Domain Understanding and Requirements Elicitation (2)

CS/SE 3RA3

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Previous Lecture: Domain Understanding and Requirements Elicitation

- Types of projects
  - **Rabbit** - the most agile project
    frequent iterations, each iteration delivers a small increment to the working functionality
  - **Horse** - fast, strong, dependable
    most common corporate projects
  - **Elephant** - solid, strong, long life and long memory
    a need for a *complete* requirements specification
Objectives: understand the system, identify the problems and opportunities, discovering the needs, exploring alternatives

Knowledge Acquisition: organization, domain, system-as-is

Identifying stakeholders and interacting with them

- Stakeholder analysis
- Handling obstacles to effective knowledge acquisition
- Interacting with stakeholders - difficult, important, often underestimated!
Previous Lecture: Domain Understanding and Requirements Elicitation

- **Artifact-driven elicitation techniques**
  - Background study: collect, read, synthesize documents
  - Data collection: gather undocumented facts and figures
  - Questionnaires: submit a list of questions to selected stakeholders, each with a list of possible answers (+ brief context if needed)
- **Scenarios**, storyboards for problem world exploration
  - Probably the most important technique!
  - Goal: acquire or validate info from concrete examples through narratives
  - Storyboard: tells a story by a sequence of snapshots
- Prototypes, mock-ups for early feedback
  - Goal: check req adequacy from direct user feedback, by showing reduced sketch of software-to-be in action
  - Prototype = quick implementation of some aspects: functional prototypes and user interface prototypes
Scenarios

- Illustrate typical sequences of interaction among system components to meet an implicit objective
- Positive scenario = one behavior the system should cover
- Negative scenario = one behavior the system should exclude
- Normal scenario: everything proceeds as expected
- Abnormal scenario = a desired interaction sequence in exception situation (still positive)
Stakeholders-driven elicitation techniques

- Interviews
- Observation and ethnographic studies
- Group sessions
Interviews

- Primary technique for knowledge elicitation
  1. Select stakeholder specifically for info to be acquired (domain expert, manager, salesperson, end-user, consultant, ...)
  2. Organize meeting with interviewee, ask questions, record answers
  3. Write report from interview transcripts
  4. Submit report to interviewee for validation and refinement

- Single interview may involve multiple stakeholders
  - saves times (good)
  - weaker contact; individuals less involved, speak less freely (bad)

- Interview effectiveness:
  \[
  \text{utility} \times \frac{\text{coverage of acquired info}}{\text{acquisition time}} 
  \]
  in reality the above formula can only be used as a guidance as we do have numerical values for all variables!
Types of Interview

- **Structured interview**: predetermined set of questions
  - specific to purpose of interview
  - some open-ended, others with predetermined answer set
    ⇒ more focused discussion, no rambling among topics

- **Unstructured interview**: no predetermined set of questions
  - free discussion about system-as-is, perceived problems, proposed solutions
    ⇒ exploration of possibly overlooked issues

⇒ Effective interviews should mix both modes:
  1. start with structured parts
  2. shift to unstructured parts as felt necessary
Interviews: strengths & difficulties

😊 May reveal info not acquired through other techniques
  - how things are running really, personal complaints, suggestions for improvement, ...

😊 On-the-fly acquisition of info appearing relevant
  - new questions triggered from previous answers

😊 Acquired info might be subjective (hard to assess)

😊 Potential inconsistencies between different interviewees

😊 Effectiveness critically relies on interviewer’s attitude, appropriateness of questions
Guidelines for effective interviews

- Identify the right interviewee sample for full coverage of issues
  - different responsibilities, expertise, tasks, exposure to problems
- Come prepared, to focus on right issue at right time
  - background study first
  - predesign a sequence of questions for this interviewee
- Center the interview on the interviewee’s work and concerns
- Keep control over the interview
- Make the interviewee feel comfortable
  - Start: break ice, provide motivation, ask easy questions
  - Consider the person too, not only the role
  - Do always appear as a trustworthy partner
Guidelines for effective interviews (2)

- Be focused, keep open-ended questions for the end
- Be open-minded, flexible in case of unexpected answers
- Ask ‘why’-questions without being offending
- Avoid certain types of questions ...
  - opinionated or biased
  - affirmative
  - obvious or impossible answer for this interviewee
- Edit and structure interview transcripts while still fresh in mind
  - including personal reactions, attitudes, etc.
- Keep interviewee in the loop
  - co-review interview transcript for validation and refinement
Example (The purpose of the interview and the type of information to be acquired)

- **Hotel Owner/manager:** Interview to discuss constraints of the project such as max cost, time for completion, max time for elevator to arrive. Additionally, this interview could be used to find out any extra features, such as if a service elevator or express elevator will be needed.

- **The Architect of the building:**
  - **Purpose of the interview:**
    1. to understand what services they need.
    2. To know how to use the system as is.
    3. To know all issues that they have the system as is.
    4. To understand the system to be.
  - **Type of information:**
    1. building load and elevator size
    2. usage information
    3. system as-is: an issue
Example (The purpose of the interview and the type of information to be acquired)

- **Front desk / Community Relations Manager / Business analysts:** The interview would be used to find out how many people are projected to be at the hotel at various times of year. This information would be critical in finding out if certain times of year would lead to unreasonable waits for the elevator to service all the requests.

