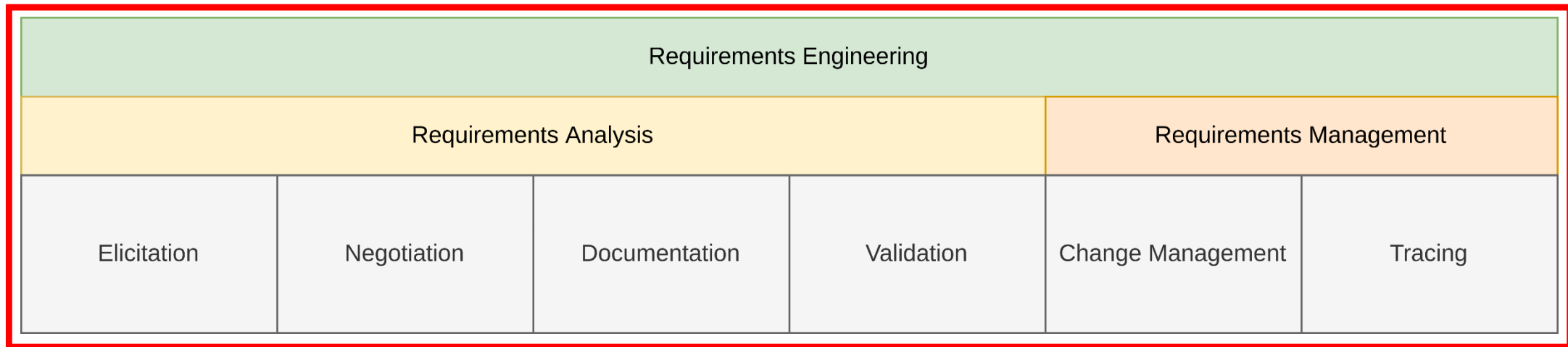# Requirement Engineering

Lecture 13: Tool Support

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General Requirements Engineering Process

Overview

Requirements Engineering					
Requirements Analysis				Requirements Management	
Elicitation	Negotiation	Documentation	Validation	Change Management	Tracing

Lecture 13: Tool Support

Content

1. Tool Support in General
2. Requirements Management Tools
3. Introducing and Evaluating Tools

TOOL SUPPORT IN GENERAL

Tool Support in General

Motivation

- Integrate and process already existing information

- Information from requirements engineering

  - Natural language requirements, models, …

- Information that is the basis of requirements

  - Minutes, goal documents, stakeholder lists, …

- In practice mostly support of requirements management

Tool Support in General

Traceability between Tools

- Usually, multiple tools are used

- Interfaces for integration and traceability required

  - Should be either available or easy to create

- Should allow tracing changes

- Should allow managing the traces

- Vital to know where changes are propagated to

Tool Support in General

Reuse of Tools from System Development

- Tools for development can often be used for requirements engineering
  - Often offer ability to manage requirements
  - Examples:
    - Test management tools
    - Bug tracking tools
    - Configuration management tools
- Advantage
  - Requirements automatically integrated with developed artifacts
  - Interface between requirements management tool and development tool not required

Tool Support in General

Wikis in Requirements Engineering

- Wikis offer a simple to use and easy to access opportunity for collaboratively working on documents

- Interesting for glossaries

  - Each wiki page defines a glossary term

- Well suited if a lot of different stakeholders are involved

Tool Support in General

Visualization Tools

- Mind mapping tools to support brainstorming sessions

  - Presentation tools can help guide through meetings and for describing rough analysis

- GUI modeling tools for prototyping user interfaces

- Flow charting tools to depict processes and work-flows

Tool Support in General

„Everyday" Tools

- Mail clients, chat software, address books, online calendars vital for communication

- Project management and controlling tools also required for managing the requirements engineering process

- Help stakeholders with the coordination of tasks

REQUIREMENTS MANAGEMENT TOOLS

Requirements Management Tools

Properties

- Manage different types of information

  - Natural language requirements

  - Conceptual models

  - Sketches

  - Test plans

  - Change requests

- Manage logical relationships

  - Traceability

- Allow unique identification

  - Unique Ids for every artifact

Requirements Management Tools

Properties

- Editors for managed information

  - Multi-user access

  - Access control

  - Configuration management

  - Version management

- Different views on information

  - Developer view

  - Tester view

  - View on partial systems

Requirements Management Tools

Properties

- Organization of managed information

  - Grouping

  - Hierarchical structuring

  - Assigning attributes

  - Annotation with additional information

- Generation of reports and summaries

  - Reports of change requests

  - Reports on state of the requirements implementation

- Generation of appropriate outputs

  - Requirements document for a system release

Requirements Management Tools

Special Purpose Tools

- Comprehensive list:

