Today: Requirements Engineering: Starting points for elicitation

adapted from Steve Easterbrook’s material on Requirements Engineering

Requirements Elicitation

• Starting point
  • Some notion that there is a “problem” that needs solving
    • e.g. dissatisfaction with the current state of affairs
    • e.g. a new business opportunity, or a potential saving of cost, time, resources, etc.
  • Collect enough information to:
    • Identify the “problem”/“opportunity”
      • Which problem needs to be solved? (identify problem Boundaries)
      • Where is the problem? (understand the Contact/Problem Domain)
      • Whose problem is it? (identify Stakeholders)
      • Why does it need solving? (identify the stakeholders’ Goals)
      • How does the problem manifest itself? (collect some Scenarios)
      • When does it need solving? (identify Development Constraints)
      • What might prevent us solving it? (identify Feasibility and Risk)
    • become an expert in the problem domain
      • Learn how to find your way round a new problem area quickly
      • Use your (initial) ignorance as an excuse to ask (dumb?) questions
      • Recognize the domain expertise of the people you talk to

• Where do we start?
  • Identify the problem
    • What is the objective of the project?
    • the “vision” of those who are pushing for it?
      • e.g., “Scheduling meetings is too costly right now”
  • Scope the problem
    • given the vision, how much do we tackle?
      • e.g. “Build a system that schedules meetings”, …or…
      • e.g. “Build a system that maintains people’s calendars” …or…
  • Identify solution scenarios
    • given the problem, what is the appropriate business process for solving it?
      • e.g., “Anyone who wants to schedule a meeting goes to the secretary, gives details and the
        secretary handles the rest”, …or…
  • Scope the solution
    • Given a business process, what parts should be automated, and how?
      • e.g., “Computer takes in scheduling request details, outputs a solution” …or…
      • e.g., “Solution arrived at interactively by secretary and computer” …or…

• Identifying the problem
  • Vague problem stated by the customer:
    • E.g. university textbook store:
      • Manager wants to computerize the book order forms filled out by instructors;
    • E.g. A large insurance company:
      • Claims manager wants to cut down the average time it takes to process an insurance
        claim from 2 months to 2 weeks
    • E.g. Large Government Aerospace Agency:
      • The president wants to send a manned mission to Mars by the the year 2020
  • Often you only see symptoms rather than causes:
    • E.g. “Ontario patients needing X-ray scans have to wait for months”
      • The long wait is the symptom, not the problem. The problem may be:
        • Shortage of X-ray machines;
        • Shortage of trained staff;
        • Shortage of doctors to process the data
        • Inefficient scheduling procedures
Stakeholders

- Stakeholder analysis:
  - Identify all the people who must be consulted during information acquisition

- Example stakeholders
  - Users
    - concerned with the features and functionality of the new system
  - Designers
    - want to build a perfect system, or reuse existing code
  - Systems analysts
    - want to "get the requirements right"
  - Training and user support staff
    - want to make sure the new system is usable and manageable
  - Business analysts
    - want to make sure "we are doing better than the competition"
  - Technical authors
    - will prepare user manuals and other documentation for the new system
  - The project manager
    - wants to complete the project on time, within budget, with all objectives met.
  - "The customer"
    - Wants to get best value for money invested!

Types of stakeholders:

- Levels of authority
  - Top management
    - establishes goals
    - does long-range planning
    - determines new market & product developments
    - decides on mergers & acquisitions.
  - Middle management
    - sets objectives
    - allocates & controls resources
    - does planning
    - measures performance
  - Lower management
    - supervises day-to-day operations
    - takes corrective action when necessary.
  - Operational level
    - performs day-to-day operations

Identifying stakeholders’ goals

- Approach
  - Focus on *why* a system is required
  - Express the ‘why’ as a set of stakeholder goals
  - Use goal refinement to arrive at specific requirements
  - Goal analysis
    - document, organize and classify goals
  - Goal evolution
    - refine, elaborate, and operationalize goals
  - Goal hierarchies show refinements and alternatives
- Advantages
  - Reasonably intuitive
  - Explicit declaration of goals provides sound basis for conflict resolution
- Disadvantages
  - Captures a static picture - what if goals change over time?
  - Can regress forever up (or down) the goal hierarchy

Scoping decision 1

- Decide the scope of the problem:
  - “Textbooks are often not ordered in time for the start of classes”
    - But that’s just a symptom. (So you ask the manager ‘why?’)
      - “Because we don’t receive the booklists from instructors early enough”
    - Is that just a symptom of some other problem? (…so ask the instructors “why?”)
      - “Because the instructors aren’t allocated to courses early enough”
    - Is that just a symptom of some other problem? (…so ask the UG office “why?”)
      - “Because we never know who’s available to teach until the last minute”
    - Is that just a symptom of some other problem? (…so ask the dept chair “why?”)
      - “Because there’s always uncertainty about who gets hired, sabbaticals, etc.”
    - Is that just a symptom of some other problem? (…so ask the dept chair “why?”)
      - “Because instructors we want to hire don’t accept our offers early enough!”
    - Is that just a symptom of some other problem? (…so ask the new recruits “why?”)
      - “Because some other universities seem to wait for ages before making offers”
    - Is that just a symptom of some other problem? (…so ask U of Waterloo, etc. “why?”)
      - “Because it takes our department a long time to reach consensus on hiring”
    - Is that just a symptom of some other problem? (…so ask U of Waterloo, and that will help us get our textbooks for the start of class…)

- "The customer"
  - Wants to get best value for money invested!

