User Centered Design and Prototyping

Why user-centered design is important
Prototyping and user centered design
Prototyping methods

System Centered Design

We could design the product with a simple point and click interface...

Or we could require the user to choose among thousands of poorly documented commands, each of which must be typed exactly right on the first try...

Bear in mind, we'll never meet a customer ourselves. Make it so they have to reboot after every typo.

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System Centered Design

What can I easily build on this platform?
What can I create from the available tools?
What do I as a programmer find interesting?

User Centered System Design

Design is based upon a user’s
- abilities and real needs
- context
- work
- tasks
- need for usable and useful product

Golden rule of interface design: *Know The User*
User Centered System Design

... is based on understanding the domain of work or play in which people are engaged and in which they interact with computers, and programming computers to facilitate human action. ...

Assumptions

- The result of a good design is a satisfied customer
- The process of design is a collaboration between designers and customers. The design evolves and adapts to their changing concerns, and the process produces a specification as an important byproduct
- The customer and designer are in constant communication during the entire process

Denning and Dargan, 1996

Participatory Design

Problem

- intuitions wrong
- interviews etc not precise
- designer cannot know the user sufficiently well to answer all issues that come up during the design

Solution

- designers should have access to representative users
  - END users, not their managers or union reps!

User centered design and prototyping
**Participatory Design**

Users are 1st class members in the design process
- active collaborators vs passive participants

Users considered subject matter experts
- know all about the work context

Iterative process
- all design stages subject to revision

**Up side**
- users are excellent at reacting to suggested system designs
  - designs must be concrete and visible
- users bring in important “folk” knowledge of work context
  - knowledge may be otherwise inaccessible to design team
- greater buy-in for the system often results

**Down side**
- hard to get a good pool of end users
  - expensive, reluctance ...
- users are not expert designers
  - don’t expect them to come up with design ideas from scratch
- the user is not always right
  - don’t expect them to know what they want
Methods for involving the user

At the very least, talk to users
- surprising how many designers don’t!

Contextual interviews + site visits
- interview users in their workplace, as they are doing their job
- discover user’s culture, requirements, expectations,…

Methods for involving the user

Explain designs
- describe what you’re going to do
- get input at all design stages
  - all designs subject to revision
- important to have visuals and/or demos
  - people react far differently with verbal explanations
Prototyping

Early design

- Brainstorm different representations
- Choose a representation
- Rough out interface style
- Task centered walkthrough and redesign
  - Fine tune interface, screen design
  - Heuristic evaluation and redesign
  - Usability testing and redesign
- Limited field testing
- Alpha/Beta tests
- Low fidelity paper prototypes
- Medium fidelity prototypes
- High fidelity prototypes
- Working systems

Late design

User centered design and prototyping
**Sketches**

- drawing of the outward appearance of the intended system
- crudity means people concentrate on high level concepts
- but hard to envision a dialog’s progression

**Computer Telephone**

Last Name:  
First Name:  
Phone:  

Place Call  
Help

**What to do**  
Touch a different color, or scan another item.

**What you selected**  
**JPG Stroller**  
For children between 1-3 years old ...$98.  
X Green  
□ Blue  
□ Red (out of stock)

<table>
<thead>
<tr>
<th>Item</th>
<th>Style</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>JPG Stroller</td>
<td>Green</td>
<td>98.00</td>
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tax: 6.98  
Total: $104.98

**All done?**  
Place your order  
Print this list  
Throw this list away
Storyboarding

- a series of key frames
  - originally from film; used to get the idea of a scene
  - snapshots of the interface at particular points in the interaction

- users can evaluate quickly the direction the interface is heading

Storyboarding examples:

1. **Initial screen**
   - What to do: Find the item you want in the catalog and scan the bar code next to it.
   - What you selected:
     - Item: Stroller
     - Style: Blue
     - Cost: $99.99

