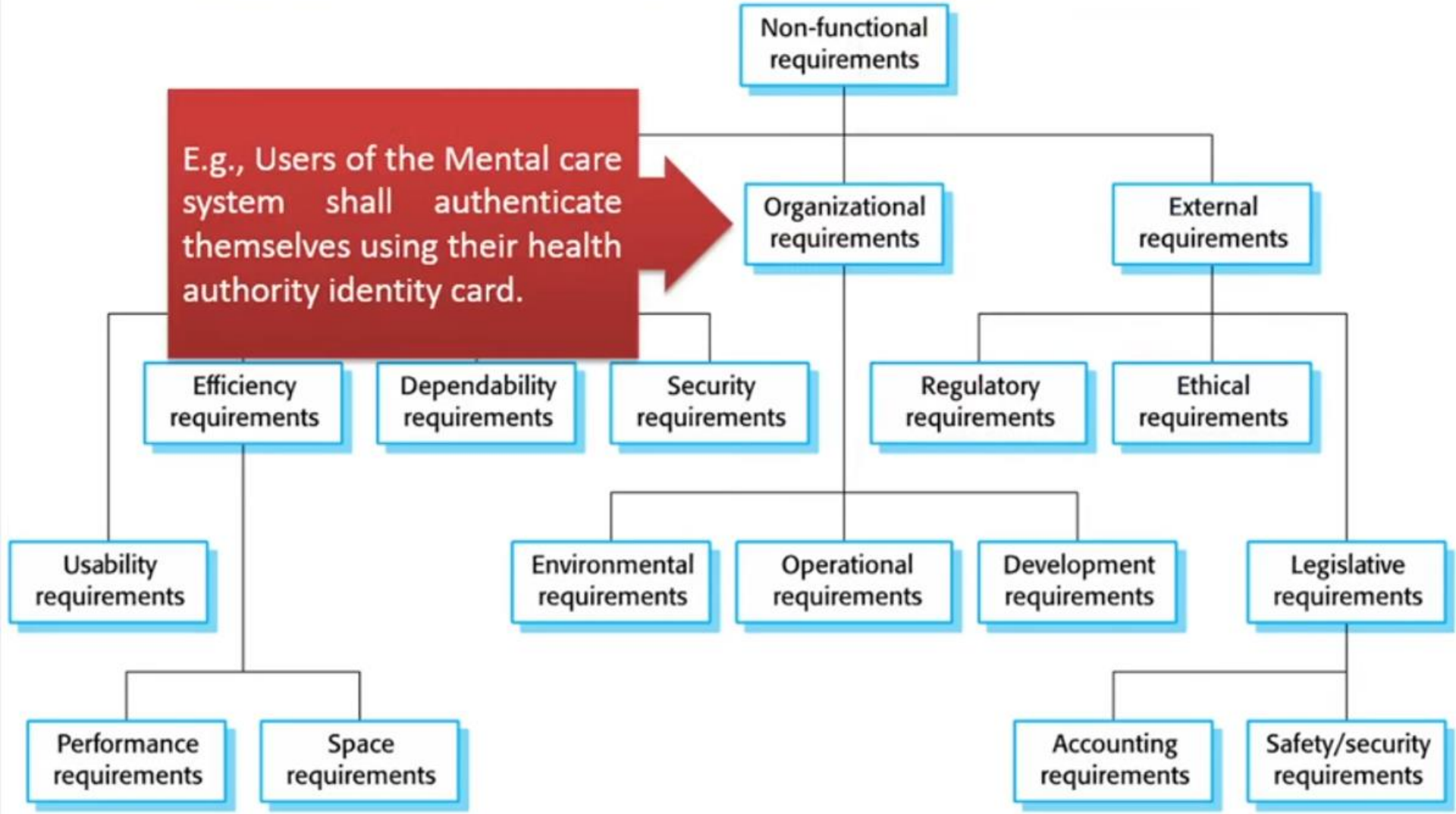
Types of Non-Functional Requirements



for a **Mental Health Care Patient Management System (MHC-PMS);**
A system used to maintain records of people receiving care for mental health problems.

