Introduction to Requirements Engineering

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Qure, CORE & REflex projects
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Goals of the session

Students know

- what requirements engineering (RE) means
- why RE is important
- which RE practices are recommended.
Agenda

- Overview of requirements engineering
- Different types and levels of requirements
- A small set of good RE practices
- Summary
Basics of Requirements Engineering

- requirements definition
- requirements management
- specification & design & coding & module/integration/system testing
- acceptance testing
Basics of Requirements Engineering

Requirements engineering covers all of the activities involved in discovering, documenting, and maintaining a set of requirements for a system. The term engineering implies that systematic and repeatable techniques should be used to ensure that system requirements are complete, consistent, relevant etc. [Som97]
Basics of Requirements Engineering

**Requirements engineering**

covers all of the activities involved in discovering, documenting, and maintaining a set of requirements for a system. The term engineering implies that systematic and repeatable techniques should be used to ensure that system requirements are complete, consistent, relevant etc. [Som97]

**Requirements engineering**

means that requirements for a product are defined, managed and tested systematically. The purpose of RE is to ensure that products satisfy customer and user needs i.e. provide value for customers and users [Qure, CORE & Reflex].
Basics of Requirements Engineering

Requirements engineering

Requirements definition
- Elicitation
- Analysis
- Representation
- Validation

Requirements management
- Change management
- Status tracking

Acceptance testing
- Document-based practices
- Collaboration-based practices
Benefits of RE [RE literature]

- Well-documented requirements
  - are an agreement between the customers and suppliers on what is to be developed
  - provide the basis for specification and design
  - support testing
  - reduce rework
Benefits of RE in real projects [Qure]

- Without knowing customer needs, it is impossible to develop a good product.

- Requirements
  - describe the **collectively accepted objectives**.
  - improve **commitment and motivation** of the project members.
  - improve **communication** outwards from the project.
  - are the basis for systematic product development.
  - are the basis for project planning.
Different Types of Requirements

- **Requirement**: A function, constraint or other property that the system must provide to fill the needs of the system’s intended user(s) [Abb86].
  - **Functional requirement** – A requirement that specifies a function or service that a system must be capable of performing.
  - **Non-functional requirement** – A requirement that describes the property of the system including performance, reliability, usability etc.
  - **Constraint** - Standards, software and hardware constraints etc

Typical view in the RE literature
Levels and types of requirements

Customer and user needs

- Business requirements
- User requirements
- Technical requirements

Functional requirements
Non-functional requirements
Constraints
Different levels of requirements

- **Business requirements**
  - Scoping and guiding
- **User needs**
  - Who uses and why?
- **User requirements**
  - What should the system do to satisfy user needs?
  - Users’ point of view
- **Technical requirements**
  - How is the system implemented?
  - Technical point of view
State of the RE Practice

Level of abstraction increases => number of details decreases

- Business requirements
- User requirements
- Technical requirements

The focus in many projects

Functional requirements
Non-functional requirements
Constraints
Requirements Definition Process

- Requirements definition
- Requirements management
- Specification & design & coding & module/integration/system testing
- Acceptance testing
Requirements Definition Process
An Iterative Model

- Elicitation
- Analysis
- Representation
- Validation

Business goals → Elicitation → Analysis → Representation → Validation → An approved set of requirements
Requirements Definition Process

- Elicitation and analysis practices:
  - Identify user groups
  - Discover customer and user needs actively by interviewing and observing
  - Prioritize needs i.e. identify essential needs from users’ point of view
Requirements Definition Process

- Representation practices:
  - Apply use cases to document functional requirements
    - Use case diagrams for describing the overview of system
    - Use case descriptions for documenting functional requirements from users’ point of view
Requirements Definition Process

- Validation practices:
  - Use multi-disciplinary teams to review requirements
  - Organize informal inspections for a small set of requirements
Agile methods: RE related practices in Scrum [Schwaber 2004]

- **Product Backlog**
  - The list of prioritized requirements (??)
  - Product owner responsible for contents and prioritization (??)
  - Dynamic; *management constantly changes the product backlog* to identify what the product needs to be appropriate, competitive, and useful (??)

- **Sprint Backlog (a month)**
  - The tasks that a Team defines for turning the product backlog into an increment of *shippable product functionality* (??)
  - New functionality demonstrated at the end of Sprint (??)

?? How to perform these practices successfully in real product development projects?
Good principles from agile methods

- Customer involvement (XP)
- Linking requirements and testing (XP)
- Collaboration (Scrum)
- Linking requirements and project planning (Scrum)

What about good old requirements practices?
Summary: Good old RE practices

- Elicitation: Discover customer and user needs actively
- Analysis: Prioritize customer and user needs
- Representation: Apply use cases for representing requirements
- Validation: Use multi-disciplinary teams to review requirements

Do not forget the importance of communication and collaboration.
Summary

Lessons learned from practice:

- Deep understanding of user needs is essential and challenging.
- Requirements improve
  - commitment and motivation of project members
  - communication.
- Requirements are the basis for
  - systematic product development
  - project planning.
Requirements Engineering: The Heart of Software Engineering

Useful and successful products and systems that provide value for customers and users
Glossary: Key concepts

- **User**: The person who operates directly with the system [IEE98].

- **Customer**: The person who pays for the system and usually (but not necessarily) decides the requirements [IEE98].

- **User needs** refer to problems that hinder users in achieving their goals, or opportunities to improve the likelihood of users’ achieving their goals [Kuj02].

- **User requirement**: A user requirement is an externally visible function, property or constraint that the system must provide to fill the needs of the system’s intended users.
References


