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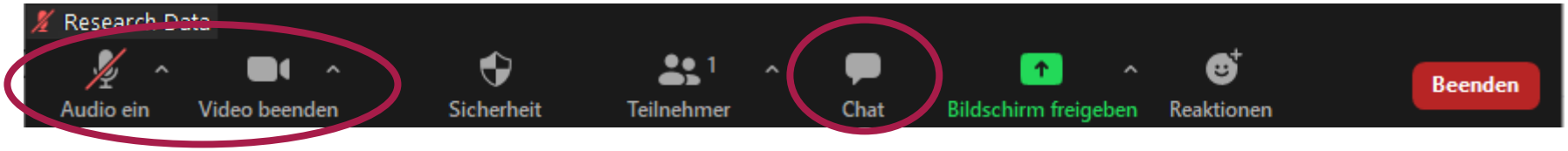
Requirements Engineering

(An Introduction to) Requirements Engineering

Housekeeping Rules

- Please turn on your camera (if possible)
- Stay muted
- Feel free to ask questions in the chat or by raising your hand.



- Slides will be available through Moodle (for license info see last slide)

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Check-in: How are you feeling today and what are your expectations on today‘s session?

Please go to Miro:
https://miro.com/app/board/uXjVKMFsPcQ=/?share_link_id=106396018858

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Introduction

What Is Requirements Engineering (RE)?

„The systematic and disciplined approach to the specification and management of requirements with the goal of understanding the stakeholders' desires and needs and minimizing the risk of delivering a system that does not meet these desires and needs."

Glinz, Martin. A Glossary of Requirements Engineering Terminology. Standard Glossary for the Certified Professional for Requirements Engineering (CPRE) Studies and Exam. University of Zurich, Department of Informatics. Requirements Engineering Research Group. Version 2.0.1. July 2022. © 2011 – 2020 International Requirements Engineering Board IREB e.V. and Martin Glinz

Problems when developing new systems

- Missing or unclear objectives
- High complexity of the task
- Constantly changing goals and requirements
- Poor quality of requirements
- Implementation starts too quickly
- Communication problems between stakeholders
- Assumption that requirements are self-evident

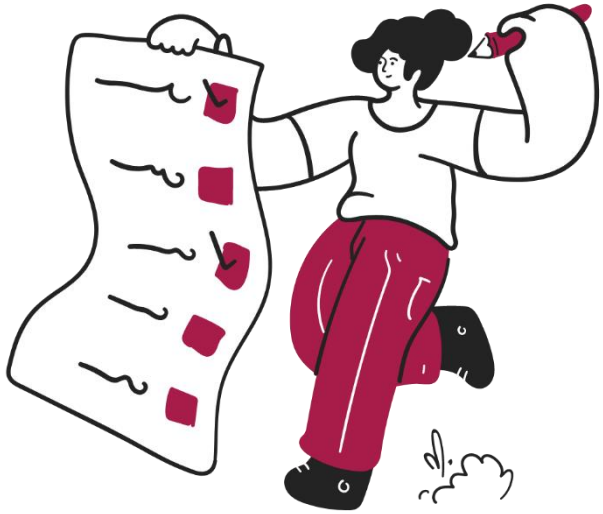
Why Do We Need RE?

- To lead projects to success
- To identify all relevant stakeholders
- Better understanding of requirements
- Minimize errors
- Basis for contracts, cost or effort estimate

