Lecture 7
Communicating the Requirements:
Non-functional Requirements

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Com S/SE 409/509
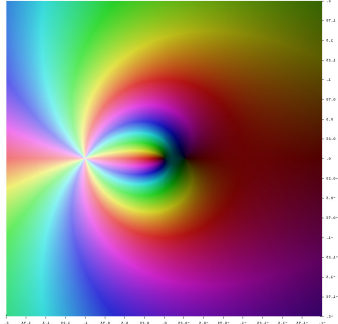
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Homework 2 due Sept. 17
Exam 1, Sept. 24

Homework 2 (due 9/17)

- HW#1 will be graded this week
- HW#2: practice 5 skills:
  1) Derive the **scenarios** (from the product use cases)
  2) Document the **domain assumption**s (get the context interfaces right, or risk building the wrong product)
  3) Identify the **functional requirements** (what the software has to do: many FRs will come from the steps in scenarios)
  4) Specify the functional requirements in **EARS** (better than text for clear & unambiguous communication)
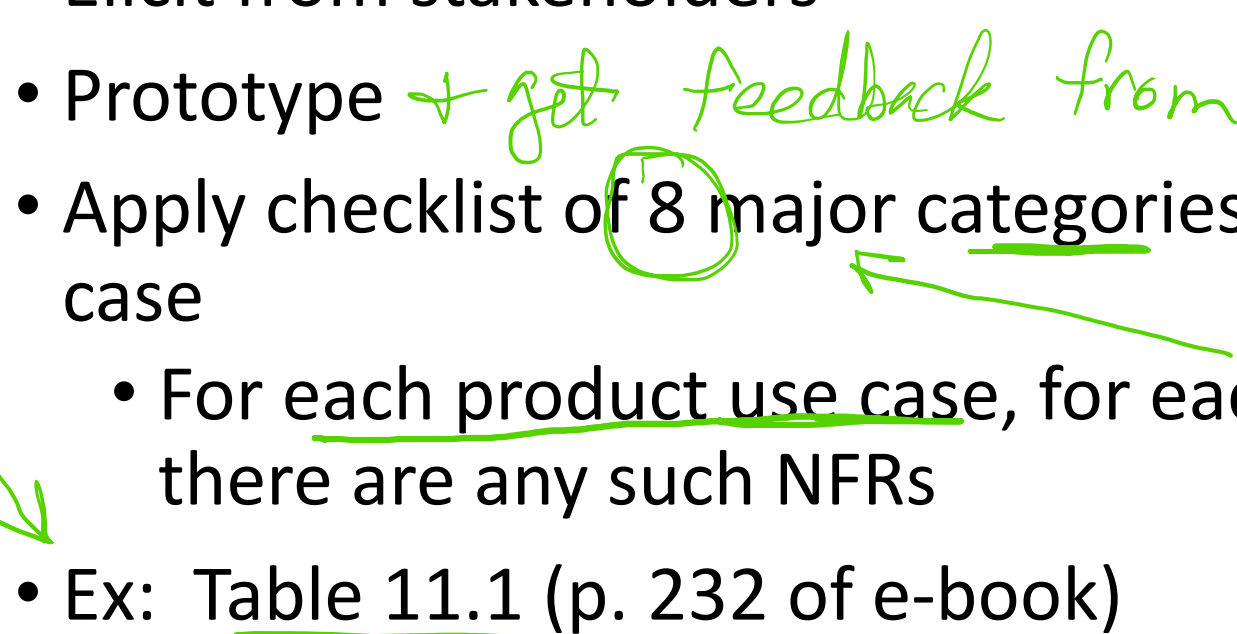 5) Document the **nonfunctional requirements** (in English text)
- 509: research paper posted: extra HW question for grad students

[handwritten annotations: "PUC ⇒ Scenarios", "FRs", "van Lamsweerde"]

Nonfunctional requirements (NFRs)
Chap. 11, Robertson & Robertson

- 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?
- 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.

How to find nonfunctional requirements (NFRs)

- Elicit from stakeholders
- Prototype *+ get feedback from Stakeholders*
- Apply checklist of 8 major categories of NFRs to each product use case
  - For each product use case, for each NFR category, consider if there are any such NFRs
- Ex: Table 11.1 (p. 232 of e-book)

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.

*also:
→ safety

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 Orbt 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

3 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 after Exam 1 (in Chap. 12).

FR vs. NFR   untestable

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?

FR   NFR