CS5127/6027: Requirements Engineering

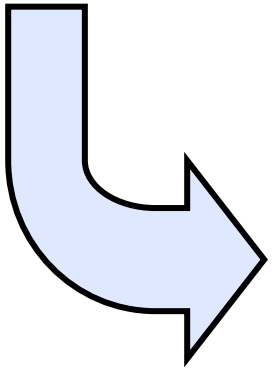
(Fall 2024)

Prof. Nan Niu (nan.niu@uc.edu)

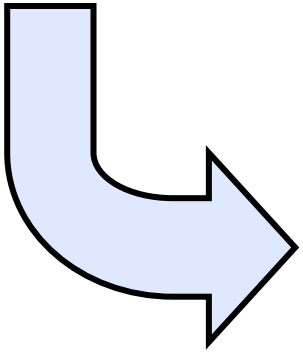
Office Hours: 10am-11am, Mondays, Rhodes 832

Today's Menu

Last Lecture (Monday 9/16):
Grad-level project *[part I]*



This Lecture (Friday 9/20):
Non-functional req.s (NFRs)



Next Lecture (Monday 9/23):
Modeling

Today's Take-Aways

- What're NFRs & what RE challenges do NFRs present?

- Methods to handle the challenges
  - Quality attribute scenarios
  - *(Repertory grid)*

  - Background reading on
    - *Quality attribute scenarios*

Functional vs. Nonfunctional

- Functional requirements describe **WHAT** the software does
- Nonfunctional requirements (NFRs) describe **HOW WELL** the software does it
- Implications: Elicitation, modeling, analysis, realization, validation, evolution … of NFRs are different from those of functional requirements

The *req.s* concerned in Jackson's paper

- The computer must not weigh more than 0.25 Kg.
- The system must be completed by 1st January 1998.
- The programs must be written in Ada.
- The system specification must be formally accepted by the steering committee.
- The operator interface must be easy to learn.
- The system must produce a monthly report of outstanding debts.
- If passenger in the lift presses the *open-doors* button while the lift is stationary at a floor, the doors should begin to open within 0.5 secs.

→ ***Functional*** requirements

↳ Real-time response

↳ Those properties (of operational safety that) can be precisely stated in terms of system behavior

Elevator is the machine

- Meaning of requirements
  - R: "A student carrying a heavy bag to attend a class at a different floor"
  - E: "different floor of the SAME building", "the intention to move UP/DOWN", …
  - S: "button pressed ➔ request sensed and sent to the elevator controller ➔ the motor triggered to move or (re-)opening the door"

It's not just about moving…

Comfort

Safety

Usability

Accessibility

Source: *Google Images*

On NFRs

→ Do we need a (formal) definition (or a complete list) of NFRs?

- Those specifying criteria that can be used to judge the operation of a system, rather than specific behaviors [Wiki'24].
- How the system behaves w.r.t. some observable attributes like performance [Franch'98].
- System qualities: All the 'ilities' [Easterbrook'05].
- Quality is a collection of 7 attributes: reliability, efficiency, usability, portability, testability, understandability, and modifiability [Glass'03].

> "If you want to trigger a hot debate among a group of RE people, just let them talk about NFRs. Although this term has been in use for more than two decades, there is still no consensus about the nature of NFRs and how to document them in requirements specifications."
>
> *Martin Glinz, RE'07*

New today (Friday, Sept 20, 2024)

- Bonus mechanism ***during*** the lectures
  - Intention: to award those students who attend the lectures and actively participate in the lectures
  - How does it work: (1) tracking; (2) grade impact