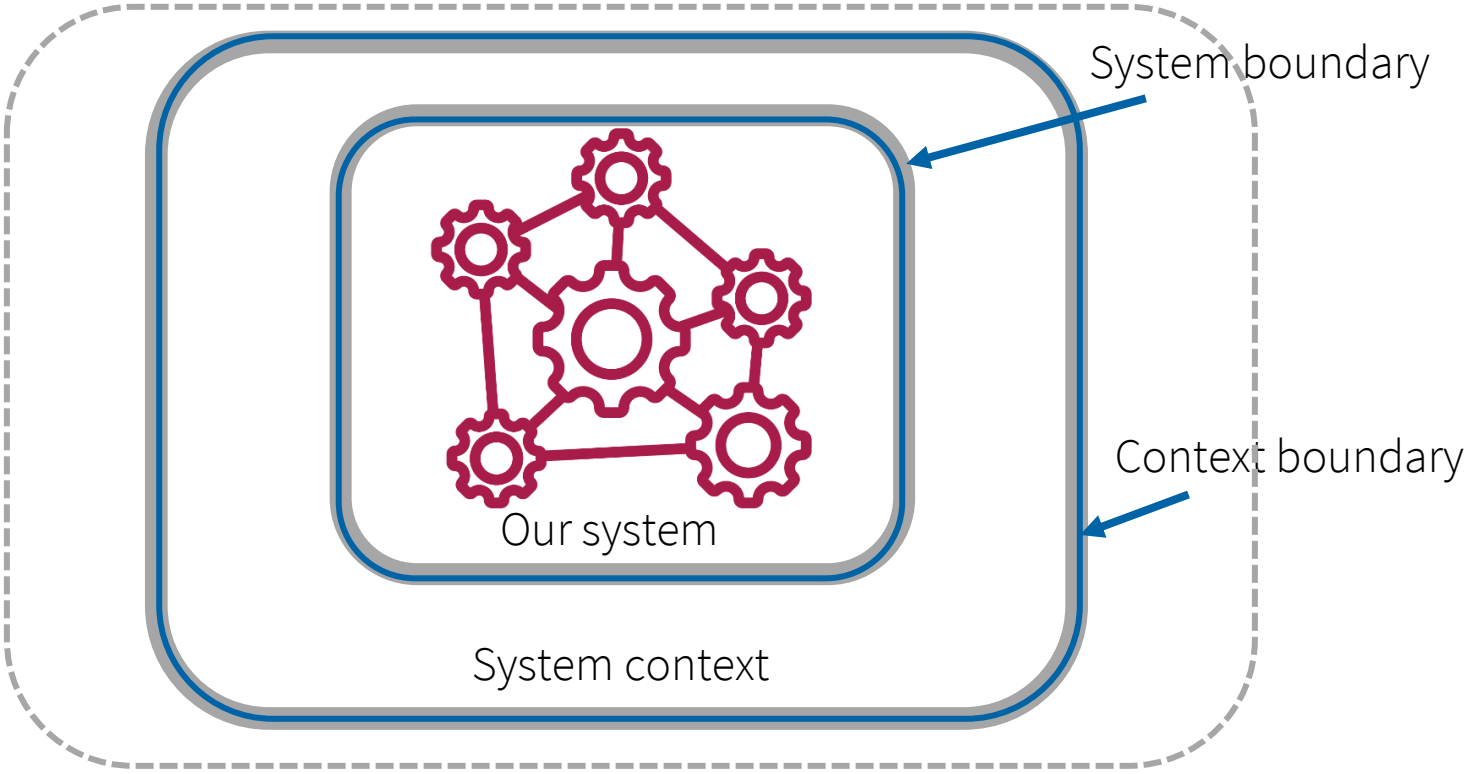
all persons or organizations who influence a system's requirements or who are impacted by that system

The Requirements Engineer – A Separate Job or a Role?

- Participation in the RE process
- Profound knowledge of RE
- Dealing properly with stakeholders requires:
  - Analytical thinking
  - Empathy
  - Communication skills
  - Conflict resolution skills
  - Moderation/Presentation skills
  - Confidence
  - Persuasiveness



System Analysis



What Is Requirements Engineering (RE)?

Elicitation

Specification

„The systematic and disciplined approach to the specification and management of requirements with the goal of understanding the stakeholders' desires and needs and minimizing the risk of delivering a system that does not meet these desires and needs."

Management

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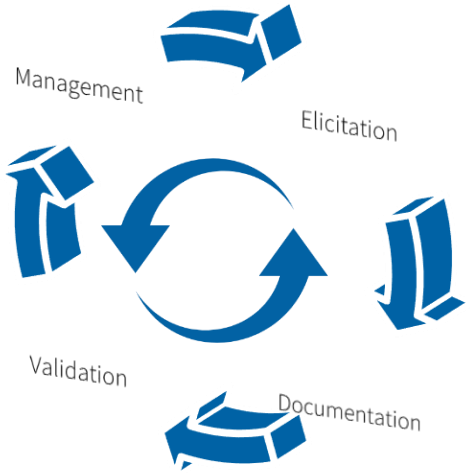
Phases of RE

Phases of RE – 2



ELICITATION	DOCUMENTATION	VALIDATION	MANAGEMENT

• Identify stakeholders
• Determine desires and needs of stakeholders
• System analysis
	• Specifying and documenting requirements in the most suitable form.	• Quality assurance
		  • Error detection
		  • Remedying errors
			• Saving, changing, tracking changes, etc.

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WordCloud: Were there ever any situations in your career when you had to use RE? If so, can you give us some examples?

