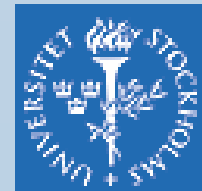




Lecture 2: Requirements Elicitation, Analysis and Negotiation

Course book: *Chapter 3*





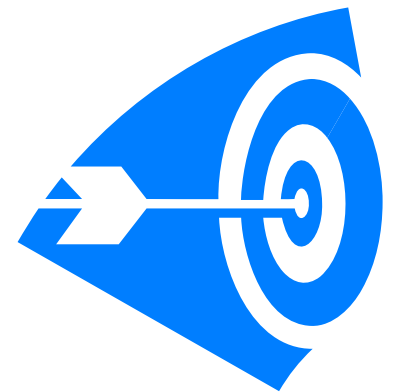
Lecture Objective

The objective of this lecture is to describe the major activities of the RE process:

requirements elicitation,

requirements analysis and

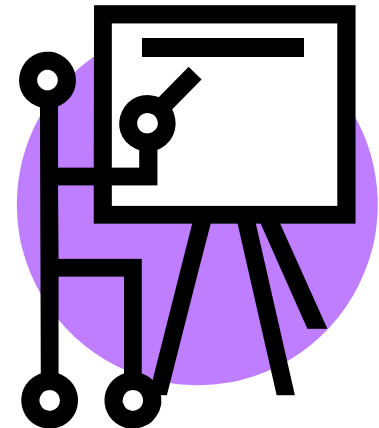
requirements negotiation





Content

- **Overview of the requirements elicitation, analysis and negotiation activities**
- **Requirements elicitation and related techniques**
- **Requirements analysis**
- **Requirements negotiation**





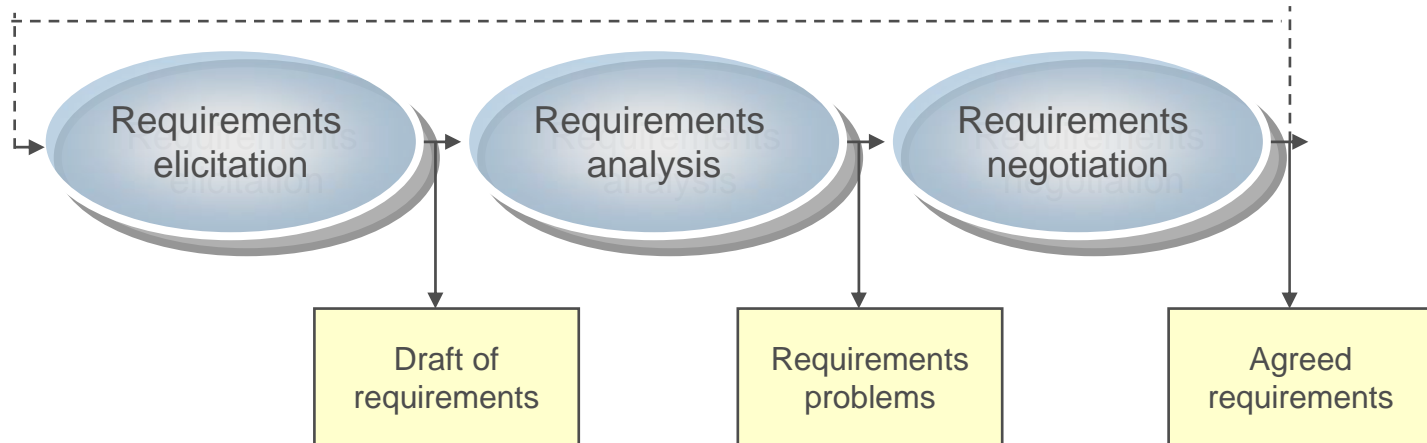
Overview

- Requirements elicitation is the activity concerned to *discovering* the requirements for a system.
 - The activity typically engages system end-users, and requirements engineers. In GORE, customers may also be involved.
 - The activity includes a profound analysis of the business of an organization, or a business-to be.
- Requirements analysis and negotiation are activities which objective is to *establish a complete, consistent and agreed set* of requirements.



