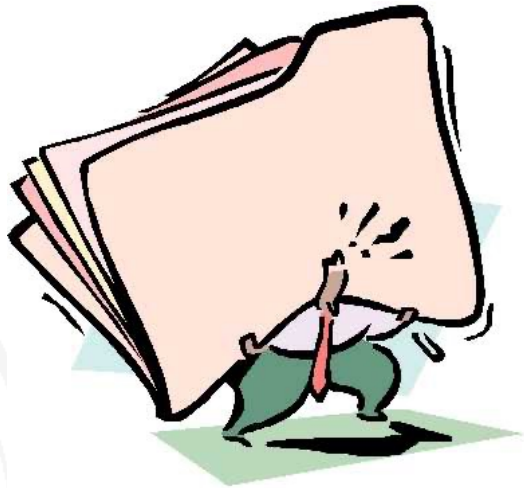
Requirements Engineering I

Chapter 10

Requirements Management

Tasks of requirements management



- Organize
  - Store and retrieve
  - Record metadata (author, status,...)
- Prioritize
- Keep track: dependencies, traceability
- Manage change

10.1 Organizing requirements

Every requirement needs

- a unique identifier as a reference in acceptance tests, review findings, change requests, traces to other artifacts, etc.
- some metadata, e.g.
  - Author
  - Date created
  - Date last modified
  - Source (stakeholder(s), document, minutes, observation...)
  - Status (created, ready, released, rejected, postponed...)
  - Necessity (critical, major, minor)

Storing, retrieving and querying

Storage

- Paper and folders
- Files and electronic folders
- A requirements management tool

Retrieving support

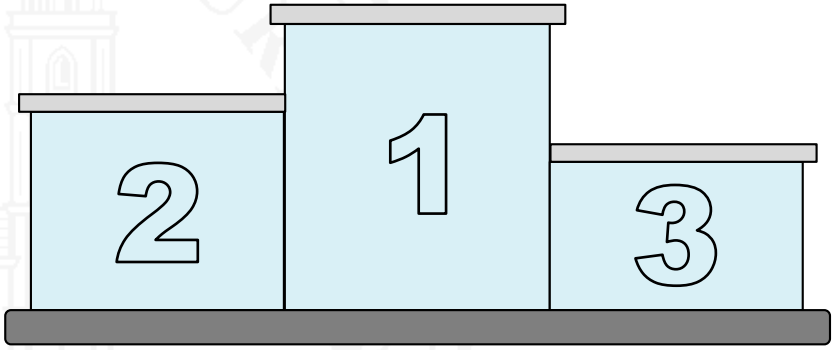
- Keywords
- Cross referencing
- Search machine technology

Querying

- Selective views (all requirements matching the query)
- Condensed views (for example, statistics)

10.2 Prioritizing requirements

- Requirements may be prioritized with respect to various criteria, for example
  - Necessity
  - Cost of implementation
  - Time to implement
  - Risk
  - Volatility



- Prioritization is done by the stakeholders
- Only a subset of all requirements may be prioritized
- Requirements to be prioritized should be on the same level of abstraction

Simple prioritization (by necessity)

Ranks all requirements in three categories with respect to necessity, i.e., their importance for the success of the system

- Critical (also called essential, or mandatory)

  The system will not be accepted if such a requirement is not met

- Major (also called conditional, desirable, important, or optional)

  The system should meet these requirements, but not meeting them is no showstopper

- Minor (also called nice-to-have, or optional)

  Implementing these requirements is nice, but not needed

Selected prioritization techniques

Single criterion prioritization

- Simple ranking

  Stakeholders rank a set of requirements according to a given criterion

- Assigning points

  Stakeholders receive a total of n points that they distribute among m requirements

- Prioritization by multiple stakeholders may be consolidated using weighted averages. The weight of the stakeholders depends on their importance

Selected prioritization techniques – 2

Multiple criterion prioritization

- Wiegers' matrix [Wiegers 1999]
  - Estimates relative benefit, detriment, cost, and risk for each requirement
  - Uses these values to calculate a weighted priority
  - Ranks according to calculated priority values
- AHP (Analytic Hierarchy Process) [Saaty 1980]
  - An algorithmic multi-criterion decision making process
  - Applicable for prioritization by a group of stakeholders
  - Application is expensive