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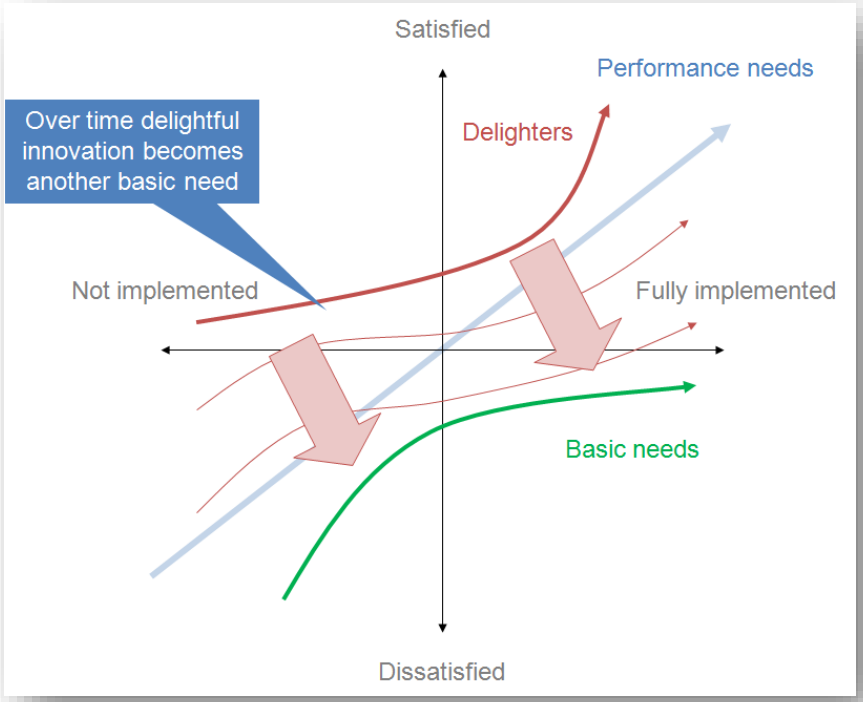
Elicitation

The process of finding, collecting and consolidating requirements

Categories of Requirements

- Dissatisfiers:
  - MUST
  - implicit (subconscious) requirements, if not implemented, increase dissatisfaction
- Satisfiers:
  - SHOULD
  - explicit requirements
- Delighters:
  - CAN
  - Implicit wishes, in many cases customer does not even realize they want it implemented



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The KANO-model

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Sources of Requirements

Capture:
Name, function, contact details, availability, relevance, area, scope of expertise, objectives and interests related to the project

- Stakeholder
  - People or organizations
- Documents:
  - Training material for the legacy system
  - Standards and norms
  - …
- Systems:
  - Legacy systems but also systems of competitors

Elicitation Techniques

- Creativity techniques:
  - Brainstorming, changing perspectives, …
- Observation techniques:
  - Field observation, apprenticing, …
- Interview techniques:
  - Questionnaires, interviews, …
- Other techniques:
  - Workshops, mind maps, artifact-based techniques (e. g. system archeology), use cases, …