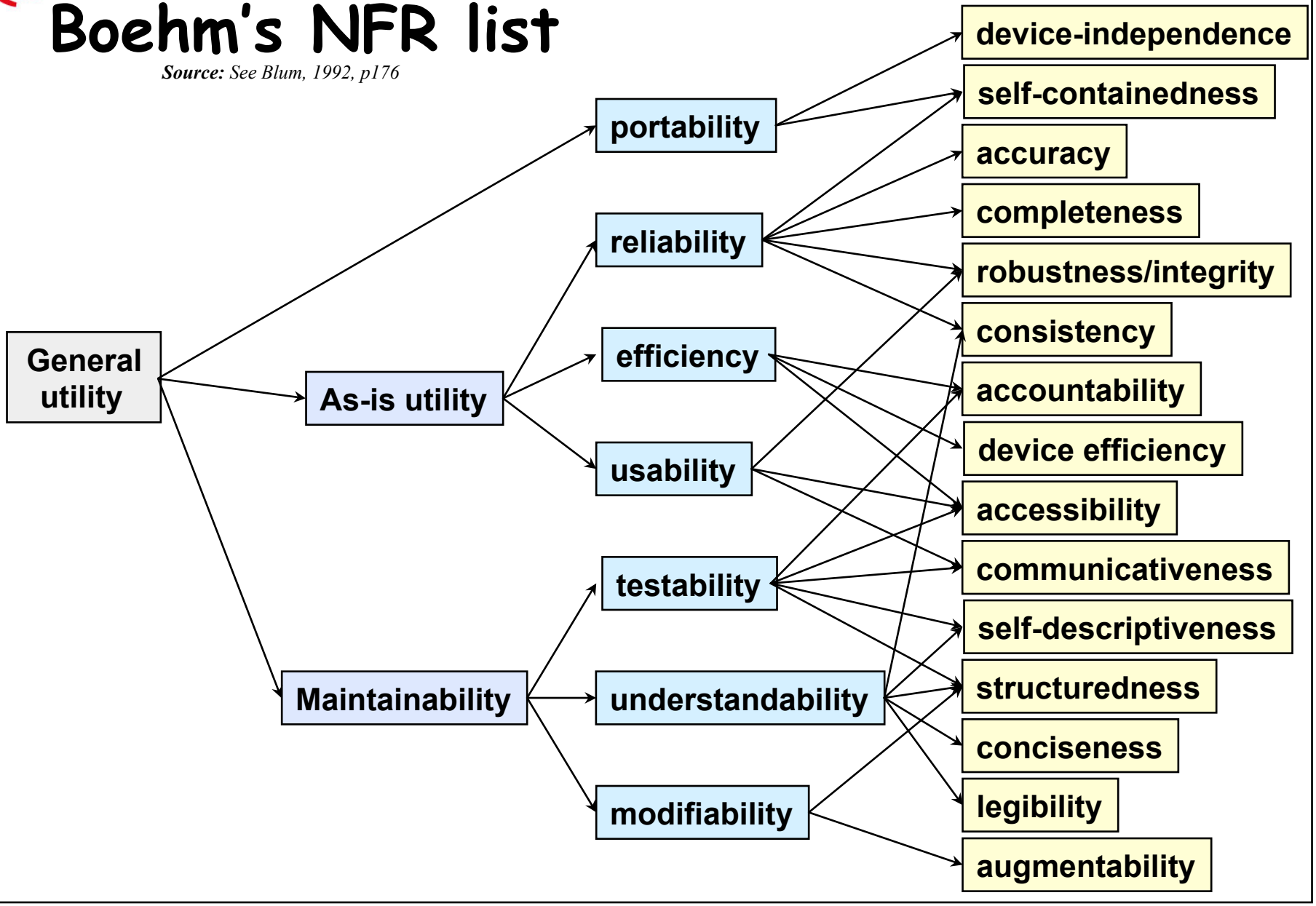
- Enumerate, without repetition, a list of NFRs

Example NFRs

- **Interface requirements**
  - how will the new system interface with its environment?
    - User interfaces and "user-friendliness"
    - Interfaces with other systems
- **Performance requirements**
  - time/space bounds
    - workloads, response time, throughput and available storage space
    - e.g., "the system must handle 1,000 transactions per second"
  - reliability
    - the availability of components
    - integrity of information maintained and supplied to the system
    - e.g., "system must have less than 1hr downtime per three months"
  - security
    - e.g., permissible information flows, or who can do what
  - survivability
    - e.g., system will need to survive fire, natural catastrophes, etc
- **Operating requirements**
  - physical constraints (size, weight),
  - personnel availability & skill level
  - accessibility for maintenance
  - environmental conditions
  - etc
- **Lifecycle requirements**
  - "Future-proofing"
    - Maintainability
    - Enhanceability
    - Portability
    - expected market or product lifespan
  - limits on development
    - E.g development time limitations,
    - resource availability
    - methodological standards
    - etc.
- **Economic requirements**
  - e.g. restrictions on immediate and/or long-term costs