10.3 Traceability

[Gotel and Finkelstein 1994]

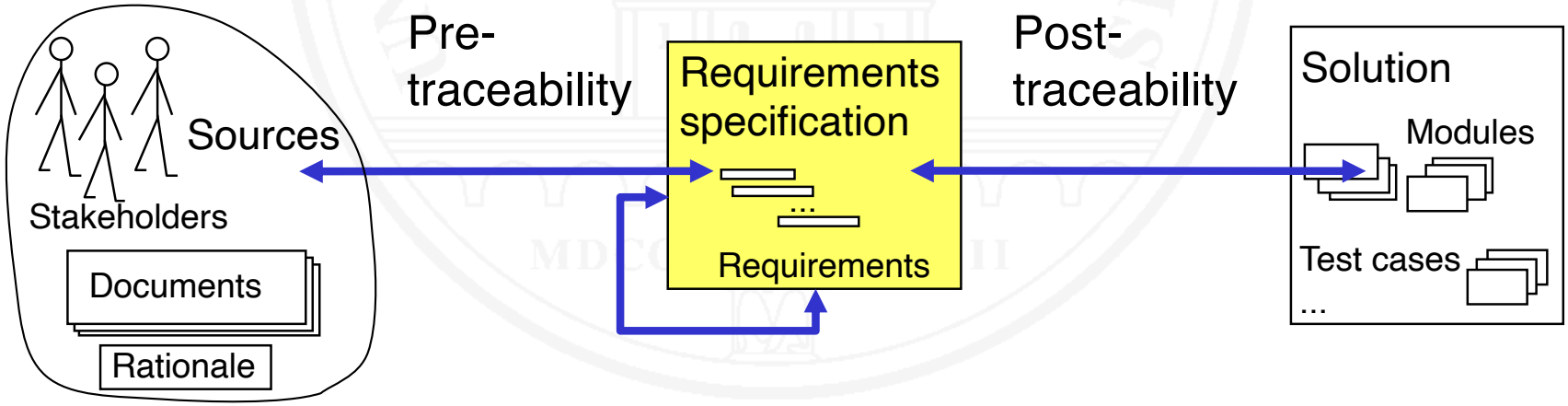
DEFINITION. Traceability – The ability to trace a requirement

(1) back to its origins,

(2) forward to its implementation in design and code,

(3) to requirements it depends on (and vice-versa).

Origins may be stakeholders, documents, rationale, etc.



Establishing and maintaining traces

- Manually
  - Requirements engineers explicitly create traces when creating artifacts to be traced
  - Tool support required for maintaining and exploring traces
  - Every requirements change requires updating the traces
  - High manual effort; cost and benefit need to be balanced
- Automatic
  - Automatically create candidate trace links between two artifacts (for example, a requirements specification and a set of acceptance test cases)
  - Uses information retrieval technology
  - Requires manual post processing of candidate links

10.4 Requirements evolution

The problem (see Principle 7 in Chapter 2):

Keeping requirements stable...

... while permitting requirements to change

Potential solutions

- Agile / iterative development with short development cycles (1-6 weeks)
- Explicit requirements change management

Every solution to this problem further needs requirements configuration management

Requirements configuration management

Keeping track of changed requirements

- Versioning of requirements
- Ability to create requirements configurations, baselines and releases
- Tracing the reasons for a change, for example
  - Stakeholder demand
  - Bug reports / improvement suggestions
  - Market demand
  - Changed regulations

Classic requirements change management

Adhering to a strict change process

(1) Submit change request

(2) Triage. Result: [OK I NO I Later (add to backlog)]

(3) If OK: Perform impact analysis

(4) Submit result and recommendation to Change Control Board

(5) Decision by Change Control Board

(6) If positive: make the change, create new baseline/release,
(maybe) adapt the contract between client and supplier

Change control board – A committee of customer and supplier representatives that decides on change requests.

Requirements change in agile development

In agile and iterative development processes, a requirements change request ...

- ... never affects the current sprint / iteration, thus ensuring stability
- ... is added to the product backlog

Decisions about change requests are made when prioritizing and selecting the requirements for the subsequent sprints / iterations

Mini-Exercise

Discuss the importance of requirements management

(a) In comparison to requirements elicitation and validation

(a) As an element of the RE process:

- Can an RE process without requirements management be successful?
- How could missing requirements management lead to failure?