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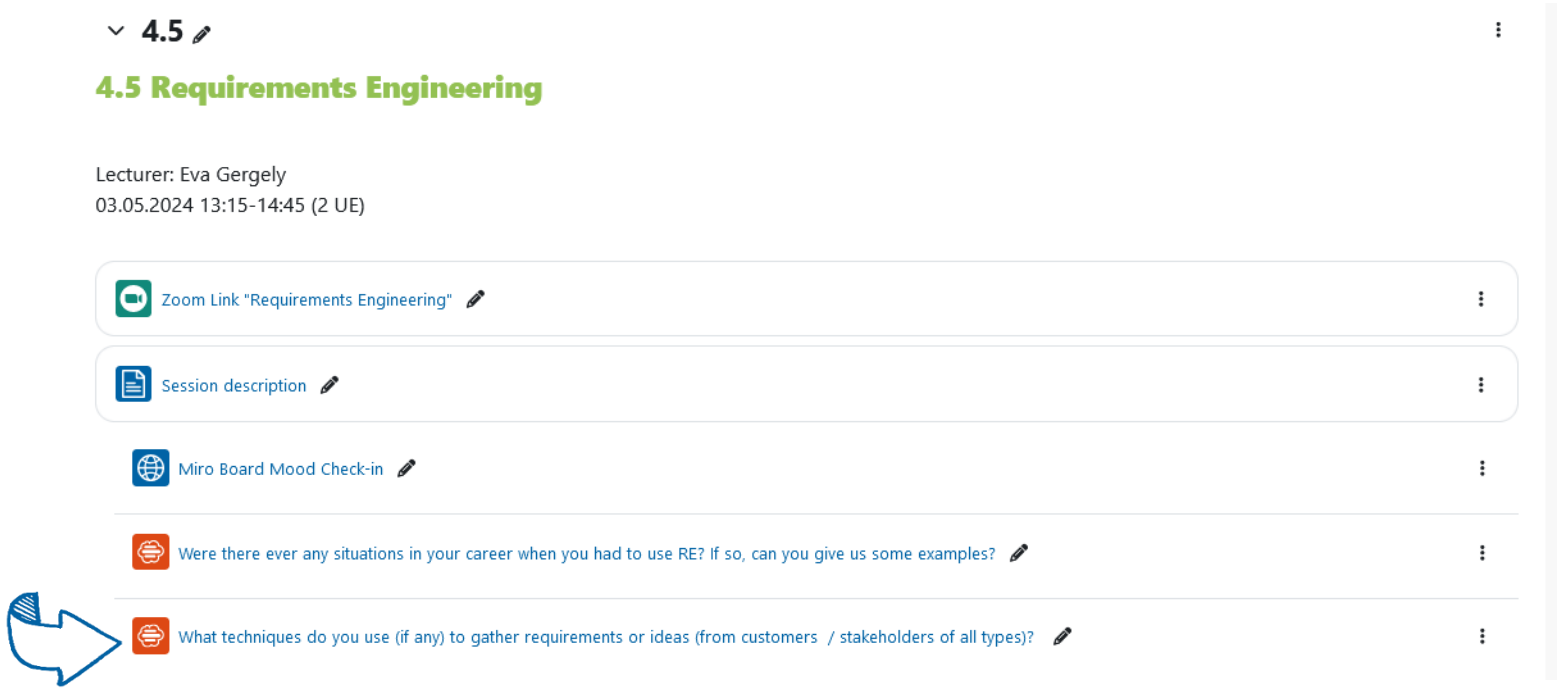
WordCloud: What techniques do you use (if any) to gather requirements or ideas (from customers / stakeholders of all types)?



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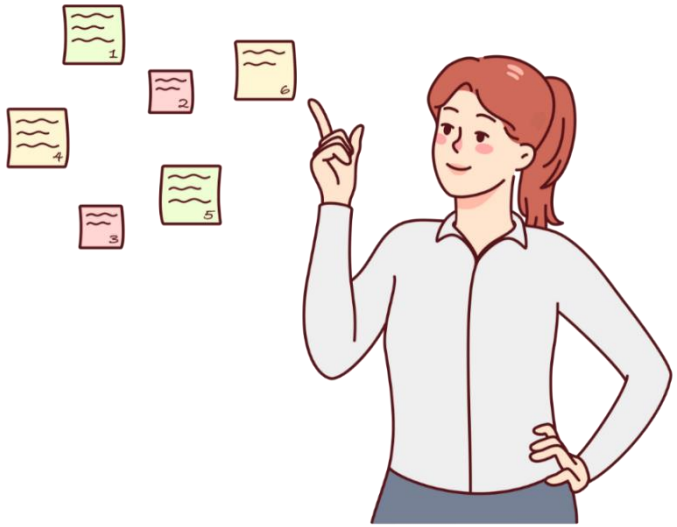
Documentation

Documenting requirements and creating a baseline

Documentation

- Many ways to document your requirements
  - Important: where you store them, metadata, version control
  - Create a baseline