- **Head maid:** This interview would be used to find how much the maids use the elevator, and if a staff elevator would be beneficial.

- **Restaurant manager:** This interview would be used to find how much the restaurant workers use the elevator, and if a staff elevator would be beneficial.

- **Security head / Elevator repair contractor / Maintenance manager:** This interview would be to find out the safety regulations that the elevator would need to conform to.
Elevator System

Example (Sample of Questions)

- **Hotel Owner/manager:**
  - What is the maximum cost of the elevator system project?
  - What is the maximum time to complete the project?
  - Can you authorize us to take the source code from the previous hotels elevator system?

- **The Architect of the building:**
  - How many bellpersons would you expect to need at the new hotel?
  - What hours are you at average load?
  - How many other people could fit inside the elevator when a bellperson is using it with the luggage cart?
Example (Sample of Questions)

- **Front desk / Community Relations Manager / Business analysts:**
  - What times of year are you at average capacity?
  - What times of year are you at maximum capacity?

- **Head maid:**
  - What times of the day would the maids be using the elevator?
  - How many other passengers could comfortably fit in the elevator along with a maid and their maid cart?

- **Restaurant manager:**
  - What times and days would you need to take food and supplies up the elevator?
  - How many other passengers could comfortably fit in the elevator along with a worker and their food cart?

- **Security head / Elevator repair contractor / Maintenance manager:**
  - What are the expected functionalities in case of emergencies?
  - What incidents have happened in the past with the elevator system?
Elevator System

Example (Open tracks that might be worth exploring at the end of the interview)

- **Hotel Owner/Manager:**
  - Are there any features you would like to see in the elevator system?
  - Elaborate on a time when customer satisfaction was diminished due to the handling of the previous elevator system.

- **The Architect of the Building:**
  - Please provide some examples of when your job was slowed down due to the nature of the past elevator system.
  - What would you suggest to improve your experience on the elevators?

- **Front desk / Community Relations Manager / Business Analysts:**
  - Please describe complaints you have received about the previous elevator system.
  - How were the issues raised resolved?
  - How could the issues be resolved faster, or better?
Elevator System

Example (Open tracks that might be worth exploring at the end of the interview)

- **Head Maid:**
  - What frustrations have you had as a result of the old elevator system?
  - How could we eliminate those frustrations in the new system?

- **Restaurant Manager:**
  - What struggles do you have with getting deliveries up the elevator to the restaurant?
  - How could the elevator system be changed to eliminate these struggles?

- **Security Head / Elevator Repair Contractor / Maintenance Manager:**
  - What would you advise to make the elevators even safer?
  - What would you advise to speed up the elevator task response algorithm?
Focus on **task** elicitation in the system-as-is

Understanding a task is often easier by observing people performing it (rather than verbal or textual explanation)

- cf. **tying shoelaces**

**Passive** observation: no interference with task performers

- Watch from outside, record (notes, video), edit transcripts, interpret
- **Protocol** analysis: task performers concurrently explain it
- **Ethnographic** studies: over long periods of time, try to discover emergent properties of social group involved about task performance + attitudes, reactions, gestures, etc.

**Active observation**: you get involved in the task, even become a team member
Observation & ethnographic studies: pros & cons

😊 May reveal ...
- tacit knowledge that would not emerge otherwise
  e.g. ethnographic study of air traffic control => implicit mental model of air traffic to be preserved in system-to-be
- hidden problems through tricky ways of doing things
- culture-specific aspects to be taken into account

😊 Contextualization of acquired info

🫡 Slow & expensive: to be done over long periods of time, at different times, under different workload conditions

🫡 Potentially inaccurate (people behave differently when observed)

🫡 Data mining problem, interpretation problem

🫡 Focus on system-as-is

Some of the interviewing guidelines are relevant
Group sessions

- More perception, judgment, invention from interactions within group of diverse people
- Elicitation takes place in series of group workshops (a few days each) + follow-up actions
  - audiovisuals, wall charts to foster discussion, record outcome
- Structured group sessions
  - Each participant has a clearly defined role (leader, moderator, manager, user, developer, ...)
  - Generally focused on high-level requirements
- Unstructured group sessions (brainstorming):
  - Participants have a less clearly defined role
  - Two separate stages
    1. Idea generation to address a problem: as many ideas as possible from each participant without censorship/criticism
    2. Idea evaluation: by all participants together according to agreed criteria (e.g. value, cost, feasibility) to prioritize ideas
Group sessions: pros & cons

😊 Less formal interactions than interviews
  => may reveal hidden aspects of the system (as-is or to-be)

😊 Potentially ...
  - wider exploration of issues & ideas
  - more inventive ways of addressing problems

😊 Synergies => agreed conflict resolutions

😊 Group composition is critical ...
  - time consuming for key, busy people
  - heavily relying on leader expertise & skills
  - group dynamics, dominant persons => biases, inadequacies

😊 Risk of ...
  - missing focus & structure => rambling discussions, little concrete outcome, waste of time
  - superficial coverage of more technical issues
Combining techniques

- Elicitation techniques have complementary strengths and limitations
- Strength-based combinations are more effective for full, adequate coverage
  - artifact-driven + stakeholder-driven
- Techniques from other Requirements Engineering phases support elicitation too
  - Resolution of conflicts, risks, omissions, etc.