Requirements Gathering & Task Analysis

This material has been developed by Georgia Tech HCI faculty, and continues to evolve. Contributors include Gregory Abowd, Jim Foley, Diane Gromala, Elizabeth Mynatt, Jeff Pierce, Colin Potts, Chris Shaw, John Stasko, and Bruce Walker. Modified by Valerie Summet, 2011. Permission is granted to use with acknowledgement for non-profit purposes. Last revision: Jan. 2011
Project Part 1: Big Picture

• Determine what data you need (today)
• Gather it using various appropriate methods and techniques (today)
• Represent the tasks and subtasks, plus other related information (next class)
• Use this data as basis for design (part 2)
Outline

1. Why, What and How of Requirements Gathering
2. Methods for Requirements Analysis and Requirements Gathering
3. User Characteristics and Usage Environment
4. Making Sense of All the Data (next class)
5. Documenting the Results (next class)
Why, What, and How?
Why?

- To understand the process we’ll be designing for
- To be more efficient
- We build systems for others, not for ourselves
  - “You are not the user!”
What?

• Overall goal - build a system that does X
• How is success defined?
• Real-world constraints
• Environment in which system will be used
• User characteristics
• User tasks to achieve the goal
  – Task decomposition
Typical Real-World Constraints

• Elapsed time to market
• Cost/effort to design and implement
• Size/footprint/weight/power/price
• Computer power/memory (related to cost and power)
• Consistency with overall product line
• Backward compatibility
• Differentiation from competitive products
How: Gather, Organize, Represent

• Gather data
  – Interviews, observation, surveys/questionnaires, documentation, immersion

• Organize data
  – Notes, cards, brainstorming, computer tools

• Represent data
  – Lists, outlines, matrices
  – Narratives
  – Hierarchies, Networks, Flow charts
How (Gather): Components

• Three key components in considering how people work
  – Activities
  – Artifacts
  – Relations

• NOT JUST computer system oriented

• Study related processes and objects in the environment that people may use
  – Office environment - papers, whiteboards, …
  – Phone calling - phone book, note pad, dial, …
How (Gather): Task Analysis Focus

• Focus on *observable behaviors*
  – What are the practices, methods, steps, objects, …, used?

• Learn *what* users do, *why* they do it, *how* they do it, *when* they do it, with what *tools* or *people* they do it
  – Your new system / UI may change some of this, especially the *how*
  – Understanding *how* can lead to deeper knowledge and insights
How (Gather): cont’d …

• Tasks & Subtasks
  – Physical
  – Cognitive
  – Communication
• Conditions under which these tasks are done
• Results/outcomes of tasks
• Requirements to perform task
  – Information
  – Communication with others
  – Equipment

Must include
Should include
Could include
Exclude
Methods
Formative & Summative Evaluation

• *Formative evaluation*
  – Conducting this process to help guide the *formation* (ie, design) of a UI

• *Summative Evaluation*
  – Conducting this process to help *summarize* (sum up) the effectiveness of an existing or developmental UI

• Many of the user & task analysis techniques can be used for both formative and summative evaluation
  – Our focus right now is on formative evaluation
  – Will revisit some of the methods again later
Some (Not All) User & Task Analysis Methods

1. Ethnography - learn by immersion/doing
2. Observation - thinking out loud
3. Cooperative Evaluation
4. Interviews
5. Questionnaires
6. Focus groups
7. Documentation analysis
8. Look at competitive products
1. Ethnography

- Deeply contextual study
- Immerse oneself in situation you want to learn about (has anthropological and sociological roots)
  - Observing people in their cultural context
- Behavior is meaningful only in context
  - For UI designers: improve system by finding problems in way it is currently being used
- Methods: interview, observation, recording
1. Observation is Key

• Carefully observe everything about users and their environment

• Think of describing it to someone who has never seen this activity before

• What users say is important, so are non-verbal details
  – Example: Office work environment
    • Business practices, rooms, artifacts, work standards, relationships between workers, managers, …
1. Drawbacks of Ethnographic Methods

• Time required
  – Can take weeks or months for large systems

• Scale/Generalizability
  – Most use small numbers of participants just to keep somewhat manageable

• Type of results
  – Highly qualitative, may be difficult to present/use

• Acquired skill – “learn by doing”
  – Identifying and extracting “interesting” things is challenging

• Ethical considerations
2. Observation - Thinking Out Loud

- Sit with user doing activity of interest to you
- Encourage user to verbalize what they are thinking
- Video or audio record (with permission)
- Not everyone is good at this
- Hard to keep it up for long time while also doing something; need breaks
3. Cooperative (Participatory) Evaluation

- Sit with user doing activity of interest to you
- Talk with user as they do their activity
  - Ask questions
    - Why are you doing that?
    - How did you know the result was what you wanted?
    - Are there other ways to achieve the same goal?
    - How did you decide to do things this way?
- Relaxed version of thinking out loud
  - Observer and participant can ask each other questions
4. Interviews

- **Structured** – “Just the facts”
  - Efficient
  - Require training
- **Unstructured** – A conversation
  - Inefficient
  - No training
- **Semi-structured** – start with focused questions, move to open-ended discussion
  - Good balance
  - Often appropriate
4. Semi-Structured Interviews

- Predetermine data of interest - know why you are asking questions - don’t waste time
- Plan for effective question types
  - How do you perform task x?
  - Why do you perform task x?
  - Under what conditions do you perform task x?
  - What do you do before you perform…?
  - What information do you need to…?
  - Whom do you need to communicate with to …?
  - What do you use to…?
  - What happens after you…?
  - What is the result or consequence of…?
  - What is the result or consequence of NOT…?
  