A stable, change-controlled set of requirements

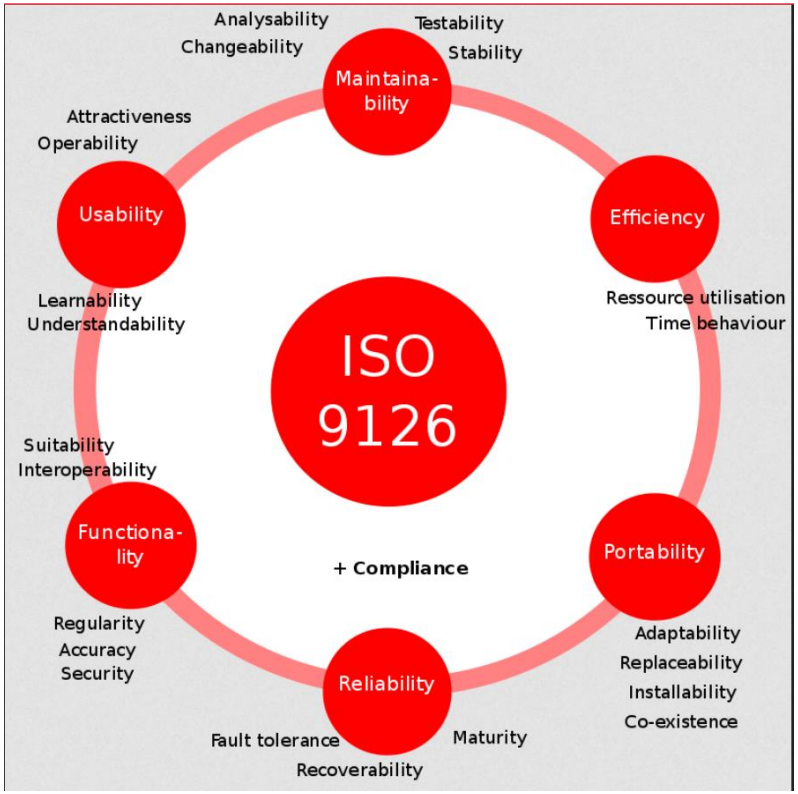


- Many specification levels → Decide which levels you want to cover
  - Do not mix different levels

Types of Requirements

- Functional requirements
- Quality requirements
- Constraints

Functional vs. non-functional requirements (→ concerning the development process, maintenance of or support for the system)



The ISO 9126 Software quality standard
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Keywords

Legally binding

Commitment	English	German
Obligatory feature	Shall	Muss
Desired feature	Should	Sollte
Intended feature	Will	Wird

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Natural-Language-Based Documentation

Benefits	Downsides
No special skills required for reading and understanding	Different interpretations possible
Natural language is extremely expressive and flexible	Ambiguities, omissions, inconsistencies
Suitable for almost any type of requirement	

Use:

- Short and well-structured sentences
- Consistent and standardized terminology

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Natural-Language-Based Documentation II

Avoid:

- Including several requirements in one sentence
- Imprecise or ambiguous terms
- Unspecific nouns
- Incomplete conditions: *"The restaurant system shall display all beverages offered on the premises to a registered user over the age of 17."*
- Incomplete comparisons

Use catiously:

- Passive phrases
- Universal quantifiers („all“, „always“, „never“, …)
- Nominalizations („authentication“)

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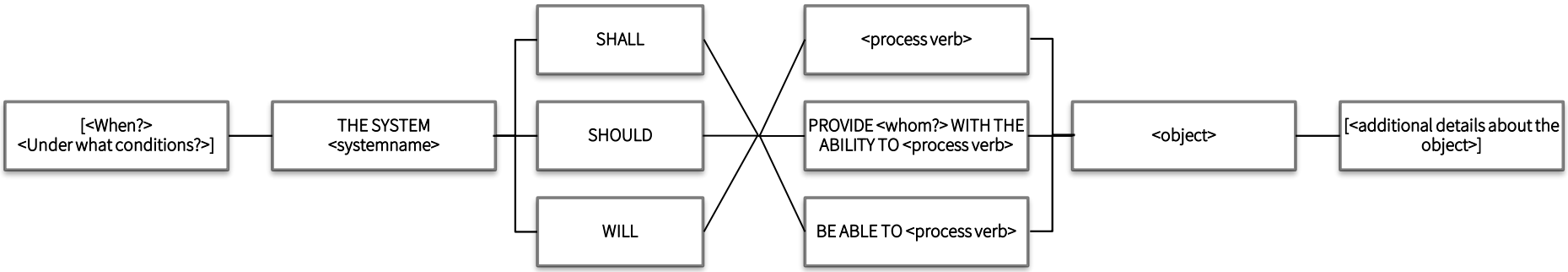
Template-Based Documentation

Benefits	Downsides
Offers a clear, reusable structure	The template may tempt you to focus more onon the formal criteria of the templatethan on the content.
Uniform wording of the requirements	Aspects that are not included in the template may be omitted by mistake.
Improves the overall quality of our list of requirements	

