Lecture 4, Part 2: Requirements Elicitation

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Requirements Elicitation

• Information to elicit
  – Description of the problem domain
  – List of problems/opportunities requiring solution (the requirements)
  – Any client-imposed constraints upon system

• Requirements Elicitation Techniques
  – Background Reading
  – Hard data collection
  – Interviews
  – Questionnaires
  – Group Techniques
  – Participant Observation
  – Ethnomethodology
  – Knowledge Elicitation Techniques

Sources of Information

• Clients (actual and potential)
• Users of systems (actual and potential)
• Domain Experts
• Pre-existing solution system (within the problem domain)
• Other relevant products
• Documents
• Technical standards and legislation

[Bra02]
Challenges of Elicitation

• Thin spread of domain knowledge
  – The knowledge might be distributed across many sources.
    • It is rarely available in an explicit form (i.e. not written down)
  – There will be conflicts between knowledge from different sources.

• Tacit knowledge (The “say-do” problem)
  – People find it hard to describe knowledge they regularly use.

Challenges of Elicitation [2]

• Limited Observability
  – The problem owners might be too busy coping with the current system.
  – Presence of an observer may change the problem.
    • E.g. Probe Effect, Hawthorne Effect

• Bias
  – People may not be free to tell you what you need to know.
  – People may not want to tell you what you need to know.
    • The outcome will affect them, so they may try to influence you (hidden agendas)

Exercise: Loan Approval

Loan approval department in a large bank
  – The analyst is trying to elicit the rules and procedures for approving a loan.

Why might this be difficult?
  – Implicit knowledge
  – Conflicting information
  – Say-do problem
  – Probe effect
  – Bias

Bias

• What is bias?
  – All views of reality are filtered.
  – Bias only exists in relation to some reference point.

• Types of bias:
  – Motivational bias
    • expert makes accommodations to please the interviewer or some other audience
  – Observational bias
    • Limitations on our ability to accurately observe the world
  – Cognitive bias
    • Mistakes in use of statistics, estimation, memory, etc.
  – Notational bias
    • Terms used to describe a problem may affect our understanding of it
Bias: Examples

- **Social pressure**
  - response to verbal and non-verbal cues from interviewer
- **Group think**
  - response to reactions of other experts
- **Impression management**
  - response to imagined reactions of managers, clients,…
- **Wishful thinking**
  - response to hopes or possible gains
- **Appropriation**
  - selective interpretation to support current beliefs

Bias: Examples [2]

- **Misrepresentation**
  - expert cannot accurately fit a response into the requested response mode
- **Anchoring**
  - contradictory data ignored once initial solution is available
- **Inconsistency**
  - assumptions made earlier are forgotten
- **Availability**
  - some data are easier to recall than others
- **Underestimation of uncertainty**
  - tendency to underestimate by a factor of 2 or 3

Elicitation Techniques

- **Traditional techniques**
  - Introspection
  - Reading existing documents
  - Analyzing hard data
  - Interviews
    - Open-ended
    - Structured
  - Surveys / Questionnaires
  - Meetings
- **Collaborative techniques**
  - Focus Groups
  - Brainstorming
  - JAD/RAD workshops
  - Prototyping
  - Participatory Design
- **Contextual (social) approaches**
  - Ethnographic techniques
  - Participant Observation
  - Ethnomethodology
  - Discourse Analysis
    - Conversation Analysis
    - Speech Act Analysis
  - Sociotechnical Methods
    - Soft Systems Analysis
- **Cognitive techniques**
  - Task analysis
  - Protocol analysis
  - Knowledge Acquisition Techniques
    - Card Sorting
    - Laddering
    - Repertory Grids
    - Proximity Scaling Techniques

Traditional: Introspection

- Requirements analyst “imagines” what kind of system is required.
- **Advantages:**
  - easy to do
- **Disadvantages:**
  - can be very inaccurate
  - unlikely to reflect stakeholder’s goals

[GC93]
Traditional: Background Reading

- **Sources of information:**
  - company reports, organization charts, policy manuals, job descriptions, reports, documentation of existing systems, etc.

- **Advantages:**
  - analyst gets an understanding of the organization before meeting the people who work there
  - Helps to prepare for other types of fact finding
    - e.g. by being aware of the business objectives of the organization.
  - may provide detailed requirements for the current system

- **Disadvantages:**
  - written documents often do not match up to reality
  - can be long-winded with much irrelevant detail

- **Appropriate for**
  - when you are not familiar with the organization being investigated.

Traditional: Analyze Hard Data

- **Hard data includes facts and figures...**
  - Forms, invoices, financial information, ...
  - Reports used for decision making, ...
  - Survey results, marketing data, ...