Overview

- The activities and the artifacts:
 - *Draft of requirements* – an initial version of requirements including a number of written statements
 - *Requirements problems* – include topics for discussion and negotiation
 - *Agreed requirements* – an agreed collection of requirements

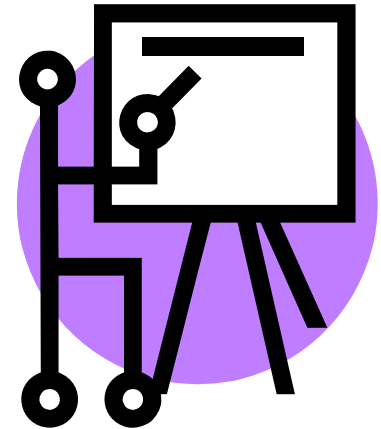


The above activities (as well as documenting) are commonly executed iteratively!



Content

- Overview of the requirements elicitation, analysis and negotiation activities
- **Requirements elicitation and related techniques**
- Requirements analysis
- Requirements negotiation





Requirements Elicitation

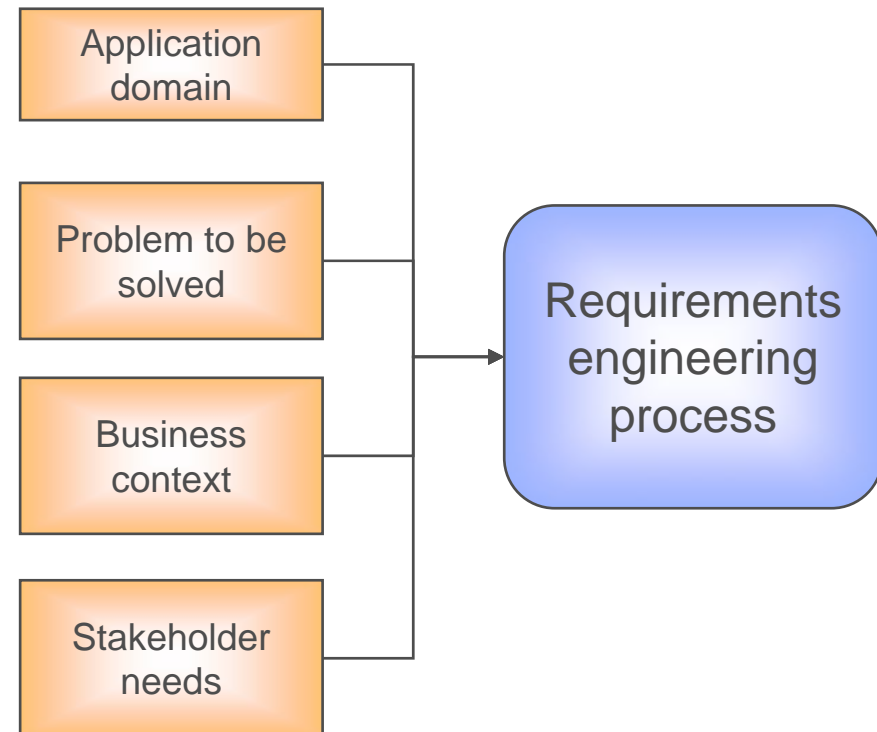
- Requirements elicitation is about identifying the needs of stakeholders.
- Customers often do not know what they want, and thereby, could be hard for the requirement engineer to discover all the necessary requirements.
- For that reason, should the requirement engineer work close with stakeholders and understand first the problem to be able further to concretize the requirements.



Requirements Elicitation – Input

During the requirements elicitation process, a good requirements engineer should obtain a profound *understanding* of the four requirements dimensions:

- Application domain
Understand the business domain
- Problem to be solved
Understand the problem and the need for the new system
- Business context
Understand how the solution will contribute to the business
- Stakeholder needs
Understand the specific needs and demands of stakeholders





Requirements Elicitation – Input

Eye-care example:

- Application domain

Understand the major primary eye-care activities.