Non-Functional REQs Classifications

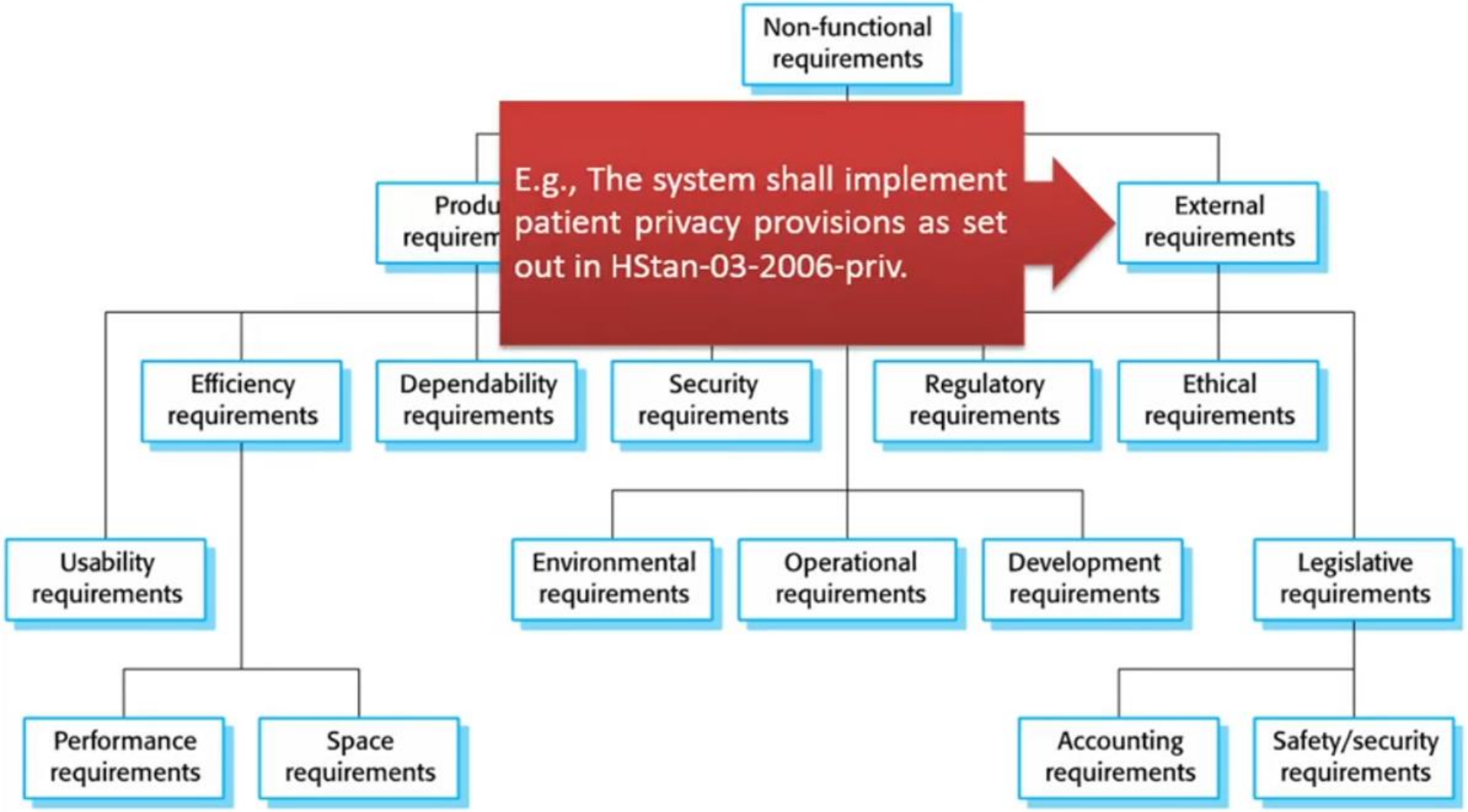
Types of Non-Functional Requirements



for a **Mental Health Care Patient Management System (MHC-PMS);**
A system used to maintain records of people receiving care for mental health problems.

Non-Functional REQs Classifications

Types of Non-Functional Requirements



Non-Functional REQs Classifications

Types of Non-Functional Requirements

According to Robertson & Robertson (2012), they can be grouped into 8 classes:

1) **Look-and-Feel REQs**. The spirit of the product's appearance.
2) **Usability & Humanity REQs**. The product's ease of use, and any special usability considerations.
3) **Performance requirements**. How fast, how safe, how accurate, how reliable, and how available the functionality must be.
4) **Operational & Environmental REQs**. The environment on which the product will have to work (e.g., under water), & what considerations must be made for this environment.
5) **Maintainability & Support REQs**. Expected changes, and the time allowed to make them.
6) **Cultural REQs**. Special requirements that come about because of the people involved in the product's development and operation.
7) **Legal REQs**. The laws and standards that apply to the product.
8) **Security REQs**. The security and confidentiality of the product.

