Human-Computer Interaction

I3 Ethnography: What did you learn?

I6: Heuristic Evaluation

- Comprehensive list
- Due in two weeks

T4: Paper Prototyping #1

- Update storyboards in response to scenario to be sent to you
- Create a paper prototyping kit for your interface
- Practice on one person prior to...
- In-class exercise next week

What is Design?

- Achieving goals within constraints
  - Goals
  - Constraints
  - Trade-offs

Golden Rule

- Understand your materials
  - Computers
  - People ("Know your users")
    - Who are they?
    - Probably not like you
    - Talk to them (how things really, vs should, happen)
    - Watch them (what ... You want why)
    - Look at the "stuff" they use
    - Use your imagination

Understanding People

- E.g., Impact of "stuff"
- E.g., Errors:
  - Slips
  - Errors
  - Omissions

Scenarios and Personas

- "**Force you** to think about the design in detail and notice potential problem before they happen"
- Also help
  - Communicate ideas
  - Validate other models (e.g., task)
  - Express dynamics
  - (But be careful ... Only show one path)

Persona

- Description of an 'example' user
  - Not necessarily a real person
- Use as surrogate user
  - What would "Ralph" think
- Details matter
  - Realism helps in creation and use

Example

- Betty is 37 years old, She has been Warehouse Manager for five years and worked for Simpkins Brothers Engineering for twelve years. She didn't go to university, but has studied in her evenings for a business diploma. She has two children aged 15 and 7 and does not like to work late. She did part of an introductory in-house computer course some years ago, but it was interrupted when she was promoted and could no longer afford to take the time. Her vision is perfect, but her right-hand movement is slightly restricted following an industrial accident 3 years ago. She is enthusiastic about her work and is happy to delegate responsibility and take suggestions from her staff. However, she does feel threatened by the introduction of yet another new computer system (the third in her time at SBE).

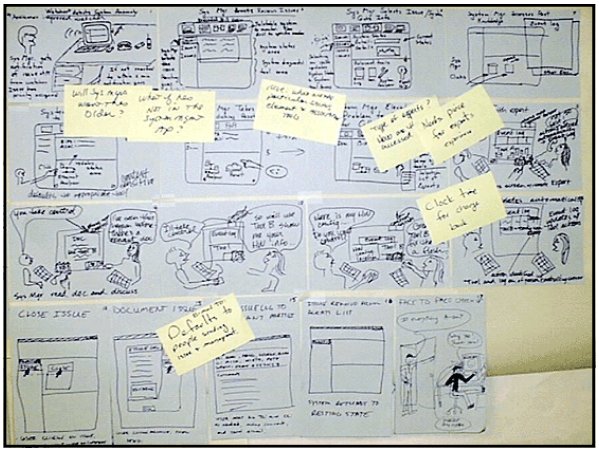
Scenario

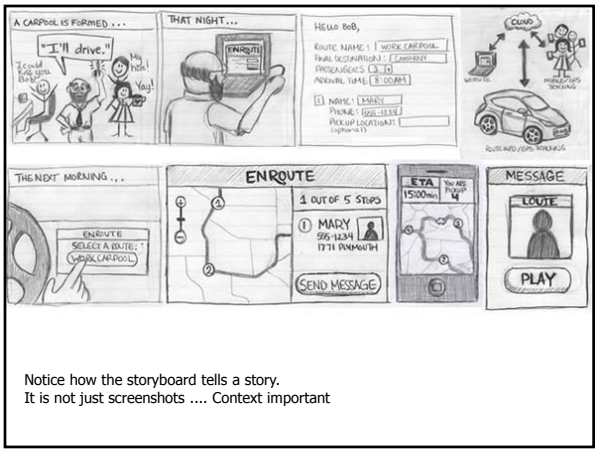
- What will users want to do?
- Step-by-step walkthrough
  - What can they see (sketches, screen shots)
  - What do they do (keyboard, mouse etc.)
  - What are they thinking?
- Use and reuse throughout design