- Problem to be solved

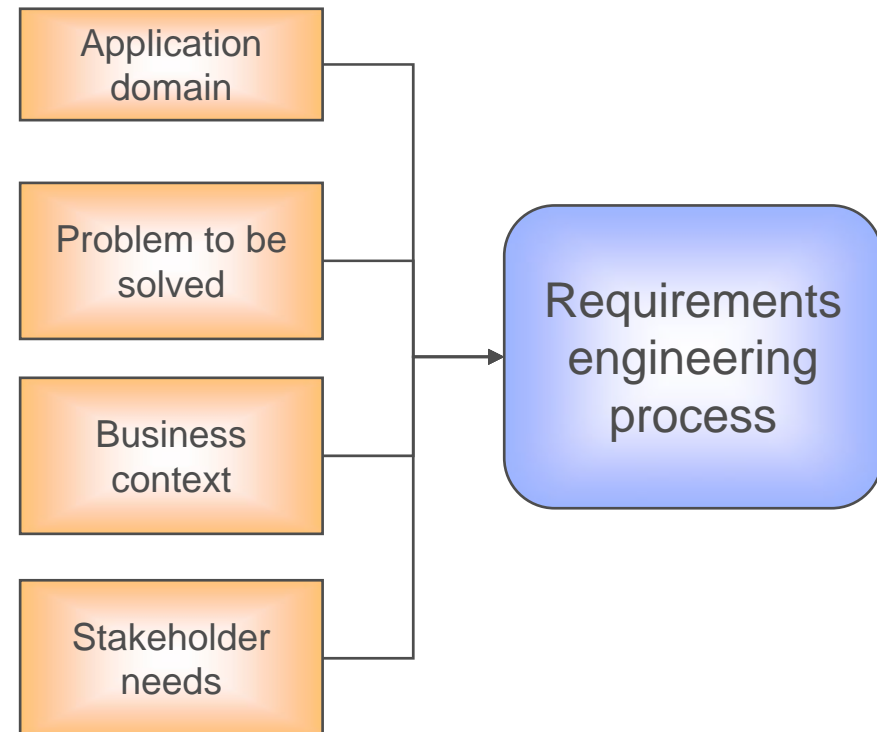
Understand the problems with current manual operations, such as referral handling and how the problems could be solved with a new IS.

- Business context

Understand how the IS solution will improve day-to-day eye-care activities.

- Stakeholder needs

Understand the specific needs of primary doctors, nurses, in respect to a new IS.





Requirements Elicitation- Techniques

- Interviews/Questionnaires
- Existing Documentation
- Interaction Scenarios
- Prototyping
- Observations



Requirements Elicitation- Techniques

Interviews/Questionnaires

- It is very commonly used technique.
- Open vs. closed – no pre-defined agenda vs. a pre-defined set of questions. It is common to go from closed to open interviews during the elicitation phase.
- 2 essentials for interviewing:
 - The interviewer must be open-minded and willing to listen stakeholders
 - Stakeholders must be given some starting point for discussion.
- Some of the starting questions in interviews or questionnaires are:
 - *“Who are the stakeholders for the future system?”*
 - *“What is the subject of your business/work/need?”*



Requirements Elicitation- Techniques

Existing Documentation

- The technique involves reading and reviewing of available documentation, such as:
 - Procedures of manual tasks
 - Specifications or user manuals for automated tasks



Requirements Elicitation- Techniques

Interaction Scenarios

- Stakeholders find it easier to relate to real-life examples rather than abstract descriptions of the functions to be provided by the new system.
- Interaction scenarios are examples of interaction sessions, which are concerned with a single-type of interaction between an end-user and the system.
- Example: *the primary doctor describes how he registers the eye problem for the patient.*
- The technique is the most useful when eliciting detailed system requirements, such as *use-case flows*.



Requirements Elicitation- Techniques

Prototyping

- A prototype of a system is an initial version of the system which is available early in the development process.
- An essential requirement for a prototype is that it should be possible to develop it quickly.
- The main benefit of developing a prototype during requirements elicitation is that it allows customers and system end-users to experiment with the system.
- Throw-away vs. evolutionary prototyping:
 - Throw-away prototypes are used for the requirements that are critical to customers or which are difficult to understand.
 - Evolutionary prototypes are built on on the requirements that are well-understood and which can deliver useful end-user functionality.



