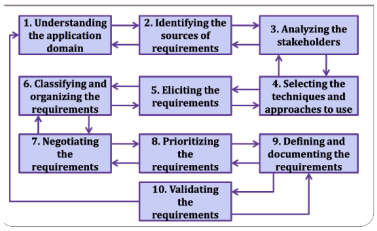
Lecture 4

➔ (Week 4 - Jan 29, 2024)

Week 4 Agenda: Requirements Elicitation Techniques (Classical & Modern)

The Process of User Requirements Elicitation



Elicitation Basics:

- Elicitation ≠ Acquisition
- Requirements ≠ Sensor data
- Elicitation ≠ Specification and Modeling
- Successful Requirements Engineering (RE) leads to mission success
- Elicitation determines RE success

Requirement Elicitation Definition:

- Process of acquiring all relevant knowledge for a requirements model
- Understanding the problem domain is essential before formal specification

Elicitation Techniques:

- No universally best methodology
- Selection based on project nature, organizational structure, and stakeholders
- Commonly used techniques: brainstorming, document analysis, interviews, prototyping, workshops

Common Elicitation Techniques:

1. Questionnaires
2. Interviews
3. Use cases and scenarios
4. Analysis of existing systems
5. Documentation analysis
6. Discourse analysis
7. Task observation
8. Brainstorming
9. Ethnography
10. Joint Application Development (JAD)
11. Prototyping
12. Pilot system
13. Reverse Engineering

Classic Requirements Elicitation Techniques:

- Proven and tested methods
- Includes: Interviews, Questionnaires, Introspection, Analysis of Existing Systems, Document Analysis, Observation, Social Analysis

Modern Requirements Elicitation Techniques:

- Includes: Scenarios, Brainstorming, Prototyping, Joint/Rapid Application Development, Task Analysis, Workshops, Reverse Engineering, Domain Analysis, Goal Modeling, etc.

Introspection:

- Analyst imagines the required system
- Typically used as a starting point for other techniques
- Advantages: Complements other elicitation methods, low cost
- Disadvantages: Inaccuracy, may not reflect stakeholders' goals, requires extensive analyst experience

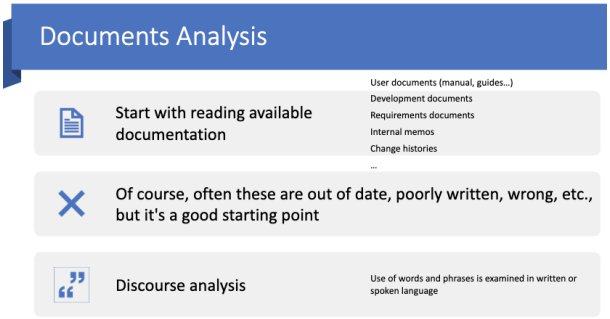
Analysis of Existing Systems:

- Useful for improving existing systems
- Determines usage patterns, strengths, weaknesses, and user preferences
- Helps prevent user dissatisfaction with new systems

- Identifies possible improvements and legacy features to retain

Document Analysis:

- Helpful in understanding current processes
- Uses documents like user manuals and process documents
- Steps: Evaluate the suitability of existing documents, identify relevant business details, validate with subject matter experts



Observation and Social Analysis:

- Observation is a method for collecting requirements by observing people in their everyday work routines.
- Useful when users have difficulty articulating their needs or when problems with existing products need to be addressed.
- It can be supplemented with questionnaires or interviews for more comprehensive data.
- Labor-intensive but valuable for obtaining insights.
- Social analysis includes passive and active observation.

Social Analysis Types:

1. Passive Observations: Involves recording using videotapes, cameras, or surveillance cameras. Data is collected from recorded footage.
2. Active Observation: The observer directly involves users, providing them with prototypes or products. Observations inform requirements.

Explanatory Observations:

- Users explain their actions while using a product, and observers take notes.
- Helpful for understanding user thought processes during tasks.

Ethnography:

- Originates from anthropology and focuses on "writing the culture."
- Immerses the observer in the user's environment to understand work processes.
- Explores human and social factors that impact requirements.
- Observations are made without asking users to explain their actions.
- Ethnography reveals implicit practices, making them explicit.

Ethnography - Example:

- Applied in air traffic control system requirements elicitation.
- Discovered surprising behaviours: controllers initiated potentially conflicting actions and silenced alarms.
- Improved understanding: controllers disliked the constant alarms, not audible ones.

Advantages and Disadvantages of Ethnography:

Advantages:

- Effective for collecting quality attributes like usability and efficiency.
- Identifies social factors and patterns.

