

ECE450 – Software Engineering II

Today: Requirements Engineering: Elicitation of Requirements

adapted from Steve Easterbrook's
material on Requirements Engineering

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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)

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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!)

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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
 - Repertory Grids

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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.

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"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
 - Purposive 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

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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)

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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?"

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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!**

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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.

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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

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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.

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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!

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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.

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