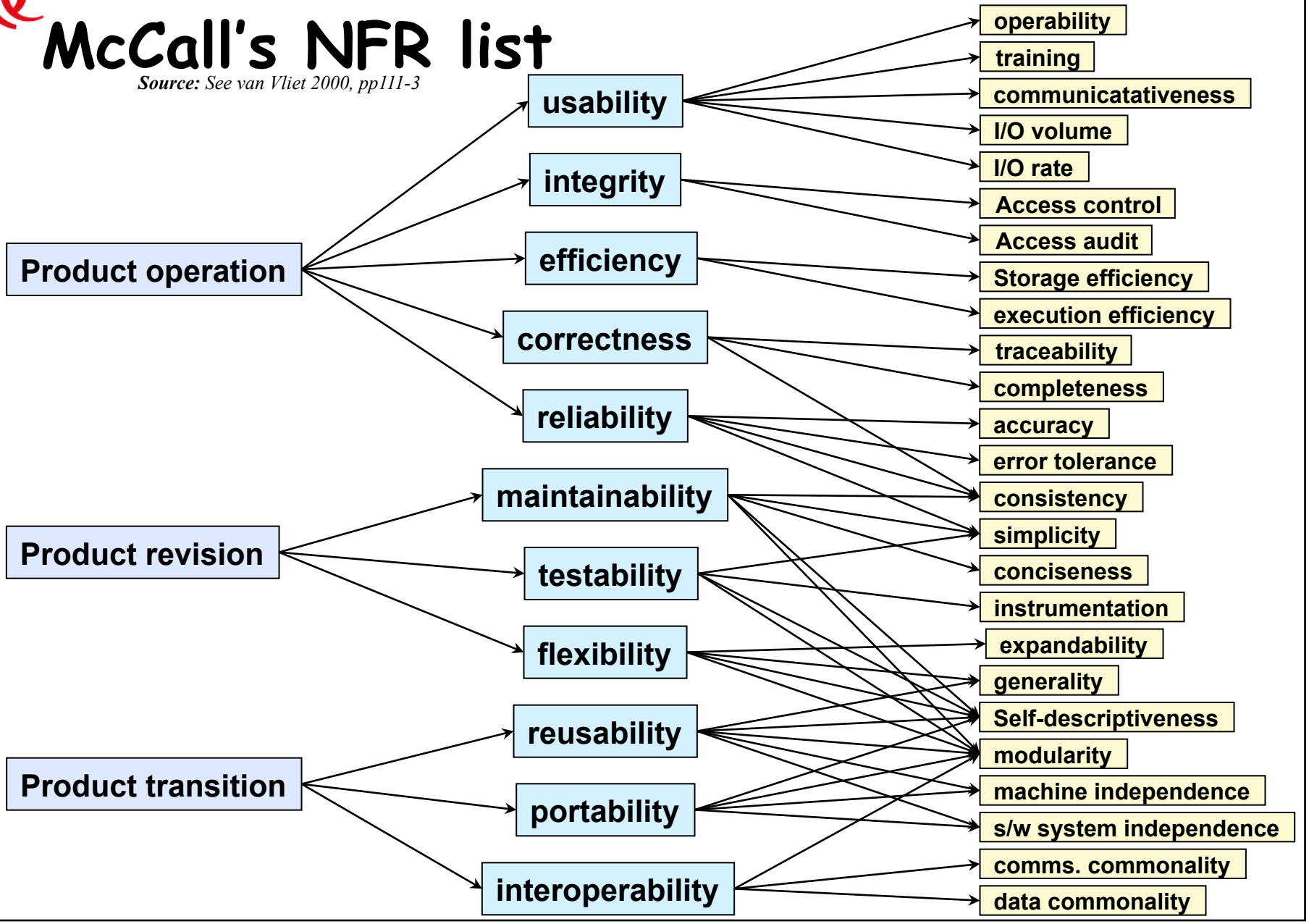
Boehm's NFR list

Source: *See Blum, 1992, p176*



McCall's NFR list

Source: *See van Vliet 2000, pp111-3*



Interrupted by an alarm

→ *Will continue on Monday (Sept 23, 2024)*