- "Top management"
  - establishes goals
  - does long-range planning
  - determines new market & product developments
  - decides on mergers & acquisitions.

- "Middle management"
  - sets objectives
  - allocates & controls resources
  - does planning
  - measures performance

- "Lower management"
  - supervises day-to-day operations
  - takes corrective action when necessary.

- "Operational level"
  - performs day-to-day operations
How to scope the problem

- **Difficulty:**
  - Every problem can be seen as a symptom of some other (larger) problem
  - You can keep on tracing root causes forever if you're not careful

- **Approach:** (…ask yourself these questions…)
  - Is there a reasonable expectation that this problem can be solved?
    - (…independently of the larger problem?)
  - Is there a reasonable expectation that solving this problem will help?
    - (…without also solving the larger problem?)
  - Is this a problem that the stakeholders want solved?
    - (do the "local experts" think this problem is the one that matters?)
  - Is this a problem that someone will pay you to solve?
    - (Hint: a feasibility study should quantify the return on investment)

How to scope the solution

- **Difficulty:**
  - We could keep on throwing more technology at the problem forever
  - It's hard to decide when to stop adding extra "bells and whistles"

- **Approach:** (…select among alternatives carefully…)
  - Is there a reasonable expectation that this alternative can be implemented?
    - (…independently of all the other options?)
  - Is there a reasonable expectation that implementing this alternative will (help to) solve the original problem?
    - (…without also having to address other aspects of the problem?)
  - Is this a solution that the stakeholders can live with?
    - (do the "local experts" think they would use all these functions?)
  - Is this a solution that someone will pay you to build?
    - (Hint: a feasibility study should quantify the return on investment for each alternative)

Scoping decision 2

- ** Decide the scope of the solution**
  - Say you decided that delay in processing booklists from instructors is the right level of problem to tackle.
  - "So, let's computerize the submission of textbook forms from instructors"
  - But while we're at it:
    - "It would help if we also computerized the submission of orders to the publishers"
  - …and of course:
    - "we ought to computerize the management of book inventories too, so we can quickly check stock levels before ordering new books"
  - …and in that case:
    - "we might as well computerize the archives of past years booklists so that we can predict demand better"
  - …and therefore:
    - "I would also make sense to provide a computerized used book exchange, because that has a big effect on demand for new books"
  - …and then of course there's … oh, wait, this is going to cost millions!
  - Bookstore manager: "tell me again how this automated used book exchange will help me order books faster?"

Scenarios

- **Scenarios**
  - Specific sequence of interaction between actor and system
  - Tend to be short (e.g. between 3 and 7 steps)
  - May be:
    - positive (i.e. required behavior)
    - negative (i.e. an undesirable interaction)
  - May be indicative (describe current system) or optative (how it should be)

- **Advantages**
  - Very natural: stakeholders tend to use them spontaneously
  - E.g. "suppose I'm admitted to hospital - what happens during my admission?"
  - Typical answer: "You, or the person accompanying you would talk to the person at the admissions desk. You have to show your OHIP card and explain who referred you to the hospital. Then you…" [and so on]

- **Disadvantages**
  - Lack of structure
  - Hard to check for completeness
### Example Scenario

<table>
<thead>
<tr>
<th>Action</th>
<th>Goals satisfied</th>
<th>Obstacles / Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alice requests meeting, specifying participants, timeframe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS sends participant requests to Bob, Carlo, and Daphne</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS sends announcement</td>
<td></td>
<td></td>
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<tr>
<td>Bob reads announcement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carlo reads announcement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daphne reads announcement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attendees preferences known</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting announced; attendance confirmed (?)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room availability determined; room booked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting requested; attendee list obtained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bob replies with preferences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daphne replies with preferences</td>
<td></td>
<td></td>
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<tr>
<td>Carlo replies with preferences</td>
<td></td>
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<tr>
<td>Daphne reads message</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bob reads message</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS sends participant requests to Bob, Carlo, and Daphne</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did we miss a goal?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Summary

- **Scoping is important**
  - What is the scope of the problem should you tackle?  
  - What is the scope of the desired solution?  

- **Ask Who and Why questions**
  - Who are the key stakeholders?  
  - Why do they want this problem solved?  
  - Analyze their goals.  

- **Ask How questions**
  - How is each goal satisfied?  
  - How might a new system improve things?  
  - Develop scenarios.