2. Requirements: Understanding Users, their Environment, and their Tasks

Dan Suthers
Spring 2005

Outline

• Overview of Requirements Analysis
  - Focus primarily on SBD
  - Also C&L Role Models and HTA
• Try it on address book design
Requirements Analysis

Design Phase or activity in which the needs of clients with respect to a proposed project or technology are analyzed.

- Understanding the work in order to offer useful functionality
- Understanding the people in order to offer it in a way suitable for them

How do we analyze work?

- Activities
  - What do people do? What goals do they pursue, and how?
- Artifacts
  - How do the tools, documents, and other aspects of the physical setting mediate activity?
- Social Context
  - What are the group and organizational goals? Roles and relationships of individuals in the group or organization?
Involving Users

Who are the users?
• Those who use the system
• The person who hired you
• Those impacted by the system
• Consider multiple stakeholders!

How do you involve users?
• Interviews
• Observation
• Participation in design

“First Rule of Usability? Don't Listen to Users - watch what they do”

Methodological Approaches

Some gross oversimplifications ...

• Contextual Inquiry
  - Observe and analyze workplace behavior
  - Collect and analyze artifacts

• Participatory Analysis
  - As above, but subsequently users help you interpret your data

• Ethnography
  - “Become one with the users”
Scenario-based Design Approach

You are here

SBD Requirements Analysis

Let’s step through this ...

Root concept: vision, rationale, assumptions, stakeholders

Field studies: workplace observations, recordings, interviews, artifacts

Summaries: stakeholder, task, and artifact analyses, general themes

Problem scenarios: illustrate and put into context the tasks and themes discovered in the field studies

Claims analysis: find and incorporate features of practice that have key implications for use
Root Concept

A shared understanding of the project’s high level goals used to guide field study and initial design

• Vision: what are we trying to achieve?
• Rationale: why will technology help?
• Stakeholder Groups: those with vested interest (not just “users“)
• Assumptions and Constraints: What decisions have we already made? What requirements have been imposed?

Field Study

• What information do you want to gather? See interview guide
• How will you record your observations?
  - Videotape
  - Audiotape
  - Camera
  - Written notes
  - Artifacts gathered
• Who plays what role in the visit?
Field Study Continued

- How do you ensure you are observing authentic work (rather than activities prepared for you)?
- Do you need to show up at a particular time to see important activities?
- Do you need to ask participants to simulate important but rare activities?

Conducting Interviews:

- What are your objectives?
- Prepare in advance:
  - Open ended questions, to get participants started
  - Specific questions, asked if not answered in above
- Who plays what role?
Summarizing the Observations

- Stakeholder Analysis
- Artifact Analysis
- Workplace Themes
- Problem Scenarios
- Claims Matrices
- Task Analysis

Stakeholder Analysis

- Descriptions of Stakeholders:
  - SBD: Background, Expectations, Preferences
  - Constantine and Lockwood: see form S3A
- Relations among Stakeholders:
  - Constantine and Lockwood’s role maps use Affinity (resembles), Classification (specializes), Composition (includes)
  - SBD uses more open ended relations
  - Why are we doing this?
### User Role Model

This is a combination of SBD and C&L. Use only what you find useful.

<table>
<thead>
<tr>
<th>Name:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Includes roles:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specializes roles:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other related roles:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Background (SBD):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expectations (SBD):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferences (SBD):</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain Knowledge:</th>
<th>low</th>
<th>medium</th>
<th>high</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Knowledge:</td>
<td>low</td>
<td>medium</td>
<td>high</td>
</tr>
</tbody>
</table>

#### Interaction Profile:
- Frequency: ___ low ___ medium ___ high
- Intensity: ___ low ___ medium ___ high
- Volume: ___ low ___ medium ___ high
- Predictable ___ variable ___ unpredictable
- Concentrated (batched) ___ distributed
- Simple ___ moderate ___ complex
- Required ___ discretionary
- Irregular ___ regular
- Continuous ___ discontinuous
- Process-driven ___ user-driven

#### Information Profile:
- Dominant flow: ___ from user ___ to user ___ balanced
- Origin: ___ aural ___ visual ___ mental process ___
- Telephone ___ paper ___ other:
- Information volume: ___ low ___ medium ___ high
- Data complexity: ___ low ___ medium ___ high

#### Supporting Capabilities
(needed functions, features, facilities):

#### Usability Objectives
(rank or check):
- Efficiency ___ accuracy ___ reliability ___ learnability
- Rememberability ___ clarity ___ comprehensibility
- Attractiveness ___ other:

#### Other salient role characteristics:

### Artifact Analysis

- **How will you gather the artifacts?**
  - Videotaping, photographs
  - Taking them with you

- **What does the artifact tell you about the task it supports?**
  - Task attributes and information
  - Action sequences

- **Best to observe in use (not always used as intended!)**
Workplace Themes

• Write observations and issues (whenever they arise) on sticky notes
• When you have a collection, arrange into groups of related notes
• Give the groups names: These are the themes to be addressed in design
• A good activity to do with users
• This provides a starting point for problem scenarios and claims
Problem Scenarios

- Stories of current practice
  - describe activities in problem domain
  - illustrate implications for design (from Workplace Themes)
- Begin with hypothetical stakeholders
- Tell a story for each stakeholder, carrying out actions to achieve a goal
- Consider interactions with other stakeholders

Claims Analysis

- As you write scenarios, identify
  - important features of situation
  - positive and negative impacts these features have on actors
- Typically these will be instances of tradeoffs
Hierarchical Task Analysis

Given a goal, how can the user achieve the goal?