Disadvantages:

- Complex due to diverse user communities.
- Requires the involvement of psychologists for analyzing social requirements.

Task Analysis:

- Utilizes a top-down approach to break high-level tasks into subtasks and detailed sequences.
- Aims to create a task hierarchy and determine knowledge requirements.
- Provides insights into user-system interactions and contextual activities.
- Requires significant effort but offers valuable information.

Advantages and Disadvantages of Task Analysis:

Advantages:

- Captures user-system interactions.

- Helps in task management.

Disadvantages:

- Demands substantial effort.
- Requires detailed information for low-level tasks.

Brainstorming:

- Informal discussion to generate ideas.
- Avoid detailed exploration or critique.
- Helpful in developing mission statements and innovative solutions.

Advantages of Brainstorming:

- Effective for innovative projects.
- Supports key decision-making.
- Promotes free thinking and idea expression.
- Generates innovative ideas.

Joint Application Development (JAD):

- Structured brainstorming approach.
- Involves stakeholders and project team.
- Facilitates gathering and consolidating information.
- Uses visual aids and defined processes.

Prototyping:

- Mock-ups or partial system implementations.
- Clarifies and completes requirements.
- Addresses uncertainties early.
- Encourages user participation.
- Types include horizontal, vertical, evolutive, and throw-away.

Reverse Engineering:

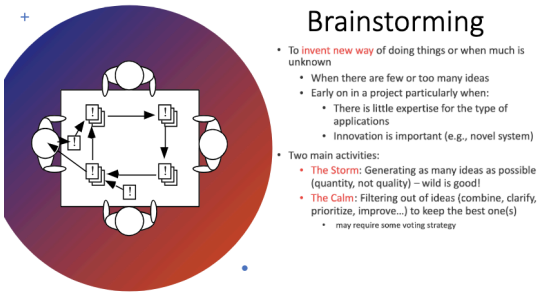
- Used in migration projects.
- Extracts implemented requirements from existing systems.
- Black box and white box reverse engineering.
- Useful when documentation is outdated or lacking.

Workshops:

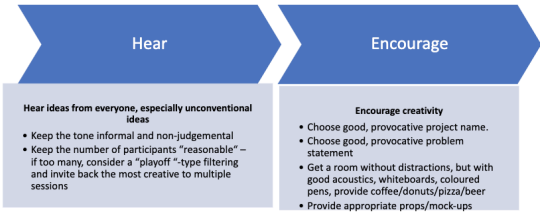
- Group sessions to identify requirements.
- Structured way to capture requirements.
- Effective for scoping, discovering, defining, and prioritizing requirements.
- Promotes mutual understanding and communication.

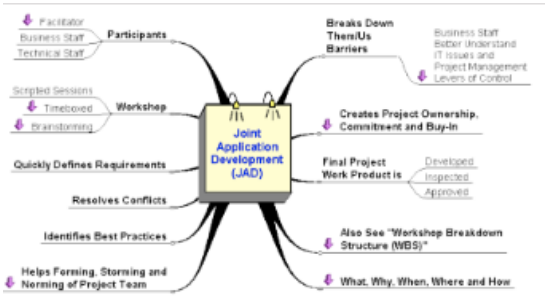
Future Directions in Requirements Elicitation:

- Research areas include education, technique selection, knowledge reuse, and technology integration.
- Guidelines for analysts and stakeholders.
- Investigating knowledge collection and reuse.
- Case studies on requirements' impact on project success.
- Exploration of requirements elicitation in emerging software engineering fields.



Brainstorming – Objectives





Comparison of Data-Gathering Techniques[1]

Technique	Good for	Data Types	Pros.	Cons.
Questionnaires	Answering specific questions	Quantitative and qualitative data	Can reach many people with low resource	The design is crucial. Response rate may be low. Responses may not be what you want
Interviews	Exploring issues	Some quantitative but mostly qualitative data	Interviewer can guide interviewee. Encourages contact between developers and users	Time consuming. Artificial environment may intimidate interviewee
Focus groups and workshops	Collecting multiple viewpoints	Some quantitative but mostly qualitative data	Highlights areas of consensus and conflict. Encourages contact between developers and users	Possibility of dominant characters
Naturalistic observation	Understanding context of user activity	Qualitative	Observing actual work gives insight that other techniques cannot give	Very time consuming. Huge amounts of data
Studying documentation	Learning about procedures, regulations, and standards	Quantitative	No time commitment from users required	Day-to-day work will differ from documented procedures