# Requirements Gathering & Understanding Users

John Stasko

Spring 2007

This material has been developed by Georgia Tech HCI faculty, and continues to evolve. Contributors include Gregory Abowd, Al Badre, Jim Foley, Elizabeth Mynatt, Jeff Pierce, Colin Potts, Chris Shaw, John Stasko, and Bruce Walker. Permission is granted to use with acknowledgement for non-profit purposes. Last revision: January 2007.

## Agenda

- Requirements Gathering
  - Why, what, how
- Observational/Interpretive Analysis
  - Motivation
  - Methods
    - Ethnography
- Implications

## Project Part 1

- Requirements?

## Why

- To understand what we are going to be doing
- We build systems for others, not for ourselves

## 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

## What 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, …

## What 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

## What 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

## How – Some (Not All) User & Task Analysis Methods

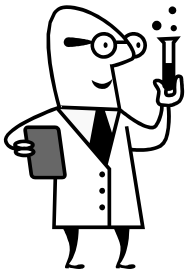
1. Ethnography - learn by immersion/doing
2. Observation - thinking out loud
3. Cooperative Evaluation
4. Interviews
5. Questionnaires
6. Focus groups
7. Study Documentation
8. Look at competitive products

## Interpretive Analysis

- Experiments: Formal and objective
- Interpretive analysis: More subjective
  - Concerned with humans, so no objective reality
  - Sociological, anthropological approach
- Users involved, as opposed to predictive approaches

## Beliefs

- Sees limitations in scientific hypothesis testing in closed environment
  - Lab is not real world
  - Can't control all variables
  - Context is neglected
  - Artificial, short tasks



## IA Methods

- A number of different methods or techniques in this area exist
  - Ethnography
    - Our main focus
  - Contextual inquiry
    - More specific form of ethnography with a focus on asking questions
  - Field study
    - Common notion, often equated with ethnography
  - Observational study
    - Much more informal, just watching users
  - …

## Ethnography

- Deeply contextual study
- Immerse oneself in situation you want to learn about (anthropological and sociological roots)
  - Observing people in their cultural context
- Interpretation of data is primary
- Behavior is meaningful only in context

## Philosophy

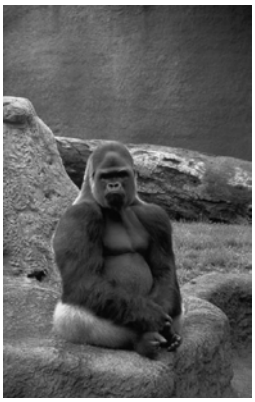
- Argues that formal environment of controlled study is artificial --- Experimenter wields "power" over subject
- So … get into working environment of user
- -> Interpretation is primary, rather than data

## Objectives

- Understanding the user
  - Understand goals and values
  - Understand individual's or group's interactions within a culture
  - Try to make tacit domain knowledge explicit
  - Do this in an **unbiased** fashion
  - For UI designers: Improve system by finding problems in way it is currently being used

## Techniques

- In person observation
- Audio/video recording
- Interviews
- "Wallow in the data"



## 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, but also non-verbal details

## Observations

- Things of interest to evaluator
  - Structure and language used in work
  - Individual and group actions
  - Culture affecting work
  - Explicit and implicit aspects of work
- Example: Office work environment
  - Business practices, rooms, artifacts, work standards, relationships between workers, managers, …

## Interviews Important

- Have a question plan, but keep interview open to different directions
- Be specific
- Create interpretations together with users
  - Be sure to use their terminology
- At end, query "What should I have asked?"
- Record interviews

## Steps

- 1. Preparation
  - Understand organization policies and work culture
  - Familiarize yourself with system and its history
  - Set initial goals and prepare questions
  - Gain access and permission to observe & interview
- 2. Field study
  - Establish rapport with users
  - Observe/interview users in workplace and collect all different forms of data
  - Follow any leads that emerge from visits
  - Record the visits

