REQUIREMENTS ENGINEERING

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CHAPTER THREE

REQUIREMENT ELICITATION AND ANALYSIS

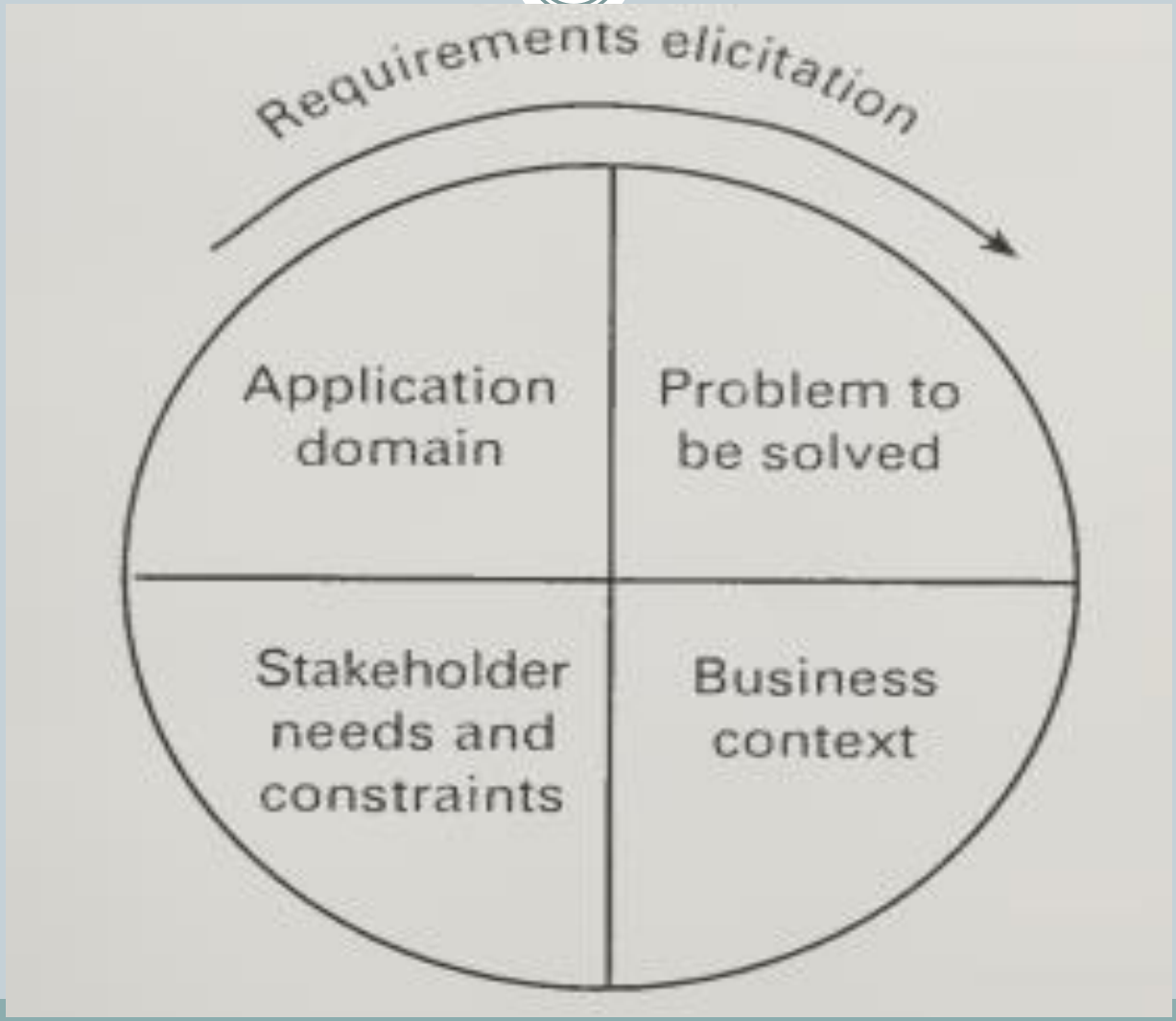
Objectives

- To describe the processes of requirements elicitation and analysis.
- To introduce a number of requirements elicitation and requirements analysis techniques.
- To discuss how prototypes may be used in the RE process.

Introduction

- **Requirement elicitation** is the process of gathering requirements.
- Two major activities/processes in requirement elicitation:
  1. **Requirements analysis:** the process of evaluating value/cost of different requirements, identifying dependencies between requirements, etc.
  2. **Requirements Negotiation:** the process of resolving conflicts between requirements, deciding which to accept, setting priorities.
- **Problem analysis** is the activity that encompasses learning about the problem to be solved (often through brainstorming and/or questioning), understanding the needs of potential users, trying to find out who the user really is, and understanding all the constraints on the solution.