1) Identify major goals and the activities by which users might achieve them
2) Decompose complex tasks into subtasks and ultimately actions
3) Check out your analysis by discussing with users or comparing to their behavior

This requires an accessible yet precise notation (see Preece handout) ...

Rosson’s example of HTA

What is the difference between identifying task requirements, doing interaction design, and doing usability analysis?
**MacGregor’s Clock Radio Example**

From Prof. C. MacGregor, Univ. of Waterloo, http://www.eng.uwaterloo.ca/~sd348/

0.0 Use Alarm Clock Radio

1.0 Set Current Time

2.0 Set Alarm Time (Wake-up)

3.0 Activate Alarm

4.0 Turn Off Alarm

5.0 Use Radio

---

**MacGregor’s Example: Expand**

From Prof. C. MacGregor, Univ. of Waterloo, ibid

Again, what do you notice about the lower levels? Can we fix this problem?

1.0 Set Current Time

1.1 Obtain correct time from external source

1.2 Hold “Time Set” Button While Adjusting Time

1.2.1 Press “FWD” Button To advance one minute At a time

1.2.2 Press both “FWD” and “FAST” button to advance time quickly

1.2.3 Press “REV” to recede one minute at a time

1.3 Release “Time Set” Button

2.4 Press both “REV” and “FAST” button to advance time quickly
Assessment of HTA

- OK for top level decomposition of sequential tasks
- Limited in how far you can take it
  - At some point you get so specific that you need to know what the tool is to specify the actions (previous example)
  - However, you have not yet designed the tool!
- Limited in Applicability:
  - Representation is hierarchical/sequential
  - No direct modeling of cognitive aspects
- HTA might help us identify use cases
  - Don’t decompose all the way to primitive actions
  - Instead, stop before the decomposition requires implementation decisions

Cognitive Task Analysis

- Recognizes that some tasks are cognitive as well as physical
- Analyzes what knowledge is needed to complete a task and how it is applied.
- Various techniques: Model Human Processor, GOMS, Task Knowledge Structures, Task Action Grammar ...
- Usually too complex for practitioners
Comments on all methods

- Capture whole human-computer system, not just part you expect to program; assign responsibility later
- Initial representations are a resource for conversations with users rather than “getting it right”
- As you transition into doing design, these representations then become working specifications and then documentation co-evolved with the system

Let’s try it ...

Automate or improve automation of Personal Address Books. Include collaborative functionality

- **Define Root Concept**
  - High-level vision, Basic rationale, Starting assumptions (we’ll do stakeholders later)
  - Use document provided

- **Plan Field Study**
  - Objectives? What questions will you ask?
  - Use document provided
Field Study

• Time for your field study!
• Cross-interview other groups
• Steal their address books

Requirements Analysis

• Stakeholder Analysis
  - Try C&L form provided and role mapping
• Artifact Analysis
• Workplace Themes
  - As you work, gather issues on sticky notes
  - Organize them into themes
• Problem Scenarios and Claims Analysis
  - write a scenario for one stakeholder
  - extract claims from it (use form provided)
• Hierarchical Task Analysis
Assignment 2

- Perform a requirements analysis for the following application:
  Collaborative Calendars: Analyze how people use their personal calendars, with particular attention to how they coordinate scheduling with others. Your objective will be to improve personal calendars to better handle collaborative aspects.

- See next slide for methods to use
- Due 2/2

Assignment 2 Details

- Apply these methods to the calendar problem (the first two items should be done in the order listed and before the others):
  - Root Concept
  - Interview (using interview guide)
  - User Role Modeling (UCD approach)
  - Artifact Analysis
  - Problem Scenario and Claims Analysis
  - Hierarchical Task Analysis
Assignment 2 Details Continued

Prepare a web page with the following:

• The artifact you created
  - By “artifact” I mean root concept document, interview guide, interview data, problem scenario, etc.
  - You’ll need to convert to HTML or use screen capture.
  - Your images and HTML should work on all platform.
    Avoid Windows-specific image formats and Microsoft-generated HTML!

• A brief explanation of each artifact

• A one page summary
  - Comparing and evaluating the utility of these methods
  - Indicating which you might choose for future work and how you would combine them