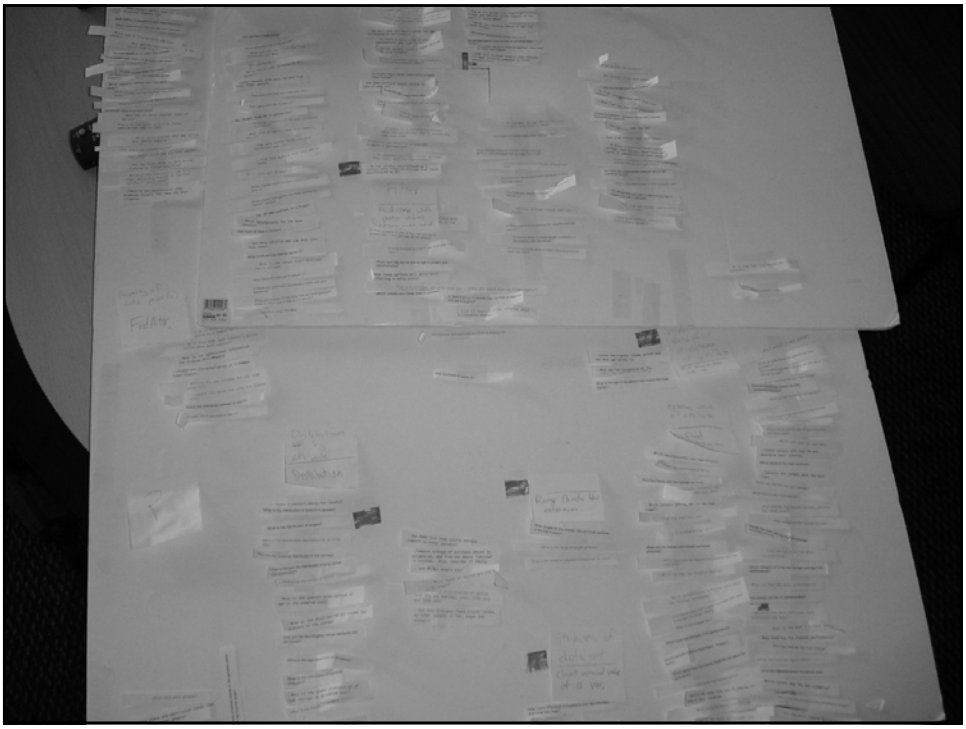
Rose et al '95

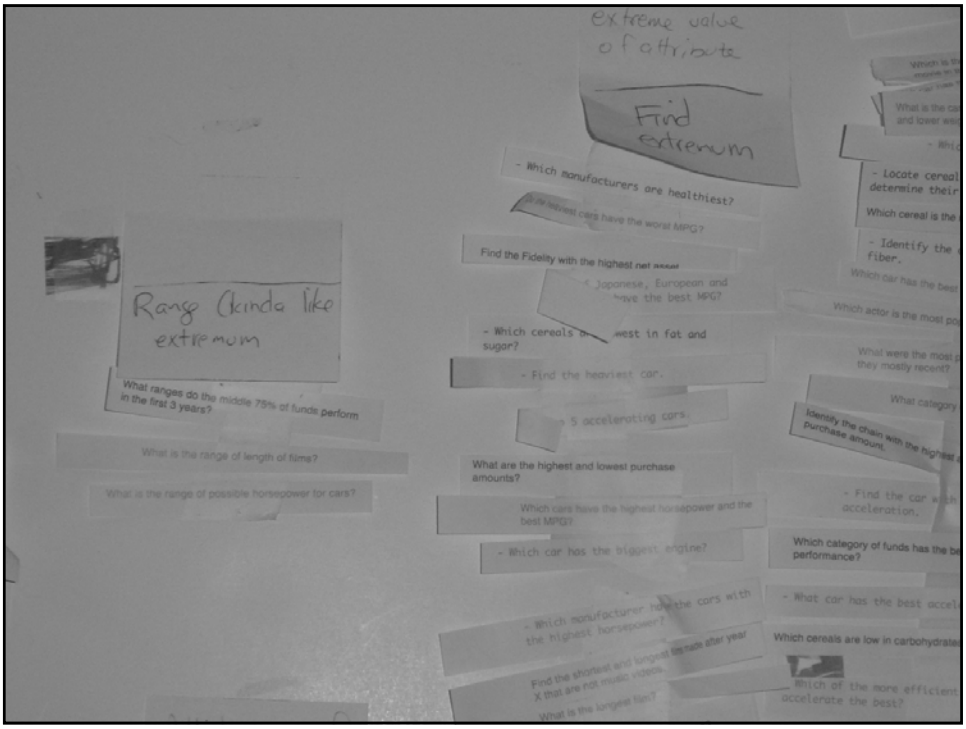
## Steps

- 3. Analysis
  - Compile collected data in numerical, textual and multimedia databases
  - Quantify data and compile statistics
  - Reduce and interpret data
  - Refine goals and process used
- 4. Reporting
  - Consider multiple audiences and goals
  - Prepare a report and present findings

## One Technique: Affinity Diagram

- Write down each quote/observation on a slip of paper
- Put up on board
- Coalesce items that have affinity
  - If they are saying similar things about an issue
- Give names to different groups (colors too)
- Continue grouping subgroups
- A hierarchy will be formed

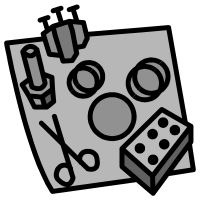



extreme value of attribute
Find extremum
- Which manufacturers are healthiest?
Range Ckinda like extremum
What ranges do the middle 75% of funds perform in the first 3 years?
What is the range of length of films?
What is the range of possible horsepower for cars?
Find the Fidelity with the highest net asset
- Find the heaviest car.
What are the highest and lowest purchase amounts?
Which cars have the highest horsepower and the best MPG?
- Which car has the biggest engine?
- Which manufacturer has the cars with the highest horsepower?
- Locate cereal
determine their
Which cereal is the
- Identify the
fiber.
Which actor is the most
What were the most
they mostly recent?
What category
Identify the chain with the highest
purchase amount.
- Find the car
acceleration.
Which category of funds has the
performance?
- What car has the best
Which cereals are low in carbohydrates
Which of the more efficient
accelerate the best?