Scenario Example

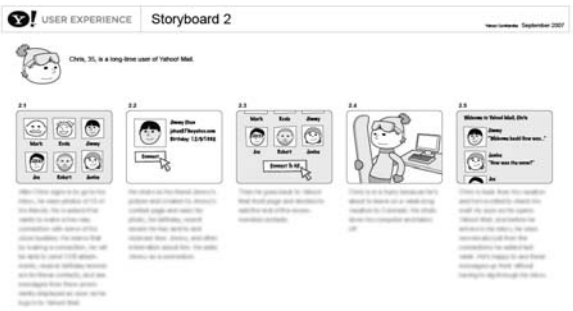
- Brian would like to see the new film "Moments of Significance" and wants to invite Alison, but he knows she doesn't like "arty" films. He decides to take a look at it to see if she would like it and so connects to one of the movie sharing networks. He uses his work machine as it has a higher bandwidth connection, but feels a bit guilty. He knows he will be getting an illegal copy of the film, but decides it is OK as he is intending to go to the cinema to watch it. After it downloads to his machine he takes out his new personal movie player. He presses the 'menu' button and on the small LCD screen he scrolls using the arrow keys to 'bluetooth connect' and presses the select button. On his computer the movie download program now has an icon showing that it has recognised a compatible device and he drags the icon of the film over the icon for the player. On the player the LCD screen says "downloading now", a percent done indicator and small whirling icon. … … …

Storyboards





Notice how the storyboard tells a story.
It is not just screenshots .... Context important



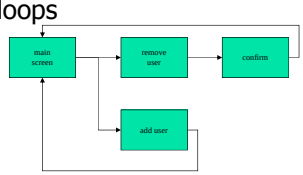
Best to not get too fancy and stick with pencil if you can...

Navigation Design / Local Structure

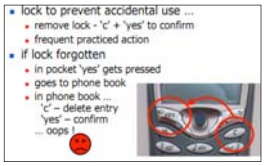
- Much interaction: goal seeking behavior
  - People meander
  - Important to
    - Know where you are
    - Know what you can do
    - Know where you are going
    - Know what will happen
    - Know where you've been
    - Know what you've done

Network diagram

- Task oriented
- What leads to what
- What happens when
- Branches and loops



Cognitive failure due to modes



- Why didn't Nokia figure this out?
- How would you figure out this is a problem?

Aesthetics and Utility

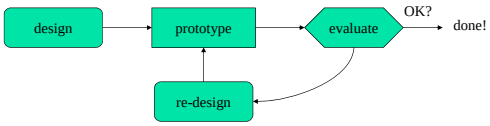
- We will talk about design later...
- For now
  - Pretty ≠ good
  - But want well designed to look nice
  - Beauty and utility may be at odds
    - Examples?

Evaluation

- Formative
  - Start in a good place ...
  - Iteration!
- Summative
  - End of process
  - Often far too late

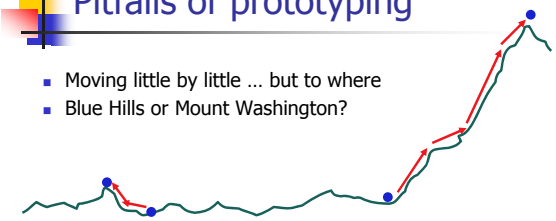
Iterative prototyping

- You never get it right first time
- If at first you don't succeed …



Pitfalls of prototyping

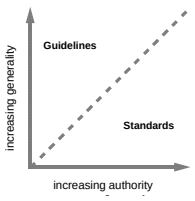
- Moving little by little … but to where
- Blue Hills or Mount Washington?



1. Need a good start point
2. Need to understand what is wrong
3. Need paper napkins not cloth napkins

Design rules

- principles
  - abstract design rules
  - low authority
  - high generality
- standards
  - specific design rules
  - high authority
  - limited application
- guidelines
  - lower authority
  - more general application



Principles to support usability

Learnability
- the ease with which new users can begin effective interaction and achieve maximal performance

Flexibility
- the multiplicity of ways the user and system exchange information

Robustness
- the level of support provided the user in determining successful achievement and assessment of goal-directed behaviour

Principles of learnability

Predictability
- determining effect of future actions based on past interaction history
- operation visibility
- assumes user has a mental model

Synthesizability
- assessing the effect of past actions
- immediate vs. eventual honesty

Principles of learnability (ctd)

Familiarity
- how prior knowledge applies to new system
- guessability; affordance

Generalizability
- extending specific interaction knowledge to new situations

Consistency
- likeness in input/output behaviour arising from similar situations or task objectives
- must be applied relative to *something*

Principles of flexibility

Dialogue initiative
- freedom from system imposed constraints on input dialogue
- system vs. user pre-emptiveness (Technically tricky)
  - Maximize: user pre-empt the system
  - Minimize: system pre-empt the user