Requirements Elicitation- Techniques

Observation

- Involves observing people in their normal work.
- Ethnography – the approach involves an observer spending an extended period in a society, making detailed observations of all their practices.
- Guidelines for the ethnographic study:
 - Focus on efficiencies and individual experiences
 - Spend time getting to know people.
 - Make detailed notes of work practices.
 - Use open interviewing.



Requirements Elicitation- Which technique to choose?

- Depends on the project budget, resources, customer availability, and so forth.
- The techniques can be combined in various ways.
 - If the business documentation exists, it should be always considered.
 - Interviews are the most common technique.
 - Scenarios are useful when the stakeholder needs to provide requirements details.
 - Observations are used in large projects and when the project timeframe and human resources allow for that.
 - Prototyping is typically used on the customer request, or when the domain is new for the requirement engineers.
- *In the project, you will mainly use interviews and possibly interaction scenarios.*



Requirements Elicitation- Problems

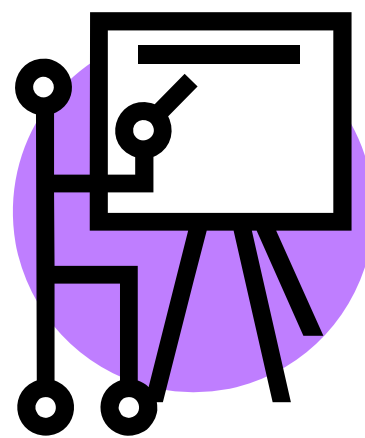
- Stakeholders are not available.
- Stakeholders do not know what they want.
- Requirements engineers are not prepared properly (see slide 8).
- Influence of organizational issues and political factors.
- Insufficient time has been allowed for requirements elicitation.
- A rational (motivation) for the new system is missing.





Content

- Overview of the requirements elicitation, analysis and negotiation activities
- Requirements elicitation and related techniques
- **Requirements analysis**
- Requirements negotiation





Requirements Analysis

- The goal of requirements analysis is to find problems in draft requirements (see slide 5). The activities which are typically part of requirements analysis are as follows:
 - *Necessity checking* - the need for the requirement is examined, in respect to the given business case and/or goals.
 - *Consistency checking* – in general, two requirements are inconsistent, if it is impossible to satisfy both simultaneously. Thereby, consistency means that no requirements should be contradictory (i.e. in **conflict**).
 - *Completeness checking* – the requirements are complete if all business activities (or goals) that are to be automated are fully covered in the requirements. *In the project, business activities are given in the form of a case study.*
 - *Feasibility checking* – the requirements are checked to ensure that they are feasible in the context of economic, time and technical aspects.
 - *Unambiguous checking* – the requirements are ambiguous if different readers of the requirement understand it differently.
 - *Redundancy checking* – the requirements as given from different stakeholder might overlap. The redundant requirements (parts) should be removed.
 - *Traceability checking* – examine if the requirement is traceable (Lecture 5)



Requirements Analysis - Techniques

- **Analysis checklists** – a list of questions which the requirements engineer may use to assess each requirement. Analysis checklists can be implemented as a spreadsheet where the rows are labeled with the requirements identifiers and the columns are the checklist items. The appropriate cells are then filled with comments about potential problems.

| Checklist item | Description |
|------------------------------------|---|
| Unnecessary requirements (P_1) | Is the req. "gold plating"? |
| Traceability (P_2) | Can requirement be traced? |
| Requirements feasibility (P_3) | Is it possible to realize the req. in respect to costs, time, technology? |

| Req/Prob | P_1 | P_2 | P_3 |
|-----------------|-------------------------|-------------------------|-------------------------|
| R_1 | - | no | - |



Requirements Analysis - Techniques

- **Interaction matrices** – elicit the interactions between requirements to highlight requirements conflicts and other problems. The simplest way to construct an interaction matrix is to label rows and the columns with the requirements identifiers and then fill it with certain values (for overlap, conflict, etc). Requirements which have high values should be carefully examined.
 - Conflict \leftrightarrow 1
 - Overlap \leftrightarrow 1000
 - Correct \leftrightarrow 0

| Req | R ₁ | R ₂ | R ₃ |
|----------------|----------------|----------------|----------------|
| R ₁ | 0 | 1000 | 0 |
| R ₂ | 1000 | 0 | 1 |
| R ₃ | 0 | 1 | 0 |

The matrices can be too complex when a substantial number of requirements is collected (i.e. Few hundreds) !