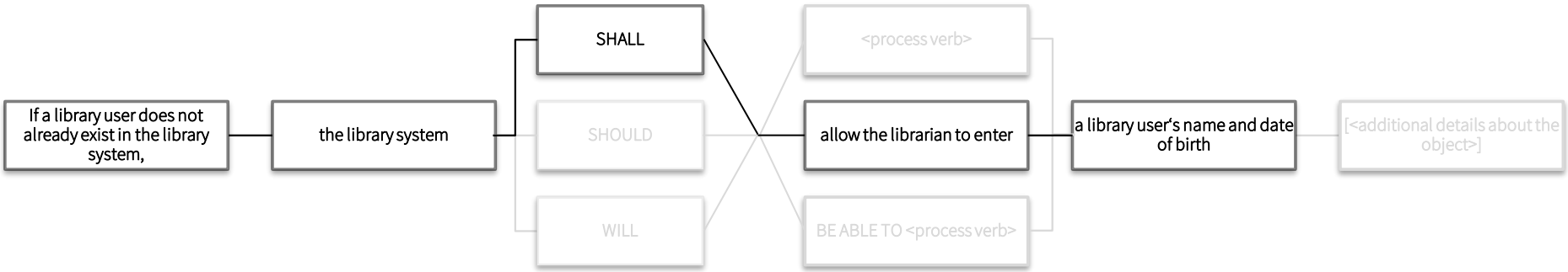
For example:

- Natural language templates
- Form templates
- Document templates

Template-Based Documentation: Requirements Template



Template-Based Documentation: Requirements Template 2



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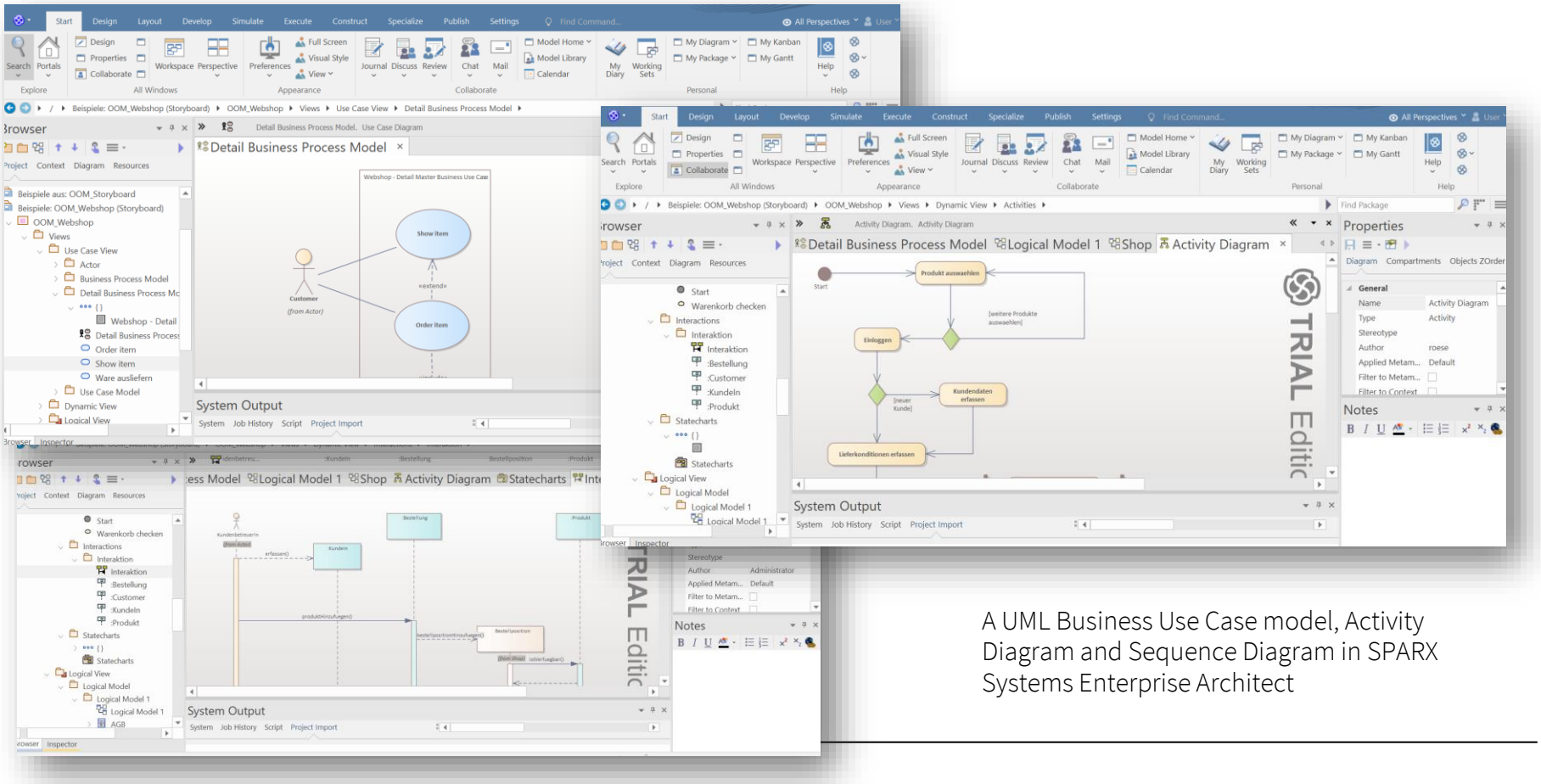
Model-based Documentation