  - http://www.volere.co.uk/tools.htm

- Examples

  - Enterprise Architect (Sparx Systems)

  - HP Quality Center

  - IBM Rational DOORS

Requirements Management Tools

Standard Office Tools

- Word processors, spreadsheet calculators

- Used in many projects due to multiple reasons

- <u>Advantages</u>

  - Are already available

  - No additional training required

  - Versatile

  - Well-suited for natural-language requirements

  - Adapted for requirements management, e.g., by using templates and predefined document formats

  - Allow traceability to some degree through hyperlinks

Requirements Management Tools

Standard Office Tools

- <u>Disadvantages</u>

  - Do not offer version control on the level of requirements

  - Do not directly support requirements engineering, e.g., traceability links often have to be maintained manually

- Drawbacks can be worked around

  - Still, the efficiency is lower than with a dedicated tool

INTRODUCING AND EVALUATING TOOLS

Introducing and Evaluating Tools

Before Introducing Tools

- Tools support existing processes

    - Process needs to be in place

    - Responsibilities must be clear

    - Techniques must be known

    - People must be able to follow all this

    → „Automating chaos just gives faster chaos" (Dorothy Graham)

Introducing and Evaluating Tools

Before Introducing Tools

- Choice and introduction of tool costs resources

  - Licensing costs

  - Training costs

  - Customization costs

  - Support costs

  - Not only current, but possible future efforts

  - Adaption of already existing artifacts may further increase the costs

Introducing and Evaluating Tools

Before Introducing Tools

- Introduction into already started projects difficult

  - Structure in place

  - Existing concepts would have to be replaced

  - Effort and risk can be estimated

  - Often underestimated due to multiple factors

- Employee resistance

- Tool deficiencies

Introducing and Evaluating Tools

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Instead →

Introducing and Evaluating Tools

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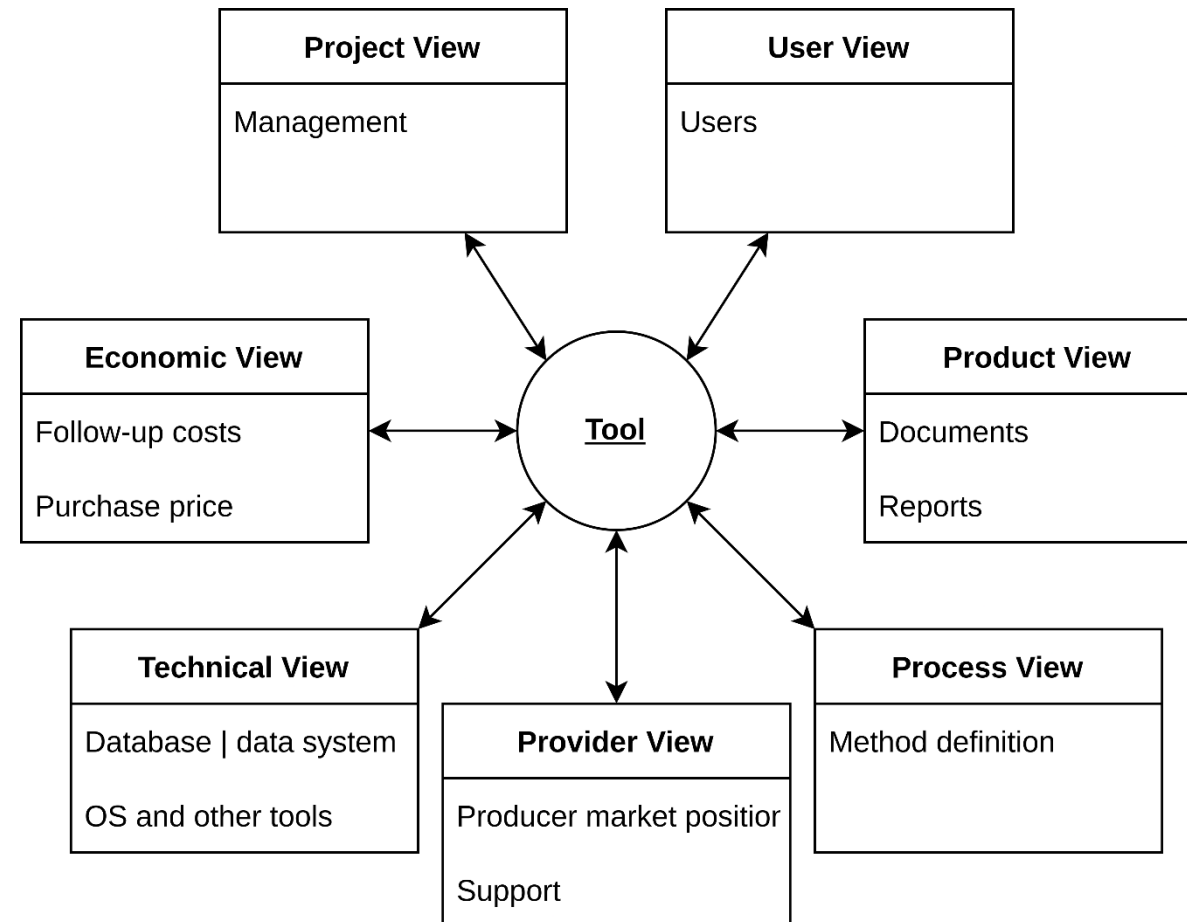- Employee resistance