Non-Functional REQs Classifications

Types of Non-Functional Requirements

According to Robertson & Robertson (2012), they can be grouped into 8 classes:

1) **Look-and-Feel REQs**. The spirit of the product's appearance.
2) **Usability & H[illegible]manity REQs**. The product's ease of use, and any special usab[illegible]nsiderations.
3) **Performa[illegible]ments**. How fast, how safe, how accurate, how reliable, ar[illegible]ailable the functionality must be.

environment on which the
ter), & what considerations

ted changes, and the time

at come about because of
lopment and operation.
apply to the product.
tiality of the product.

Examples:
- The product shall use only two colours
- The product should use a lot of animation
- The product shall use a large range of exciting sounds.
- The product shall comply with corporate branding standards.
- The product shall be attractive to an older audience.

Non-Functional REQs Classifications

Types of Non-Functional Requirements

According to Robertson & Robertson (2012), they can be grouped into 8 classes:

1) **Look-and-Feel REQs**. The spirit of the product's appearance.
2) **Usability & Humanity REQs**. The product's ease of use, and any special usability co[illegible]derations.
3) **Performance req[illegible]nts**. How fast, how safe, how accurate, how reliable, and h[illegible] the functionality must be.
4) **Operational & E[illegible]ental REQs**. The environment on which the

considerations

, and the time

but because of

d operation.

product.

product.

Examples:

- The product shall be easy to use by members of the public who might not read English.
- The product shall be easy to use on the first attempt by a member of the public without training.
- It should be possible to use the system to pay in different currencies.
- 90% of the general population should be able to place an order from the web interface within 5 minutes, & 90% of the elderly users should be able to place an order from the web interface within 10 minutes.

Non-Functional REQs Classifications

Types of Non-Functional Requirements

According to Robertson & Robertson (2012), they can be grouped into 8 classes:

1) **Look-and-Feel REQs**. The spirit of the product's appearance.
2) **Usability & Humanity REQs**. The product's ease of use, and any special usability considerations.
3) **Performance requirements**. How fast, how safe, how accurate, how reliable, and how available [illegible] functionality must be.
4) **Operational & Environm[illegible]EQs**. The environment on which the

Examples:
- The product shall identify whether an aircraft is hostile or friendly within 0.25 second.
- The product shall produce the schedule within 3 seconds of the user's request.
- The product shall calculate a guest's bill in 2 seconds.
- The product shall handle up to 10 users simultaneously.
- The product shall, on average, operate without failure for 20 days.

8) **Security REQs**. The security and confidentiality of the product.

Non-Functional REQs Classifications

Types of Non-Functional Requirements

According to Robertson & Robertson (2012), they can be grouped into 8 classes:

1) **Look-and-Feel REQs**. The spirit of the p
2) **Usability & Humanity REQs**. The pro
   special usability considerations.
3) **Performance requirements**. How fast,
   reliable, and how available the fu
4) **Operational & Environmental**
   product will have to work, & wha
   this environment.
5) **Maintainability & Support REQs**. Expe
   allowed to make them.
6) **Cultural REQs**. Special requirements t
   the people involved in the product's development and operation.
7) **Legal REQs**. The laws and standards that apply to the product.
8) **Security REQs**. The security and confidentiality of the product.

Examples:

- The product shall be used in variable lighting conditions.
- The product shall conserve battery life.
- The product will be used in a standard office environment, except that high levels of background noise may occur.

Non-Functional REQs Classifications

Types of Non-Functional Requirements

According to Robertson & Robertson (2012), they can be grouped into 8 classes:

1) **Look-and-Feel REQs**. The spirit of the product's appearance.
2) **Usability & Humanity REQs**. The product's ease of use, and any special usability considerations.
3) **Performance requirements**. How fast, h… reliable, and how available the function…
4) **Operational & Environmental REQs**. Th… product will have to work (e.g., under w… must be made for this environmen…
5) **Maintainability & Support REQ**… allowed to make them.
6) **Cultural REQs**. Special requirements t… the people involved in the product's de…
7) **Legal REQs**. The laws and standards tha…
8) **Security REQs**. The security and confide…

Examples:

- The product shall be able to be modified to cope with a new class of user.
- The product shall be readily portable to Linux.
- The product shall be able to be modified to cope with minor changes to European law that occur every six months on average.