Benefits	Downsides
The relationships between requirements are easier to understand with (graphical) models than innatural language.	Keeping multiple models consistent with each otheris a challenge.
The fact that they focus on one aspect, makes it easier to understand them.	Quality requirements or constraints often cannot be expressed in models.
Modeling languages have a restricted syntax → reduces ambiguities and omissions	Not every relevant piece of information can bebe expressed in a model.

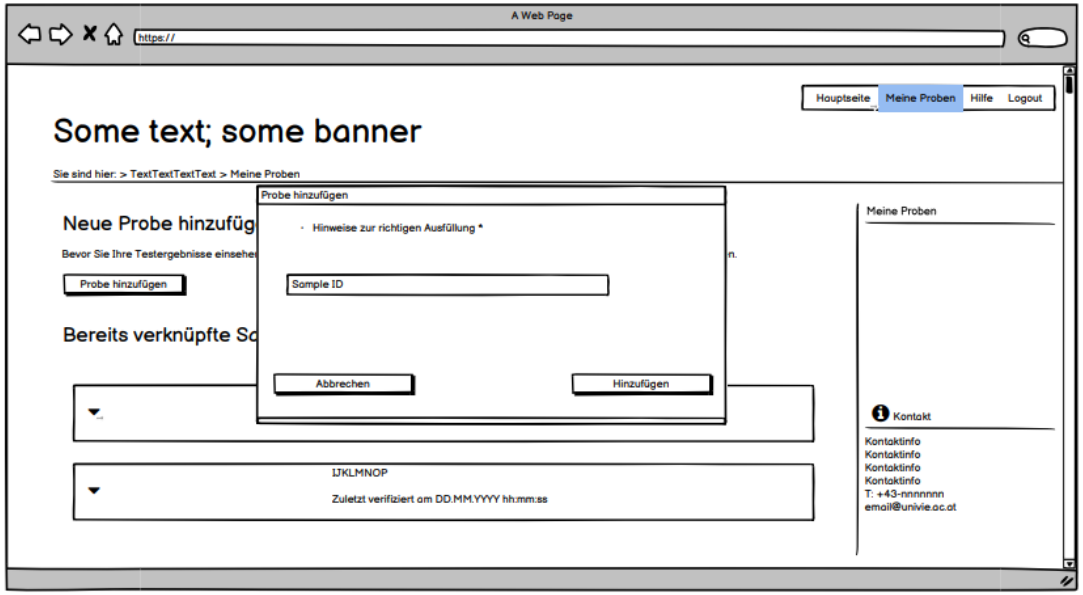
Model-based Documentation



A UML Business Use Case model, Activity Diagram and Sequence Diagram in SPARX Systems Enterprise Architect

Prototypes

- Explorative prototypes:
  - Wireframes
  - Mock-Ups
  - Native prototypes



Balsamiq wireframe

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Validation

Quality assurance and making sure the requirements are accepted

Validation

- Requirements should be accepted by stakeholders and meet quality standards
- Quality criteria
- Identify discrepancies, errors, shortcomings
- At minimum:
  - Adequacy
  - Comprehensibility

Quality Criteria for Requirements

- One requirement per sentence
- Short sentences

- Adequacy
- Unambiguity
- Validity
- Consistency
- Verifiability
- Realizability
- Traceability
- Completeness
- Comprehensibility
- …

Quality Criteria for Requirements

Content:

- Completeness
- Traceability
- Verifiability
- Consistency
- Realizability
- …

Documentation:

- Comprehensibility
- Unambiguity
- Validity

Alignment with stakeholder desires:

