**Today:** Requirements Engineering: Elicitation of Requirements

Difficulties of elicitation

- Thin spread of domain knowledge
  - It is rarely available in an explicit form (i.e. not written down)
  - …distributed across many sources
  - …with conflicts between knowledge from different sources
- Tacit knowledge (The “say-do” problem)
  - People find it hard to describe knowledge they regularly use
- 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;
    - E.g. 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)

Example

- Loan approval department in a large bank
  - The analyst is trying to elicit the rules and procedures for approving a loan
- Why this might be difficult:
  - Implicit knowledge:
    - There is no document in which the rules for approving loans are written down
  - Conflicting information:
    - Different bank staff have different ideas about what the rules are
  - Say-do problem:
    - The loan approval process described to you by the loan approval officers is quite different from your observations of what they actually do
  - Probe effect:
    - The loan approval process used by the officers while you are observing is different from the one they normally use
  - Bias:
    - The loan approval officers fear that your job is to computerize their jobs out of existence, so they are deliberately emphasizing the need for case-by-case discretion (to convince you it has to be done by a human!)

Elicitation Techniques

- Traditional techniques
  - Introduction
  - 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
    - Repertoire Grids
Background reading

- Sources of information:
  - company reports, organization charts, policy manuals, job descriptions, reports, documentation of existing systems, etc.
- Advantages:
  - Helps you get an understanding of an 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:
  - Whenever you not familiar with the organization being investigated.

“Hard data” and Sampling

- Hard data includes facts and figures...
  - Forms, Invoices, financial information,...
  - Reports used for decision making,...
  - Survey results, marketing data,...
- Sampling
  - Sampling used to select representative set from a population
    - Purpose Sampling - choose the parts you think are relevant without worrying about statistical issues
    - Simple Random Sampling - choose every kth element
    - Stratified Random Sampling - identify strata and sample each
    - Clustered Random Sampling - choose a representative subpopulation and sample it
  - Sample Size is important
    - balance between cost of data collection/analysis and required significance
- 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

Interviews

- Types:
  - Structured - agenda of fairly open questions
  - Open-ended - no pre-set agenda
- Advantages
  - Rich collection of information
  - Good for uncovering opinions, feelings, goals, as well as hard facts
  - Can probe in depth & adapt followup questions to what they tell you
- 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 (“how do you tie your shoelaces?”)
  - Tacit knowledge (and post-hoc rationalization)
  - Removal from context
  - Interviewer’s attitude may cause bias (e.g. variable attentiveness)

Interviewing tips

- 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: “…what a beautiful photograph! Did you take that?”
- Ask if you can record the interview
  - Put the recorder where it is visible
  - Let interviewee know 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,
    - e.g. “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?”
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

- 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 beating your wife?”)
  - Appropriation (“What is this a picture of?”)
  - Ambiguous questions (i.e. not everyone is answering the same question)

**REMEMBER TO HAVE A PILOT RUN OF YOUR QUESTIONNAIRE!**

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.
  - Use the meeting to confirm what has been learned, talk about findings

- Meetings are an important managerial tool
  - Used to move a project forward.
  - 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 be distributed to meeting participants
    - Special rules apply for formal presentations, walkthroughs, brainstorming, etc.

Group Elicitation Techniques

- Types:
  - Focus Groups
  - Brainstorming

- 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

Joint/Rapid Application Development (JAD/RAD)

- 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

- 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.
Participant Observation

• **Approach**
  – 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

• **Watch for**
  – going native!

Ethnomethodology

• **Basis**
  – Social world is ordered
  • The social order may not be obvious, nor describable from common sense
  • The social order cannot be assumed to have an a priori structure
    • Social order is established on a moment-to-moment basis through participants’ collective actions (no pre-existing structures)
    • I.e., social order only observable when an observer immerses herself in it.
  – Observation should be done in a natural setting
  – Need to consider how meanings develop and evolve within context

• “Use the members’ own Categories”
  – Most conventional approaches assume preexisting categories
    • This may mislead the observer (e.g. appropriation)
  – Ethnography attempts to use the subjects’ own categories
    • What categories (concepts) do they use themselves to order the social world?
    • What methods do people use to make sense of the world around them?
  – Use the same methods members use during observation
  – E.g. by developing a legitimate role within the community under observation.