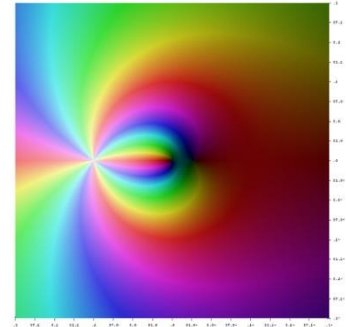


Lecture 6

Communicating the Requirements: *Nonfunctional Requirements (NFRs)*



Jan Homann /Public domain

Com S/SE 4090/5090

Robyn Lutz

rlutz@iastate.edu

Office hours:

Robyn: 11 Tues, 230 Atanasoff; 3 Fri (<https://iastate.zoom.us/my/rlutz>), & by appointment

Carter: cwunsch@iastate.edu, 12 Tues (0112 Pearson); 12 Thurs
(<https://iastate.webex.com/meet/cwunsch>), & by appointment

Arushi: arushi17@iastate.edu, 1 Wed (0112 Pearson) & by appointment

Homework 1 due Thurs, 9/19

Reading assignment in textbook:

Chap. 10 Functional requirements (last lecture)

Chap. 11 Nonfunctional requirements (this lecture)

Nonfunctional requirements (NFRs)

Chap. 11, Robertson & Robertson (with many examples of NFRs)

Also called **quality** attributes, quality of service, quality requirements

- Functional: **What** does the software have to do?
- Nonfunctional: **How well** does it have to do it?

Q: Why important?

Nonfunctional requirements (NFRs)

Chap. 11, Robertson & Robertson (with many examples of NFRs)

Q: Why important?

A: NFRs determine whether the software works well enough to be used (fast, can handle volume of requests, reliable, familiar interface, secure, etc.)

Examples:

- FR: IceBreaker shall record the road temperatures each time that data is transmitted by the weather stations.
- Security NFR: Once recorded, the data shall not be altered except by a supervising engineer.
- Performance NFR: The data shall be recorded within 0.5 second of receipt.

Example from Chap. 11

Q: Why are nonfunctional requirements important?

A new product for help-desk staff was installed but **not used** because

- it couldn't handle the volume of requests (performance)

- it was difficult to use because its conventions were unfamiliar (cultural)

- some icons were considered offensive (cultural)

- it didn't protect user data from unauthorized access (security)

How to find nonfunctional requirements (NFRs)?

- Elicit from stakeholders
- Prototype
- Apply checklist of 8 major categories of NFRs to each product use case
 - Ask:
 - for each* product use case
 - for each* NFR category
 - are there* are any needed requirements of that category?