- Adequacy
- …

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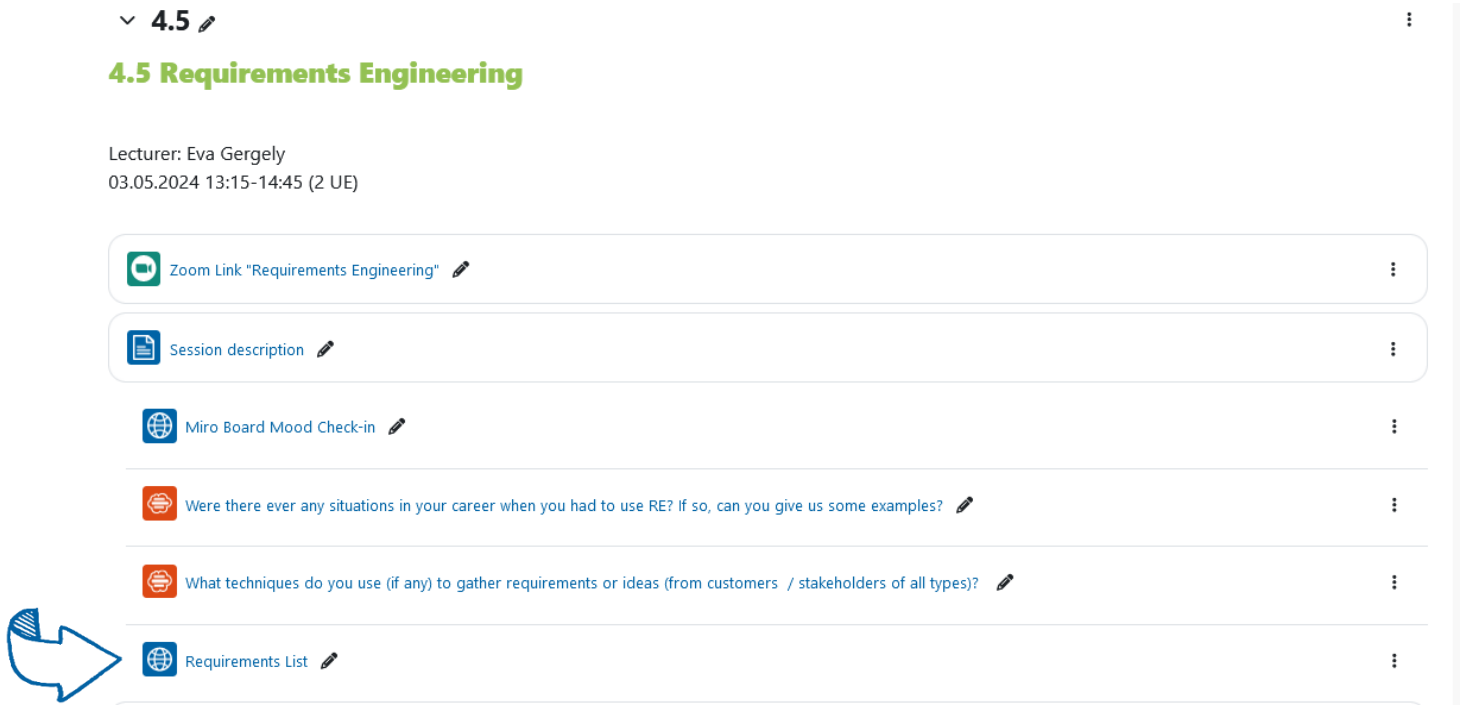
Please open the document „Requirements List“ on Moodle and analyze and comment its contents!



Validation

- Involve stakeholders
- Prepare for and solve conflicts
- Employ validation techniques:
  - Review techniques
    - Walkthroughs
    - Inspections
  - Exploratory techniques
    - Prototyping
    - MVP
    - …

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Storing, modifying and tracking changes

Management

Prioritization

1. Define goals
2. Define evaluation criteria
3. Create a list of stakeholders we want to involve
4. Select requirements for prioritization
5. Choose priorization technique
6. Prioritize!

Requirements Management

Status change → version change

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Questions?

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Thank you for your attention!

Sources:

Pohl, K., Rupp, C. Basiswissen Requirements Engineering. Aus- und Weiterbildung nach IREB-Standard zum Certified Professional for Requirements Engineering. Foundation Level. 3. Auflage. 2011. dpunkt. 978-3-89864-771-7 (ISBN)

Rupp, C., die SOPHISTen. Requirements-Engineering und –Management. Professionelle, iterative Anforderungsanalyse für die Praxis. 5. aktualisierte und erweiterte Auflage. 2009. Hanser, Carl. 978-3-446-41841-7 (ISBN)

Glinz, Martin. A Glossary of Requirements Engineering Terminology. Standard Glossary for the Certified Professional for Requirements Engineering (CPRE) Studies and Exam. University of Zurich, Department of Informatics. Requirements Engineering Research Group. Version 2.0.1. July 2022. © 2011 – 2020 International Requirements Engineering Board IREB e.V. and Martin Glinz

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https://www.studocu.com/en-nz/document/auckland-university-of-technology/data-and-process-modelling/exercise-2-writing-good-requirements/7496593