Non-Functional REQs Classifications

Types of Non-Functional Requirements

According to Robertson & Robertson (2012), they can be grouped into 8 classes:

Examples:
- The language used in the interface should be formal and polite.

* *Includes Political Requirements; E.g.,* The product shall not display religious symbols or words.

f the product's appearance.
ne product's ease of use, and any

v fast, how safe, how accurate, how
unctionality must be.
EQs. The environment on which the
nder water), & what considerations
ent.

5) **Maintai y & Support REQs**. Expected changes, and the time allowed t ake them.
6) **Cultural REQs**. Special requirements that come about because of the people involved in the product's development and operation.
7) **Legal REQs**. The laws and standards that apply to the product.
8) **Security REQs**. The security and confidentiality of the product.

Non-Functional REQs Classifications

Types of Non-Functional Requirements

According to Robertson & Robertson (2012), they can be grouped into 8 classes:

1) **Look and Feel REQs**. The spirit of the product's appearance.
2) **Usability REQs**. The product's ease of use, and any
3) **Performance REQs**. How safe, how accurate, how
4) **Operational REQs**. The environment on which the
5) **Maintainability and Portability REQs**. What considerations
6) **Cultural REQs**. Special requirements that come about because of the people involved in the product's development and operation.
7) **Legal REQs**. The laws and standards that apply to the product.
8) **Security REQs**. The security and confidentiality of the product.

Examples:

- The product shall comply with the Disability Discrimination Act (or an **Equality Act**).
- The product shall comply with our ISO 9001 certification.

* **The cost of litigation** *(i.e, penalties for non-conformance with the law such as fines, imprisonment & loss of reputation)* is one of the major risks for software.

Examples:
- The product shall ensure that only authorized users are able to gain access.
- The product shall distinguish between authorized and non-authorized users.

* **Security requirements cover aspects such as:**
- Access; *uninterrupted/continual access to data & functionality by authorised users.*
- Privacy; *protection of data from unauthorised access/disclosure.*
- Integrity; *prevention of unauthorised modification/deletion of data (data consistency).*
- Immunity; *protection against threats and attacks.*

* **The forms an attack might take include:**
- **Disclosure** of private information or the unauthorised release of information.
- **Modification**, loss of integrity, or the unauthorised alteration of data/information.
- **Denial of use** *or* **service** or loss of access *(to its authorised/legitimate users).*
- **Repudiation**, where a legitimate user claims that they did not send/receive a particular message that was sent/received.

allowed to make them.

6) **Cultural REQs**. Special r… …s that come about because of the people involved in th… … development and operation.
7) **Legal REQs**. The laws and sta… …ds that apply to the product.
8) **Security REQs.** The security and confidentiality of the product.