Components of Requirements Elicitation



Components of Requirements Elicitation

1. **Application domain understanding:** Application domain knowledge is knowledge of the general area where the system is applied. **For example,** to understand the requirements for a railway signaling system, you must have background knowledge about the operation of railways and the physical characteristics of trains.
2. **Problem Understanding:** The details of the specific customer problem where the system will be applied must be understood. **Therefore,** for a railway signaling system, you must know the way in which speed limits are applied to particular track segments.
   - During problem understanding, you specialize and extend general domain knowledge.

Components of Requirements Elicitation

3. **Business Understanding:** Systems are generally intended to contribute in some way to the development of a business or organization.
   - You must understand how these systems interact and affect the different parts of the business and how they can contribute to overall business goals.
4. **Understanding the needs and constraints of system stakeholders:**
   - System stakeholders are those people who are affected in some way by the system.
   - They may be end-users of the system, managers of departments where the system is installed, etc.
   - You must understand, in detail, their specific needs for system support in their work.

Requirements Elicitation Process

- A good requirements elicitation process should include four critical activities.

1. **Objective Setting:** The overall organizational objectives should be established at this stage. These include :
   - General goals of the business
   - An outline description of the problem to be solved
   - An outline description of why the system may be necessary
   - An outline description of the milestones on the system such as budget, schedule and inter-operability constraints.

Requirements Elicitation Process

2. **Background knowledge acquisition:** This is a very important stage where the requirements engineers gather and understand background information about the system. This includes:
   - Information about the organization where the system is to be installed,
   - Information about the application domain of the system.
   - Information about any existing systems which are in use and which may be replaced by the system being specified.

Requirements Elicitation Process

3. **Knowledge organization:** The large amount of knowledge which has been collected in the previous stage must be organized and collated. This involves :
   - Identifying system stakeholders and their roles in the organization.
   - Prioritizing the goals of the organization.
   - Discarding domain knowledge which does not contribute directly to the system requirements.

Requirements Elicitation Process

4. **Stakeholder requirements collection**: It involves:
   - Consulting system stakeholders to discover their requirements
   - Deriving requirements which come from the application domain and the organization which is acquiring the system.

- The **output** from the requirements elicitation process should be a **draft document** which describes the system requirements.
- This document is then analyzed to discover problems and conflicts in the requirements definition.

Requirements Analysis

"The goal of requirements analysis is to find problems in the draft requirements document"

HOW TO DO IT:

Activities for Requirements Analysis

1. **Necessity checking:** Ask Why?
   - The need for the requirement is analyzed.
     - Root cause analysis
     - Determine (recursively) the factors that contribute to the problem(s) found by stakeholders
- In some cases, requirements may be proposed which don't contribute to the business goals of the organization or to the specific problem to be addressed by the system.

Activities for Requirements Analysis

2. **Consistency and completeness checking:** The requirements are cross-checked for consistency and completeness.
3. **Feasibility checking:** The requirements are checked to ensure that they are feasible in the context of the budget and schedule available for the system development.

- The **output** from the requirements analysis process may lead for **requirements negotiation**.

Activities for Requirements Negotiation

1. **Requirements discussion:** Requirements which have been highlighted as problematical are discussed and the stakeholders involved present their views about the requirements.
2. **Requirements prioritization:** Disputed requirements are prioritized to identify critical requirements and to help the decision making process.
3. **Requirements agreement:** Solutions to the requirements problems are identified and a compromise set of requirements is agreed.

Elicitation Techniques

1. Analysis of Existing Systems
2. Interview
3. Brainstorming
4. Joint Application Design (JAD)
5. Prototyping

Analysis of Existing Systems

- Useful when building a **new improved version** of an existing system.
- **Important to know:**
  - What is used, not used, or missing
  - What works well, what does not work
  - How the system is used (with frequency and importance) and it was supposed to be used, and how we would like to use it

Interview

- Requires preparation and good communication management
- Achieve interview objectives without preventing the exploration of promising leads
- Interview as many stakeholders as possible
- Ask problem-oriented questions

"When people talk, listen completely. Most people never listen"