## Why Useful?

- Can help designer gain a rich and true assessment of user needs
  - Help to define requirements
- Uncovers true nature of user's job
  - Discovers things that are outside of job description or documentation
- Allows you to play role of end-user
  - Can sit in when real users not available
- Open-ended and unbiased nature promotes discovery
  - Empirical study and task analysis are more formal – ethnography may yield more unexpected revelations

## Types of Findings



- Can be both
  - Qualitative
    - Observe trends, habits, patterns, …
  - Quantitative
    - How often was something done, what per cent of the time did something occur, how many different …

## Drawbacks

- Time required
  - Can take weeks or months
- Scale
  - Most use small numbers of participants just to keep somewhat manageable
- Type of results
  - Highly qualitative, may be difficult to present and use
- Acquired skill
  - Identifying and extracting "interesting" things is challenging

## Ethnomethodology

- Concurrent/informed ethnography
  - Study is being done in conjunction with a system being developed
  - + Helps keep focus on user throughout design
  - - Requires lots of time and coordination

## To Learn More…

- CS 6455 – User Interface Design and Evaluation
- All about qualitative methods

## 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 Evaluation

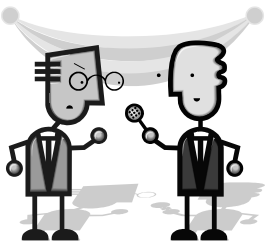
- User is viewed as collaborator in evaluation, not a subject
  - "Friendly approach"
- Relaxed version of think-aloud
  - Evaluator and participant can ask each other questions

## CE Methods

- Seeks to detect errors early in a prototype
- Experimenter uses tasks, also talks to participant throughout, asks questions…
- Have debriefing session at end

## 4. Interviews

- Structured – "Just the facts"
  - Efficient
  - Training - interview process
- Unstructured – A conversation
  - Inefficient
  - Training – process + domain knowledge
- Semi-structured – start with focused questions, move to open-ended discussion
  - Good balance, often appropriate
  - Training – process + domain knowledge



## 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 …?
  - 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

## 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

## 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?

## Domain Expert Interviews

- Expert describes how it should be done (not necessarily how it is done)

# 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 test run with one or two people

# Questionnaires - Example

- Seven-point Likert Scale (use odd #)

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

- Could also use just words
  - Strongly agree, agree, neutral, disagree, strongly disagree

## 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
  - And to 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. Study Documentation

- 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
- Do user task performance metrics to establish bounds on your system

## 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

## Goal - Organize Information

- Organizing the information blends in with step 5, documenting the results
- Group process - compare notes
- Several tools can be used to facilitate

# Tools for Making Sense

- Card Sorting - to create Affinity Diagrams
- Card sorting also useful for web site organization
  - Do it with multiple users

# Affinity Diagram - from Card Sorting

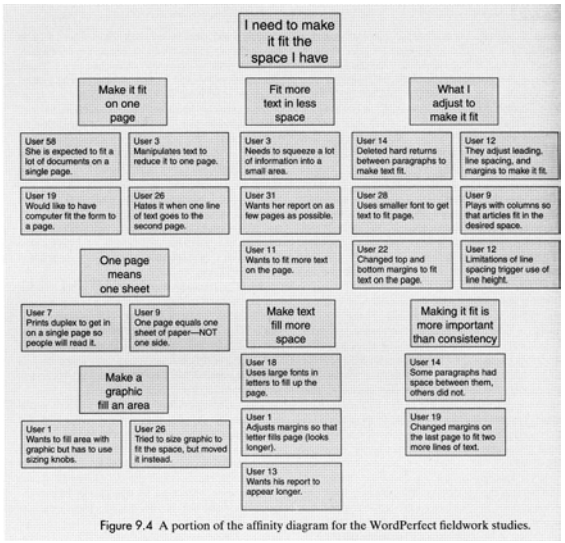



Figure 9.4 A portion of the affinity diagram for the WordPerfect fieldwork studies.

- Cards are notes from interviews, focus groups, etc.

From *Interaction Design*, Preece Rogers and Sharp

## More Tools for Making Sense

- Flow charts and work flow diagrams
- Software tools for
  - Card sorting
  - Flow charts
  - Task analysis diagramming

## Project Part 1

- Let's review the specs…

## *Design of Everyday Things*

- Discuss next Thursday
- Be reading now…

## Upcoming

- Task analysis & requirements definition
- *Design of Everyday Things*
- Design