- See Gordon & Gill, 1992; Graesser, Lang, & Elofson, 1987
4. Typical Open-Ended Questions

- Why do you do this (whatever the task is you are studying)?
- How do you do this?
  - Gets at task-subtask structure
  - Then ask about each subtask
- Why do it this way rather than some other way?
  - Attempts to get user to explain method so you can assess importance of the particular way of doing task
- What has to be done before you can do this?
  - To understand sequencing requirements
4. Typical Open-Ended (cont’d)

• Please show me the results of doing this
• Do errors ever occur when doing this?
  – If answer is ‘yes,’ then learn why occur
• How do you discover the errors, and how do you correct them?
  (Adapted from Nielsen et al, CHI ‘86)

• Encourage digressions; ask for elaborations
• “What else should I have asked you?” or “Can you think of anything else I should know?”
4. Domain Expert Interviews

- Expert describes how it should be done (not necessarily how it is done)
- Be careful to use this only to understand tasks, goals, and objectives
- Don’t use to define UI requirements
5. Questionnaires

• General criteria
  – Make questions clear and specific
  – Ask some closed questions with range of answers
    • Sometimes also have a no opinion option, or other answer option
  – Do a test run with one or two people to make sure there aren’t problems with your instrument
  – Quantitative vs. Qualitative questions
5. Questionnaires - Example

- Seven-point Likert Scale (use odd #) see pg. 151 in DtUI

**Evaluation Questionnaire**

Please complete the following questionnaire by indicating how strongly you agree or disagree with the following statements. Your responses will be kept confidential and will be used only for improving the interface that you worked with in this experiment.

1. I felt that the computer agent’s help was **worthwhile**.  
   
   1-----2-----3-----4-----5-----6-----7
   Strongly Strongly Disagree Agree

2. I found the computer agent to be **intrusive**.  
   
   1-----2-----3-----4-----5-----6-----7
   Strongly Strongly Disagree Agree

- Could also use just words
  - Strongly agree, agree, neutral, disagree, strongly disagree
5. Other Typical Questions

- Rank the importance of each of these tasks (give a list of tasks)
- List the four most important tasks that you perform (this is an open question)
- List the pieces of information you need to have before making a decision about X, in order of importance
- Are there any other points you would like to make? (open-ended opinion question; good way to end)
- Same questions can be used in interview and in questionnaire; difference is in follow-up opportunity
6. Focus Groups

• Group of individuals - 3 to 10
  – Use several different groups with different roles or perspectives
    • Separate the powerful from those who are not
    – Careful about few people dominating discussion

• Use structured set of questions
  – More specific at beginning, more open as progresses
  – Allow digressions before coming back on track

• Relatively low cost, quick way to learn a lot

• Audio or video record, with permission
7. Documentation Analysis

- Written documentation of procedures and tasks often exists, particularly in business contexts.
- Similar in some ways to the expert interview.
- Often describe how things should be done rather than how they are done.
  - Try to understand why not done “by the book”
8. Look at Competitive Products

• Looking for both good and bad ideas
  – Functionality
  – UI style

• Use task performance metrics to establish bounds on your system
  – Ex: Give user task to perform on other system. Try to do “better.”
Which Methods to Use?

• Depends on
  – Resources
  – Current knowledge of tasks and users
  – Context
    • Can’t use talking out loud if tasks involve two people working together
  – Essential to use some methods
  – Not likely you will use all methods
Types of Findings

• Can be both
  – Qualitative
    • Observe trends, habits, patterns, …
    • Present through prose and case studies
  – Quantitative
    • How often was something done, what per cent of the time did something occur, how many different …
    • Present through statistics
User Characteristics and Environment
User Characteristics

- Attitude, morale, willingness to change, motivation, reading level, typing skill, education, frequency of use, training, color-blindness, handedness, gender,…

- Novice, intermediate, expert
  - System experience, task experience, computer literacy

- Cultural factors
  - Uses of icons, colors, words, metaphors - more later
User Motivation

**User**

- Low motivation, discretionary use
- Low motivation, mandatory use
- High motivation, due to fear
- High motivation, due to interest

**Design goal**

- Ease of learning
- Control, power
- Ease of learning, robustness, control
- Power, ease of use
## Implications of Experience

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<th>Experience</th>
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Job & Task Implications

• Frequency of use
  – High - Ease of use
  – Low - Ease of learning & remembering

• Task implications
  – High - Ease of use
  – Low - Ease of learning

• System use
  – Mandatory - Ease of use
  – Discretionary - Ease of learning
Job Characteristics

- Mission critical
- Life and safety
- High stress environment
- High mental workload
- Low mental workload

- Implications of these types of jobs?
Environment

• Lighting levels / directions
• Noise level
• Temperature
• Standing / sitting

• Implications of these types of environments?