Multithreading
- ability of system to support user interaction for more than one task at a time
- concurrent vs. interleaving; multimodality

Task migratability
- passing responsibility for task execution between user and system

Principles of flexibility (ctd)

Substitutivity
- allowing equivalent values of input and output to be substituted for each other
- representation multiplicity; equal opportunity

Customizability
- modifiability of the user interface by user (adaptability) or system (adaptivity)

Principles of robustness

Observability
- ability of user to evaluate the internal state of the system from its perceivable representation
- browsability; defaults; reachability; persistence; operation visibility

Recoverability
- ability of user to take corrective action once an error has been recognized
- reachability; forward/backward recovery; commensurate effort
  - Difficult to undo, then difficult to do

Principles of robustness (ctd)

Responsiveness

- how the user perceives the rate of communication with the system
- Stability

Task conformance

- degree to which system services support all of the user's tasks
- task completeness; task adequacy

Standards

- set by national or international bodies to ensure compliance by a large community of designers standards require sound underlying theory and slowly changing technology
- hardware standards more common than software high authority and low level of detail
- ISO 9241 defines usability as effectiveness, efficiency and satisfaction with which users accomplish tasks

Guidelines

- more suggestive and general
- many textbooks and reports full of guidelines
- abstract guidelines (principles) applicable during early life cycle activities
- detailed guidelines (style guides) applicable during later life cycle activities
- understanding justification for guidelines aids in resolving conflicts

Golden rules and heuristics

- "Broad brush" design rules
- Useful check list for good design
- Better design using these than using nothing!
- Different collections e.g.
  - Nielsen's 10 Heuristics (see Chapter 9)
  - Shneiderman's 8 Golden Rules
  - Norman's 7 Principles

Shneiderman's 8 Golden Rules

1. *Strive for consistency*
2. *Enable frequent users to use shortcuts*
3. *Offer informative feedback*
4. *Design dialogs to yield closure*
5. *Offer error prevention and simple error handling*
6. *Permit easy reversal of actions*
7. *Support internal locus of control*
8. *Reduce short-term memory load*

Norman's 7 Principles

1. *Use both knowledge in the world and knowledge in the head.*
2. *Simplify the structure of tasks.*
3. *Make things visible: bridge the gulfs of Execution and Evaluation.*
4. *Get the mappings right.*
5. *Exploit the power of constraints, both natural and artificial.*
6. *Design for error.*
7. *When all else fails, standardize.*

HCI design patterns

- An approach to reusing knowledge about successful design solutions
- Originated in architecture: Alexander
- A pattern is an invariant solution to a recurrent problem within a specific context.
- Examples
  - Light on Two Sides of Every Room (architecture)
  - Go back to a safe place (HCI)
- Patterns do not exist in isolation but are linked to other patterns in *languages* which enable complete designs to be generated

HCI design patterns (cont.)

- Characteristics of patterns
  - capture design practice not theory
  - capture the essential common properties of good examples of design
  - represent design knowledge at varying levels: social, organisational, conceptual, detailed
  - embody values and can express what is humane in interface design
  - are intuitive and readable and can therefore be used for communication between all stakeholders
  - a pattern language should be generative and assist in the development of complete designs.

To do

- Read and take notes (light this week!)
  - Dix Ch 9 and Neilsen Ch 5 (on Blackboard)
  - 4 Health Interfaces #2 papers (Week 7) Research papers
- Do homework T4
- Start thinking about homework I6

Research Papers (left from last week)

- Li, Hong, and Landay, Topiary: A Tool for Prototyping Location-Enhanced Applications, UIST 2004 (Presenter: Lei Wang)

Research Papers

- Design Skills (Week 6)
  - Dow et al, Parallel Prototyping Leads to Better Design Results, More Divergence, and Increased Self-Efficacy, TOCHI 2010 (Presenter: Subhajit Mukherjee)
  - Davidoff et al., Rapidly Exploring Application Design through Speed Dating, UbiComp 2007 (Presenter: Akshay Ajit Sane)
  - Brandt, Designing Exploratory Design Games: A Framework for Participation in Participatory Design?, Participatory Design Conference 2006
  - Tohidi et al., User Sketches: A Quick, Inexpensive, and Effective way to Elicit More Reflective User Feedback, NordCHI 2006