Non-Functional REQs Implementation

Verifiable Non-Functional Requirements

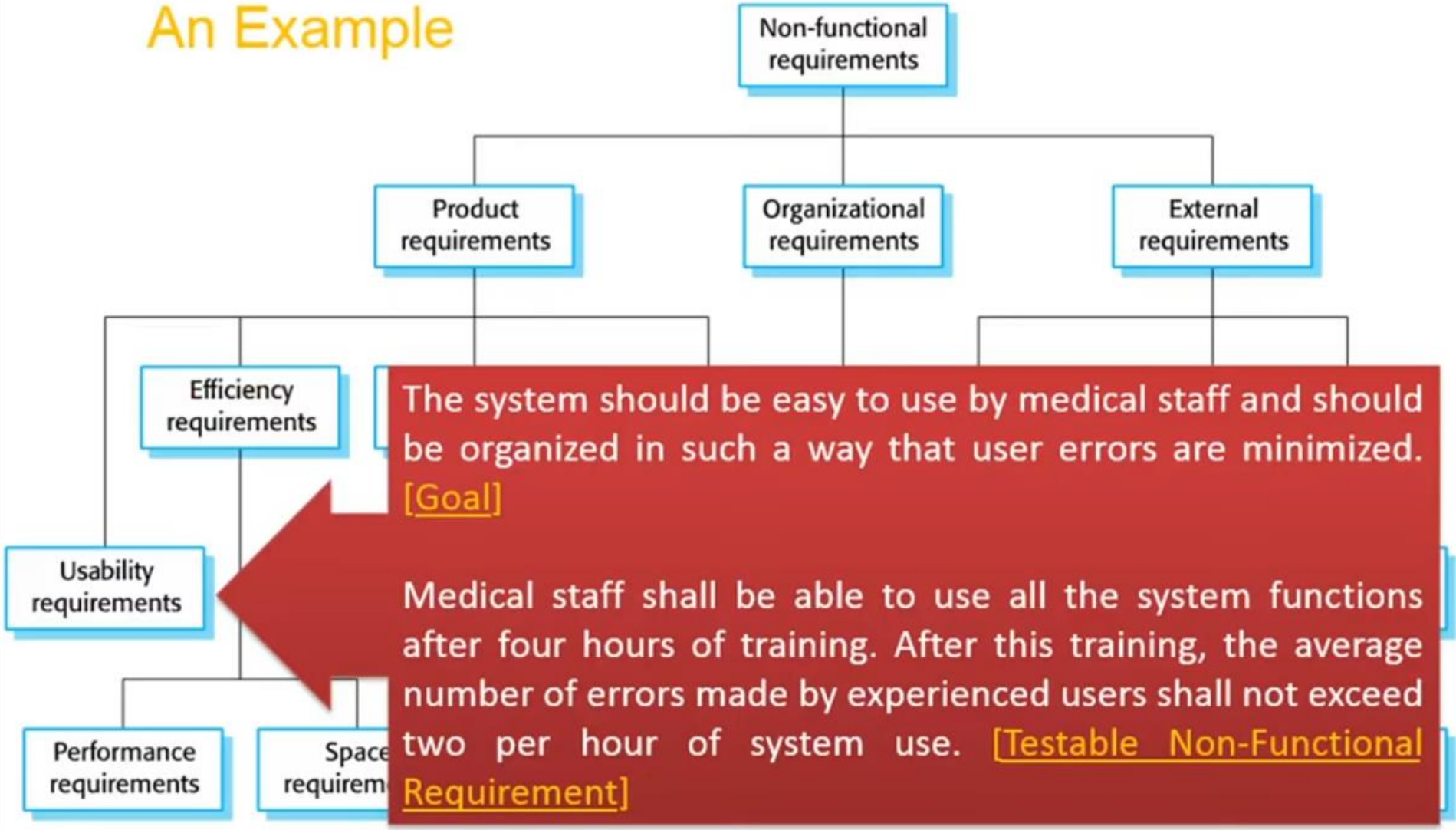
- Non-functional requirements may be very difficult to state precisely, and imprecise requirements may be difficult to verify [i.e., normally, their evaluation tends to be subjective & they are hard to test].
- Given a **Goal**, which is a general intention of the user *(such as ease-of-use, a.k.a. usability)*, a **Verifiable / Testable Non-Functional Requirement** is a statement using some measure that can be objectively tested.

for a **Mental Health Care Patient Management System (MHC-PMS);**
A system used to maintain records of people receiving care for mental health problems.

Non-Functional REQs Implementation

Verifiable Non-Functional Requirements

An Example



Metrics [Fit-Criteria] *for specifying* Non-Functional REQs

Property	Measure
Speed	• Processed transactions/second • User/event response time • Screen refresh time
Size	• Mbytes • Number of ROM chips
Ease of use	• Training time • Number of help frames
Reliability	• Mean time to failure • Probability of unavailability • Rate of failure occurrence • Availability
Robustness	• Time to restart after failure • Percentage of events causing failure • Probability of data corruption on failure
Portability	• Percentage of target dependent statements • Number of target systems

Non-Functional REQs [Constraints]

- **Solution Constraints;** Any mandated technology.
  - *E.g., The product shall operate using Windows XP.*
- **Deadlines;** Any known deadlines.
  - *E.g., The product must be available at the beginning of the new tax year.*
- **Financial Budget;**
- **Current System Constraints;**
  - *E.g., The product is a photocopier to be used by an environmentally conscious organization; it must work with recycled paper.*