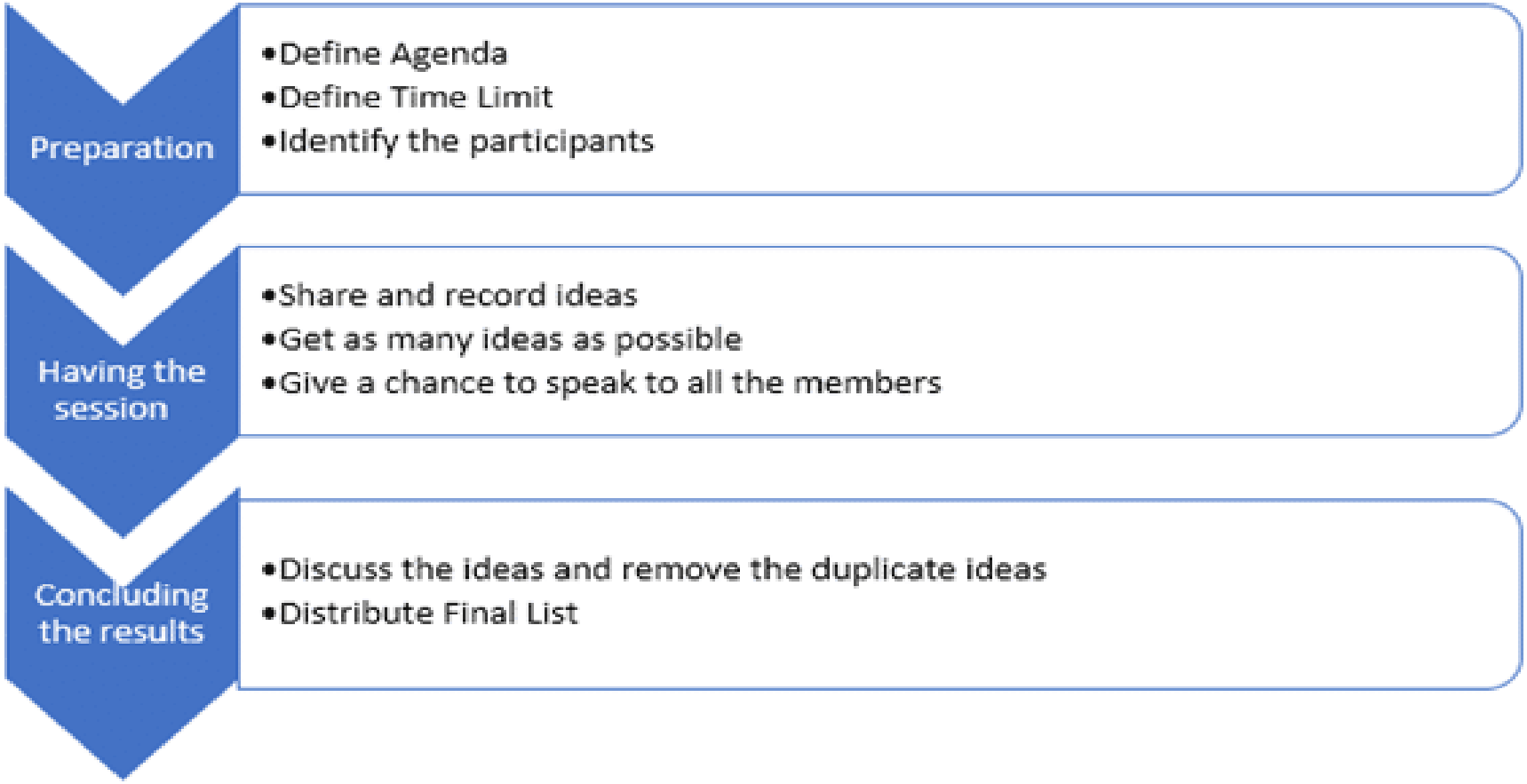
Interviews – Objectives and Process

- Three main objectives:
  - Record information to be used as input to requirements analysis and modeling
  - Discover information from interviewee accurately and efficiently
  - Reassure interviewee that his/her understanding of the topic has been explored, listened to, and valued
- Process consists of four important steps:
  - Planning and preparation
  - Interview session
  - Consolidation of information
  - Follow-up

Brainstorming

- To invent new way of doing things or when much is unknown
  - When there are few or too many ideas
- Early on in a project particularly when:
  - There is little expertise for the type of applications
  - Innovation is important (e.g., novel system)
- Two main activities:
  - The Storm: Generating as many ideas as possible (quantity, not quality) – wild is good!
  - The Calm: Filtering out of ideas (combine, clarify, prioritize, improve…) to keep the best one(s) – may require some voting strategy
- Roles: scribe, moderator (may also provoke), participants

Brainstorming Phases



Joint Application Design (JAD)

- JAD a collaborative way to gather requirements across people or groups connected to the project.
- Used for making decisions on different aspects of a project
- Any process where consensus-based decision making across functional areas is required, e.g.,
  - Planning a project
  - Defining requirements
  - Designing a solution

"Governed by 6 "P"s"

The 6 “P”s

1. Purpose - Why do we do things? (Goals, needs, motivation)
2. Participants - Who is involved? (People, roles, responsibilities)
3. Principles - How do we function? (Guidelines, working agreements, ground rules)
4. Products - What do we create? (Deliverables, decisions, plans, next steps)
5. Place - Where is it located? (Venue, logistics)
6. Process - When do we do what? (Activities, sequence)

Prototyping

- A software requirements prototype is a mock-up or partial implementation of a software system
  - Helps developers, users, and customers better understand system requirements
  - Helps clarify and complete requirements
  - Provides early response to “I'll know it when I’ll see (or won’t see) it” attitude
  - Effective in addressing the “Yes, But” and the “Undiscovered Ruins” syndromes
  - Helps find new functionalities, discuss usability, and establish priorities
- Prototyping is effective in resolving uncertainties early in the development process
  - Focus prototype development on these uncertain parts
  - Encourages user participation and mutual understanding

Any Question?