Overview: 8 categories of nonfunctional requirements

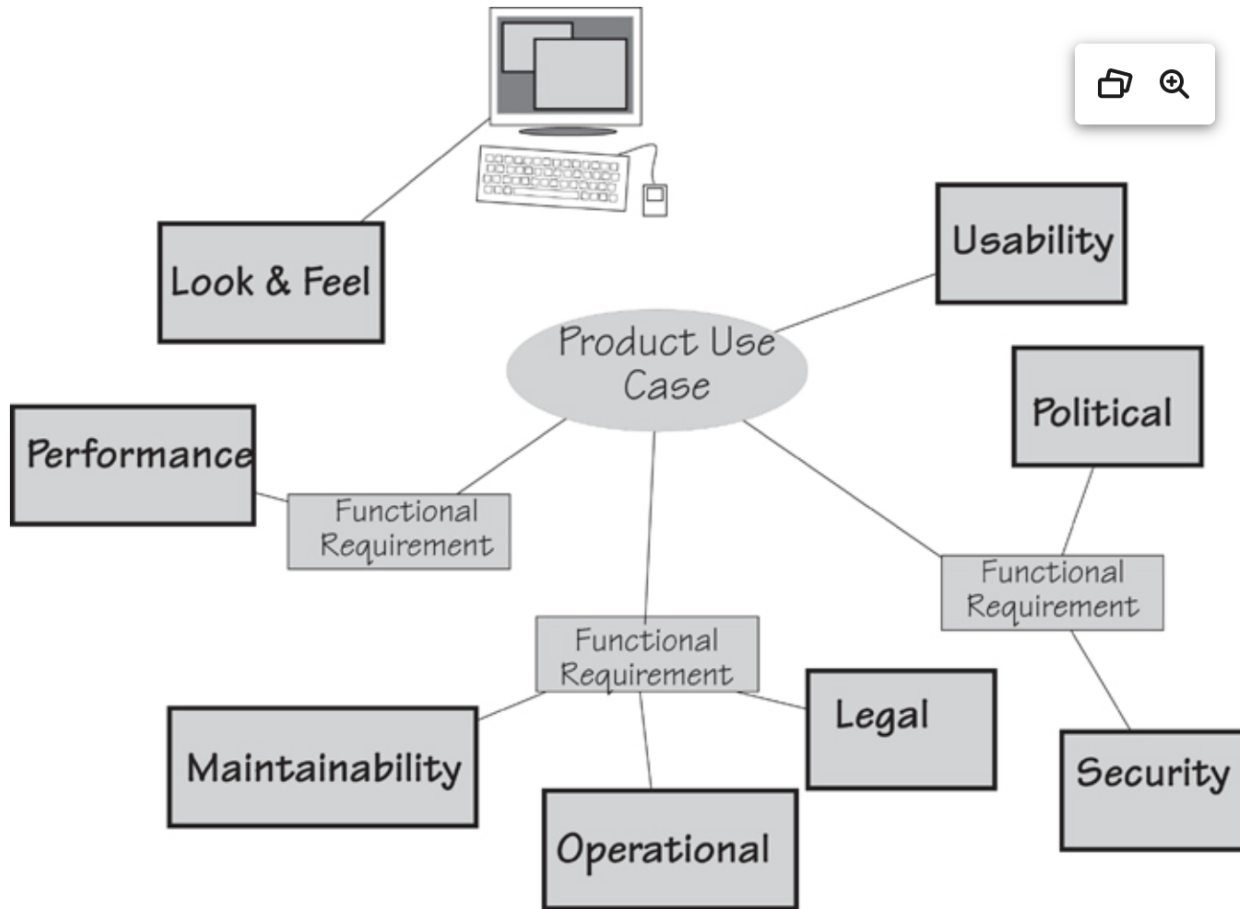


Figure 11.2. Non-functional requirements are properties that the functionality must have.

The functionality can be represented either by a product use case or by its constituent functional requirements.

In this example, the product use case has three functional requirements, each having some non-functional properties.

The use case as a whole must meet certain usability requirements, whereas the look and feel requirements relate to the entire product.

8 categories of nonfunctional requirements

1. Look & feel

- appearance often important for consumer & web products
- Ex: The product shall use the **company colors**

2. Usability

- ease of use/understanding/customization/accessibility
- Ex: The product shall produce a schedule that is easy to read

3. Performance

- timing/accuracy/capacity/throughput/availability/fault-tolerance/reliability*
- Ex: The product shall identify whether an aircraft is hostile or friendly within 0.25 sec.
- Ex: The product shall have the capacity to predict ice for 5,000 roads.

8 categories of nonfunctional requirements (cont.)

4. Operational

- the context/environment, in which the product must operate
- often needed for the product to collaborate with its adjacent systems/actors
- Ex: The product shall be usable in low-lighting conditions.

5. Maintainability

- anticipate changes & updates
- Ex: The product shall support easy addition of new road authority areas.

8 categories of nonfunctional requirements (cont.)

6. Security [& S. Pfleeger]

- Confidentiality: The product shall ensure account data can only be accessed by authorized users.
- Privacy: The product shall prevent personal and confidential data from being printed.
- Integrity: The product's weather data shall be the same as that received from the source of the data.
- Auditability: The product shall retain all ice prediction schedules for one year.
- Availability: The Tracking & Data Relay Satellite system for Low Earth Orbit shall have a cumulative maintenance downtime of < 11 days/yr.

8 categories of nonfunctional requirements (cont.)

7. Cultural and political

- often arise when product has multiple markets or target users
- Ex: The product shall use American spelling.

8. Legal

- may need to comply with laws or standards regarding consumer protection, security, privacy, government certification, finances, medical records, accessibility
- Ex: The product shall produce an audit report of all road schedules and their subsequent treatments that complies with ISO 93.080.00

Discovering nonfunctional requirements

The users (2)	Look and Feel (10) Usability (11): Are there any special considerations for this kind of user? Security (15): Do you have to protect, or protect against, the users? Cultural (16): Is there a risk of offending, or misleading your users?
The operating environment (5, 6, 8)	Operational (13): Particularly collaborating products. Performance (12): Demands made by the environment. Maintenance (14): Consider proposed changes to the environment.
The client, customer, and other stakeholders (2)	Look and Feel (10) Usability (11) Cultural (16)
The adjacent systems (6, 8)	Legal (17): Include special rights for this kind of adjacent system. Operational (13) Performance (12)

Table 11.1 in
Robertson&Robertson

4 notes on nonfunctional requirements

Rationale

- If it's not clear why a requirement is needed, add the reason or justification for it
Ex: "The product shall be easy to use on the first try."
Rationale: "We want our customers to voluntarily switch to this new product."

Fit Criteria

- So far, many of our nonfunctional requirements have been vague. We'll fix this later on (in Chap. 12).

4 notes on nonfunctional requirements

Cross-reference:

- Possible overlaps between FRs & NFRs [vanLamsweerde].
Ex: “The product shall provide a firewall.” FR or security NFR?
- Possible overlaps between NFR categories
Ex: Denial of service to a patient database during surgery.
Security or safety NFR?

Tradeoffs:

- A NFR may conflict with another NFR
Ex: Password-protection of user data increases security
but the increased steps may decrease usability