Design, Ideation, and Prototyping

Why User Centered Design is Important
How Prototyping helps User Centered Design

System Centered Design

System Centered Design

- What can be built easily on this platform?
- What can I create from the available tools?
- What do I as a programmer find interesting to work on?

Ideally we AVOID doing this!

Design as Research

One of the fields of research in human-computer interaction is around design techniques.

We explore and develop techniques that will improve the likelihood of an end product that is “user friendly” (a term that itself is vague).
Idea Generation: “Ideation”

The process of “idea generation” typically includes a fairly rapid cycle of

- Brainstorming ideas, even at a “blue sky” level.
- Prototyping and developing the ones that jump out as having potential for immediate (could be innovative new approaches).

until you are ready to lock in on a final design to implement.

Even after finalizing your design, you should still do iterative development, confirming you are on the right path as you go.

User-Centered Design

Design is based upon a user’s
- abilities and real needs
- context
- work
- tasks

Golden rule of interface design:
“Know The User”
Not an afterthought…

User Diversity

It is important to note that the users that you think will benefit might only be a subset of the actual set of users that will benefit from or make use of your technology.

Some assistive technologies that were “meant” for users with hearing or vision impairments are used by “everyday” users today.

Some researchers say they wanted to work on the ideas but needed a context that would justify the efforts at the time…
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...

Three 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.

Participatory Design

Problem

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

Solution

Designers should have access to pool of representative users. These are the “end-users” themselves, not their managers or union reps, etc. Research attempts to show the benefits of such interactions during design.
Prototyping and Development

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 / restricted systems

Late design

Working systems

Low fidelity prototypes

Paper-based prototypes
- a paper mock-up of the interface look, feel, functionality
- “quick and cheap” to prepare and modify

Purpose
- brainstorm competing representations
- elicit user reactions
- elicit user modifications / suggestions

Research
- researchers work on new ways to make and use these prototypes
**Low fidelity prototypes**

Sketches:
drawing of the outward appearance of the intended system

- “crudity” means people concentrate on high level concepts
- can often be difficult to envision a dialog’s progression

Computer-drawn is **generally not good!**
Should be hand-drawn on paper.

---

**Low fidelity prototypes**

Iterate:
“To get a good idea, get lots of ideas…”

The speed of lo-fi prototypes makes it fundamentally easier to go through several iterations – each with feedback from users.
Low fidelity prototypes

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
PICTIVE prototypes

“Plastic Interface for Collaborative Technology Initiatives through Video Exploration” - Muller, CHI 91

Design is multiple layers of sticky notes and plastic overlays
- different sized stickies represent icons, menus, windows etc.

Interaction demonstrated by manipulating notes
- contents changed quickly by user/designer with pen and note repositioning

Session can be videotaped for later analysis
- usually end up with mess of paper and plastic!

PICTIVE prototypes (cont)

You could also create pre-made interface components on paper (though this can lock users into a certain initial mindset).

e.g., these empty widgets were created in visual basic and can be printed out:

buttons
combo box
list box

menu
entries

alert box
tabs

I would argue it is still better to hand-draw them...
Other uses of low fidelity prototypes

Tutorials and manuals
- Could start to write them in advance of the system…
- What are they?
  - tutorial for step by step description of an interaction
    (essentially an interface “walk-through” with directions)
  - manual for reference of key concepts
    (essentially an in-depth technical description)
- If the application is highly visual, then you could have a
  storyboard set within textual explanations or even make
  an animated tutorial.

Does this work?
- some people do read manuals of competing products to check
  interface, available functionality, whether it’s a good match to
  their tasks…

1908s - From Apple’s Tutorial Guide to the Macintosh Finder
Photoshop 7 – Toolbox
Overview from help

The zoom tool zooms in and out of an image.
The background eraser tool erases areas to transparency by clicking.
The gradient tools create smooth, linear, radial, angle, reflected, and Gaussian blends between colors.
The paint bucket tool fills newly selected areas with the foreground color.
The clone tool blends hard edges in an image.
The sharpen tool sharpens soft edges in an image.
The smudge tool smears data in an image.
The dodge tool highlights areas in an image.
The brush tool Paints in an image.
The sponge tool Changes the color saturation of an area.
The color selection tool Tool makes shaped or straight selections, drawing anchor points, direction lines, and selection paths.
The type tool Creates type on an image.

To open the Memos Folder, click the Open button.

Directory title
items you can open
Open button

As you open the Memos Folder, you move down through the hierarchy. The directory title changes to remind you where you are in the hierarchy, and the box shows you what's on the new level you just moved to—in this case, the two documents in the Memos Folder. The selected document is the one that will open when you click the Open button. If you want to open the other document, click anywhere on the other document's name to highlight it, and then click the Open button.

1980s - From Apple’s Tutorial Guide to the Macintosh Finder
Medium-Fidelity prototypes

Prototyping with a computer

– simulate or animate some but not all features of the intended system
  • engaging for end users

Purpose

– provides a sophisticated but limited scenario to the user to try out
– provides a development path (from crude screens to functional system)
– can test more subtle design issues
Medium-Fidelity prototypes (cont)

Dangers…
– Medium fidelity prototypes take too long to build and change
  • Reduces number of iterations
– User’s reactions are usually “in the small”
  • blinds people to major representational flaws
– Developers resist changes
  • “but it is already working…”
– A single bug can halt testing
– Management may think its real!

Medium-Fidelity prototypes (cont)
Approaches to 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
  • surface layers includes the entire user 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
Medium-Fidelity prototypes (cont)

Wizard of Oz - A method of testing a system, or a part of a system, that does not yet exist.

– human simulates the system’s intelligence and interacts with user
– uses real or mock interface
  • “Pay no attention to the man behind the curtain!”
– user uses computer as expected
– “wizard” (preferably hidden):
  • interprets subjects input according to an algorithm
  • has computer/screen behave in appropriate manner
  • might have errors artificially introduced
– good for:
  • adding simulated and complex vertical functionality
  • testing futuristic ideas

Wizard of Oz Examples (I)

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 was very hard to implement at the time, even harder to change!
Wizard of Oz Examples (II)

Imagine scenarios where you aren’t sure whether the investment is worth the ‘payout’ or you want to develop the technology while exploring interface ideas.

- You want to build a map system that shows where the user is in real-time. Rather than needing to install tracking systems before being able to do the UI testing, you could have a wizard watching the users and updating their location manually on the system.
- You want to have location-aware directional cues such as blinking lights or arrows or sound effects turn on and off as appropriate to guide a user to a destination. Again, you could have a wizard instruct the system to turn things on and off without having the proximity sensors installed or heuristics to determine the user’s directional orientation.

Other prototyping tool…

The next slide set / topic (after the midterm) will present a few examples of prototyping and some tools that can be utilized…
What you now know

• User centered design
  – design is based upon a user’s real needs, tasks, and work context

• Participatory design
  – brings 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 prototypes best for brainstorming and choosing representations
  – medium-fidelity prototypes best for fine-tuning the design

• Prototyping methods
  – vertical, horizontal and scenario prototyping
  – storyboarding
  – PICTIVE
  – scripted simulations
  – Wizard of Oz