Writing Effective Requirements Specifications

Properties

- Complete
  - All relevant scenarios must be covered
  - Forgetting requirements is expensive
- Realistic
  - Functional requirements and non-functional requirements should not contradict each other
    - e.g.: the response time of a system which solves mixed integer programming problems is usually long

Properties

- Correct
  - The requirements must correctly reflect the challenges posed by the environment
    - Negative example: Y2K-Problem
- Modifyable
  - Related requirements should be grouped together, so that changes can be made locally
- Ranked according to priority

Properties

- Verifiable
  - Make sure that requirements can be checked objectively
    - Include measures
      - Transaction/sec
      - MTBF
      - …
    - Subjective: The system should be easy to use
    - More objective: An experienced user should be able to use the system after two hours training

Properties

- Traceable
  - Each requirement must be uniquely identified
- Unambiguous
  - Specifies in a concise language which does not allow alternative interpretations (difficult to achieve)
- Valid
  - Understood and accepted by all project members, managers, customers involved

Recommendations

- Language
  - Choose imperatives carefully. Distinguish
    - shall: describes required system functionality
    - must, must not: describes a constraint
    - should: suggests functionality
  - Reduce ambiguity
    - avoid options: can, may, optionally
    - avoid weak phrases: as a minimum, as appropriate, easy, adequate

Recommendations

- Language
  - Use readable, simple language
    - short sentences
    - generally understood words
  - Decompose long requirements into parts

Recommendations

- Elements of a good requirements statement
  - Localization/scenario, e.g. “In online mode”
  - Actor/owner, e.g. “the static tolerance band agent”
  - Action, e.g. “maintains a log of limit violations”
  - Target/owned, e.g. “for the selected signals”
  - Constraint, e.g. “provided the appropriate tolerance band have been defined by the plant administrator”
- Within a use case, Localization/Scenario, is provided by the context

Recommendations

- Documentation Standard
  - Minimize general and administrative sections in your documents. The requirements should be the largest part.
  - Use templates, but
    - customize them to the needs of your projects (omit useless sections)
    - don’t invent meaningless texts to fill all sections in the template

Recommendations

- Documentation Standard
  - Number all requirements
    - Make sure (e.g. using tool support), that
      - the numbering scheme is applied consistently in all documents
      - every requirement has a unique number
    - Within a use case, denote each step on a separate, numbered line
  - When using examples, illustrations, tables
    - Mark them uniquely
    - Explain their purpose (“This is an example for ...”) and structure (“Column1 describes …”)

Recommendations

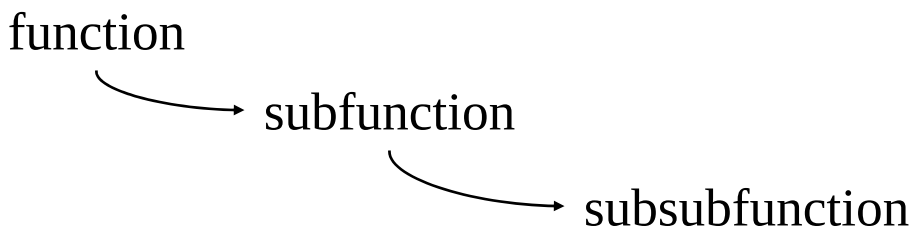
- Choose the right granularity
  - Since requirements are to be read by humans, a use case with 100 steps might be too long
- Conduct reviews
  - Review quality of content
  - (Separately) Review conformance with guidelines and standards

Use and Abuse of Use Cases

- Use case advantages
  - Capture a user's need
  - Input to the testing process
  - Unit of work for incremental development

Abuse of use cases

- Abuse by decomposition
  - Many designers use <<uses>> relationships among use cases for functional decomposition



  - Problems
    - Contradicts the OO style
    - Subsubfunctions are duplicated (under different functions)
    - Objects are only context-specific encapsulations of data in this approach
  - Do not try to design the program using use cases
    => leave out detail

Abuse of use cases

- By abstraction
  - Use cases are intended for communication.
  - There is no need to abstract from the concrete use cases, even if the implementation will do so.
  - The abstraction might not be natural. Time is lost by discussing it.
  - If you abstract from “Send receipt to customer” to “Transmit or generate document for stakeholder”, you will have a large use case, which will be hard to understand and implement
    => “Use the concrete use cases to explain and verify your powerful abstractions.”

Abuse of use cases

- By GUI
  - Today's GUI builders allow to describe use cases via GUI prototypes
  - Problems
    - The user thinks, that everything is done, when he sees the GUI prototype => false indication of progress
    - The user will not accept later changes to the GUI easily

Abuse of use cases

- By denying choice
  - Use cases should really describe goals, i.e. problems the user would like to solve.
  - Often one tends to commit to early to describing a solution; this keeps us from considering alternative solutions
  - Example
    - apply style (in Word) <-> Format paragraph