2. **Scan the stroller**
   - What to do: Touch a different color, or scan another item.
   - What you selected: Stroller for children between 1-3 years old.
   - Item: Stroller
     - Style: Green
     - Cost: $99.99 (tax $6.99)
   - Total: $104.98

3. **Place the order**
   - What to do: To get your items, bring the printout to the food counter.
   - What you selected: Stroller
     - Item: Stroller
     - Style: Blue
     - Cost: $99.99 (tax $6.99)

   

User centered design and prototyping
Pictive plastic interface for collaborative technology initiatives through video exploration

Designing with office supplies
- multiple layers of sticky notes and plastic overlays
- different sized stickies represent icons, menus, windows etc.

interaction demonstrated by manipulating notes
- new interfaces built on the fly

session videotaped for later analysis
- usually end up with mess of paper and plastic!

User centered design and prototyping
Pictive

Can pre-make paper interface components

- buttons
- combo box
- list box
- menu
- alert box
- entries
- tabs

Tutorial manuals

Write them in advance of the system
- a step by step storyboard walkthrough with detailed explanations
- key interface concepts for programmers
Medium fidelity prototypes

Prototyping with a computer
- simulate some but not all features of the interface
  - engaging for end users

purpose
- provides sophisticated but limited scenario for the user to try
- can test more subtle design issues

dangers
- user’s reactions often “in the small”
- users reluctant to challenge designer
- Users reluctant to touch the design
- management may think its real!

Limiting prototype functionality

vertical prototypes
- includes in-depth functionality for only a few selected features
- common design ideas can be tested in depth

horizontal prototypes
- the entire surface interface with no underlying functionality
- a simulation; no real work can be performed

scenario
- scripts of particular fixed uses of the system; no deviation allowed

**Integrating prototypes and products**

**throw-away**
- prototype only serves to elicit user reaction
- creating prototype must be rapid, otherwise too expensive

**incremental**
- product built as separate components (modules)
- each component prototyped & tested, then added to the final system

**evolutionary**
- prototype altered to incorporate design changes
- eventually becomes the final product

**Painting/drawing packages**

draw each storyboard scene on computer
- very thin horizontal prototype
- does not capture the interaction “feel”
**Scripted simulations**

create storyboard with media tools
- scene transition activated by simple user inputs
- a simple vertical prototype

user given a very tight script/task to follow
- appears to behave as a real system
- script deviations blow the simulation
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**User centered design and prototyping**
Interface builders

Design tools for laying out common widgets

excellent for showing look and feel
- a broader horizontal prototype
- but constrained to widget library

vertical functionality added selectively
- through programming
**Wizard of Oz**

A method of testing a system that does not exist
- the voice editor, IBM 1984

What the user sees

The Wizard

--

**Wizard of Oz**

Human ‘wizard’ simulates system response
- interprets user input according to an algorithm
- controls computer to simulate appropriate output
- uses real or mock interface
- wizard sometimes visible, sometimes hidden
  - “pay no attention to the man behind the curtain!”

good for:
- adding simulated and complex vertical functionality
- testing futuristic ideas
What you now know

User centered + participatory design
- based upon a user’s real needs, tasks, and work context
- bring end-user in as a first class citizen into the design process

Prototyping
- allows users to react to the design and suggest changes
- low-fidelity vs medium-fidelity

Prototyping methods
- vertical, horizontal and scenario prototyping
- sketches, storyboarding, pictive
- scripted simulations, Wizard of Oz
Storyboard of a computer telephone

You can enter either the person's name or their number. Then hit the place button to call them.

Establishing connection...

Call completed...

Help-
Type name and place call
**Wizard of Oz Examples**

IBM: an imperfect listening typewriter using continuous speech recognition
- secretary trained to:
  - understand key words as "commands"
  - to type responses on screen as the system would
  - manipulating graphic images through gesture and speech

Intelligent Agents / Programming by demonstration
- person trained to mimic "learning agent"
  - user provides examples of task they are trying to do
  - computer learns from them
- shows how people specify their tasks

In both cases, system very hard to implement, even harder to change!