Requirements Analysis - Prioritization

- Commonly not all requirements are developed at once (due to costs, time, available technologies, etc.). Thereby some requirements are prioritized over others.
- A common approach is to separate requirements into three categories:

- Requirements that absolutely must be met (*essential*)
- Requirements that are highly desirable (*desirable*)
- Requirements that could be eliminated (*optional*)

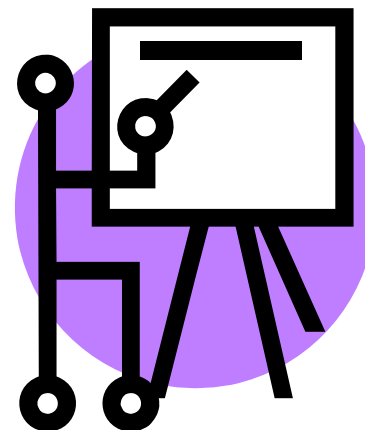
Example: *purchase order (e), different purchase fees (d), demarking total, discount in red in the printed copy (o).*

- Criteria for setting priority attributes could differ: functional, economic, temporal, etc.)
- Priority attributes can be used when solving requirements conflicts.

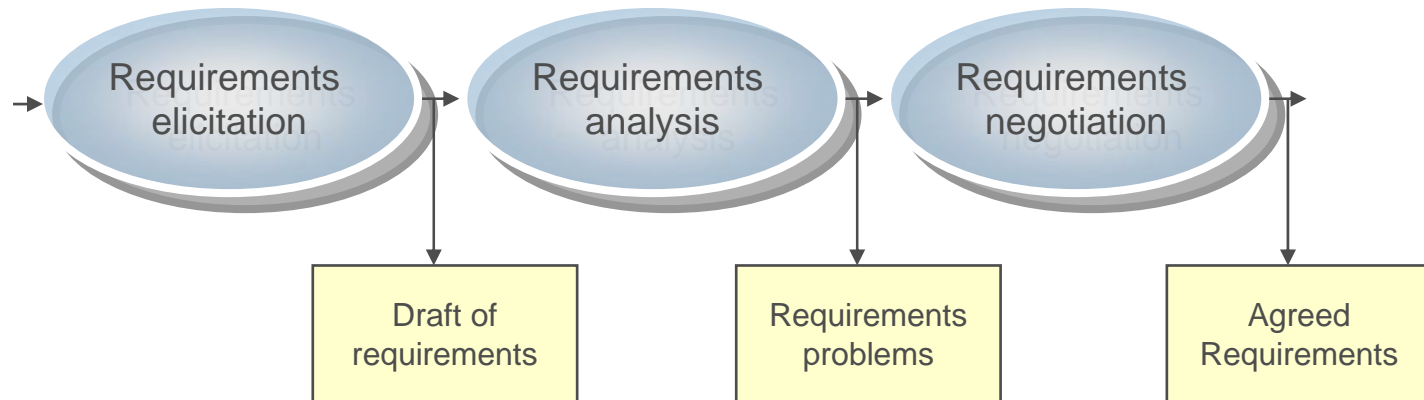


Content

- Overview of the requirements elicitation, analysis and negotiation activities
- Requirements elicitation and related techniques
- Requirements analysis
- **Requirements negotiation**



Requirements Negotiation



- The requirements analysis activities result in a set of *requirements problems* which need to be discussed in the requirements negotiation phase. For instance: the cost of a requirements is higher than expected; or, there are conflicting requirements, etc.
- The requirements negotiation involves three major steps:
 - **Discussion**, where stakeholders present their views
 - **Prioritization**, where disputed requirements are prioritized,
 - **Agreement**, where compromises and solutions are identified and agreed.
- Requirements negotiation should be an objective process. The judgments should be based on logical reasons, as well as on technical and organizational needs.



Summary

What is requirements elicitation?

What are the requirements elicitation techniques

What is requirements analysis?

What is requirement negotiation?

What are common requirements analysis techniques?