- **Sampling used to select representative set from a population**
  - Process:
    - Decide what data should be collected - e.g. banking transactions
    - Determine the population - e.g. all transactions at 5 branches over one week
    - Choose type of sample - e.g. simple random sampling
    - Choose sample size - e.g. every 20th transaction

Exercise: Hard Data

- **What does this data tell you?**
- **What would you do with this data?**
Traditional: Interviews

- **Types:**
  - Structured - agenda of fairly open questions
  - Open-ended - no pre-set agenda

- **Advantages:**
  - Rich collection of information
  - Uncovers opinions, feelings, goals, as well as hard facts
  - Can probe in depth, and adapt follow-up questions to what the person tells you

Traditional: Interviews [2]

- **Disadvantages:**
  - Large amount of qualitative data can be hard to analyze
  - Hard to compare different respondents
  - Interviewing is a difficult skill to master

  - **Watch for:**
    - Unanswerable questions (e.g., “how do you tie your shoelaces?”)
    - Tacit knowledge – Removal from context
    - Interviewer’s attitude may cause bias

Traditional: Interviews [2]

- **Starting off...**
  - Begin the interview with an innocuous topic to set people at ease
    - e.g. the weather, the score in last night’s hockey game
    - e.g. comment on an object on the person’s desk: “My… what a beautiful photograph! Did you take that?”

- **Ask if you can record the interview**
  - Make sure the tape recorder is visible
  - Say that they can turn it off at any time

- **Ask easy questions first**
  - perhaps personal information
    - e.g. “How long have you worked in your present position?”

- **Follow up interesting leads**
  - E.g. if you hear something that indicates your plan of action may be wrong: “Could we pursue what you just said a little further?”

- **Ask open-ended questions towards the end**
  - e.g. “Is there anything else you would like to add?”

Traditional: Questionnaires

- **Advantages**
  - Can quickly collect info from large numbers of people
  - Can be administered remotely
  - Can collect attitudes, beliefs, characteristics

- **Disadvantages**
  - Simplistic (presupposed) categories provide very little context
    - No room for users to convey their real needs
Traditional: Questionnaires [2]

- Watch for:
  - Bias in sample selection
  - Bias in self-selecting respondents
  - Small sample size (lack of statistical significance)
  - Open ended questions (very hard to analyze!)
  - Leading questions (“Have you stopped cheating on assignments?”)
  - Appropriation (“What is this a picture of?”)
  - Ambiguous questions (i.e., not everyone is answering the same question)

Traditional: Meetings

- Used for summarization and feedback
  - E.g. meet with stakeholders towards the end of each stage:
    - to discuss the results of the information gathering stage
    - to conclude on a set of requirements
    - to agree on a design etc.
  - Every meeting should have a clear objective:
    - E.g. presentation, problem solving, conflict resolution, progress analysis, gathering and merging of facts, training, planning, ...
  - Plan the meeting carefully:
    - Schedule the meeting and arrange for facilities
    - Prepare an agenda and distribute it well in advance
    - Keep track of time and agenda during the meeting
    - Follow up with a written summary to meeting participants

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- Contextual (social) approaches
  - Ethnographic techniques
  - Ethnomethodology
  - Discourse Analysis
  - Conversation Analysis
  - Speech Act Analysis
  - Sociotechnical Methods
    - Soft Systems Analysis

- Collaborative techniques
  - Focus Groups
  - Brainstorming
  - JAD/RAD workshops
  - Participatory Design
  - Prototyping

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Collaborative: Focus Groups

- Focus groups are a type of group interview.
- Advantages:
  - More natural interaction between people than formal interview
  - Can gauge reaction to stimulus materials (e.g. mock-ups, storyboards, etc)
- Disadvantages:
  - May create unnatural groups (uncomfortable for participants)
  - Danger of Groupthink
  - May only provide superficial responses to technical questions
  - Requires a highly trained facilitator
- Watch for:
  - sample bias
  - dominance and submission

[GC93]
Collaborative: JAD/RAD

- Joint/Rapid Application Development (JAD/RAD) Principles:
  - Group Dynamics - use workshops instead of interviews
  - Visual Aids
    - Lots of visualization media, e.g. wall charts, large monitors, graphical interfaces
  - Organized, Rational Process
    - Techniques such as brainstorming and top-down analysis
  - WYSIWYG Documentation Approach
    - each JAD session results in a document which is easy to understand and is created and agreed upon during the session.

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Collaborative: JAD/RAD [2]

- Notes:
  - Choose workshop participants carefully
    - they should be the best people possible representing various stakeholder groups
  - Workshop should last 3-5 days.
    - Must turn a group of participants into a team - this takes 1-2 days.
    - Session leader makes sure each step has been completed thoroughly.
    - Session leader steps in when there are differences of opinion - "open issues".
    - Meeting room should be well-equipped for presentations, recording etc.

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[Contextual: Participant Observation]

- Approach
  - Ethnographic
    - Subarea of anthropology that studies the scientific description of specific human cultures
  - Observer spends time with the subjects
    - Joining in long enough to become a member of the group
    - Hence appropriate for longitudinal studies

- Advantages
  - Contextualized
  - Reveals details that other methods cannot

- Disadvantages
  - Extremely time consuming!
  - Resulting 'rich picture' is hard to analyze
  - Cannot say much about the results of proposed changes
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