- Tool deficiencies

Instead → pilot project

Introducing and Evaluating Tools

Evaluation of Tools

- Different perspectives matter for tools

  – Project view

  – User view

  – Product view

  – Process view

  – Provider view

  – Technical view

  – Economic view

- Should be taken into account when evaluating tools

  – Criteria for all views should be defined

Introducing and Evaluating Tools

Views on RE Tools

Based on K. Pohl, C. Rupp (2011) – Requirements Engineering Fundamentals: A study guide for Requirements Engineering Foundation Level

Requirements Engineering – TU Clausthal

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Introducing and Evaluating Tools

Views on Tools: Project View

- Extent to which a tool can support a project

- Project preparation
  - Definition of project-specific information types
  - Definition of project-specific document formats
- Project planning
  - Scope of milestones
  - How information managed by the tool pertains to milestones
- Project execution
  - Project control, e.g., completion of requirements

Introducing and Evaluating Tools

Views on Tools: User View

- Tool requirements from the user's perspective

- Tool usage
  - Access to appropriate functions required
- Mapping of roles
  - Stakeholders mapped to roles through user management and access rights
- Support of group work
  - Multiple users should be able to work collaboratively

Introducing and Evaluating Tools

Views on Tools: Product View

- Concerned with the functionalities possed by a tool

  - For example, for different documentation types

- Considerations

  - Supported document types

  - Views on requirements

  - Reports that can be generated

  - Traceability

Introducing and Evaluating Tools

Views on Tools: Process View

- From the perspective of method support

  - How does a tool support the application of a specific technique?

- Ability to document activities

- Method guidance

  - Strict and restrictive guidance (e.g., wizards)

  - Lenient guidance (e.g., suggestions and hints)

- Project-specific process model definition

  - e.g, phases

Introducing and Evaluating Tools

Views on Tools: Provider View

- Market position and services offered by the tool manufacturer

- Brand awareness and reputation often important criteria

- High costs and required long-term support require strong commitment

Introducing and Evaluating Tools

Views on Tools: Technical View

- Considers technical context

- Ability to integrate the tool with existing tools

  - Evaluate APIs

- Performance of the tool

  - Evaluate how long importing/exporting data takes

- Scalability

  - Maximum number of users/objects

- Hardware and software requirements

Introducing and Evaluating Tools

Views on Tools: Economic View

- Considers costs
  - Due to acquisition
  - Introduction
  - Maintenance
  - Integration costs
  - Operation costs
  - Method tailoring

SUMMARY

Summary

- Different kinds of tools available

  - Special RE tools vs. general purpose tools

- A good process comes before a good tool

- Whatever the tool, its use must be fitting for the process

- New tools should be introduced in a pilot

  - Evaluating new tools is time consuming

Questions?