

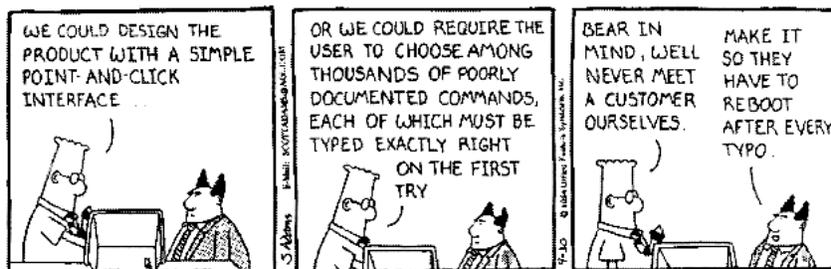
User Centered Design and Prototyping

Why User Centered Design is important

How Prototyping helps User Centered Design

Saul Greenberg

System Centered Design



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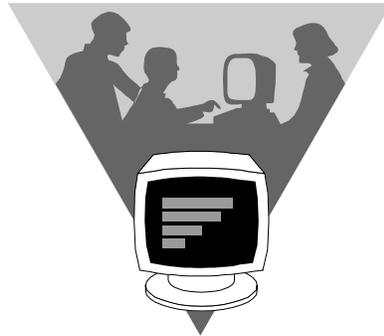
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System Centered Design

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?

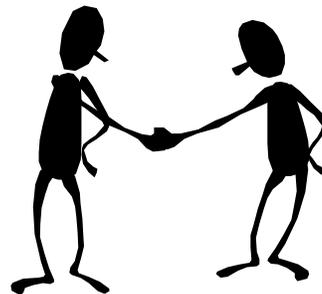


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User Centered System Design

Design is based upon a user's

- abilities and real needs
- context
- work
- tasks



Golden rule of interface design: *“Know The User”*

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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

Denning and Dargan, 1996

From Denning and Dargan, p111 in Winograd, Ed., *Bringing Design to Software*, Addison Wesley

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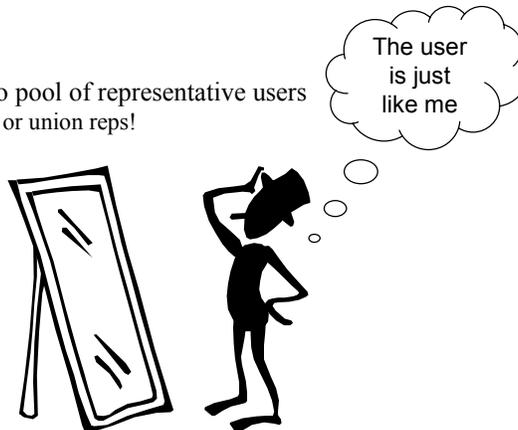
Participatory Design

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 pool of representative users
 - END users, not their managers or union reps!



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Participatory Design

Users become first 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



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Participatory Design

Participatory Design:

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



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Methods for involving the user

At the very least, talk to users

- surprising how many designers don't!

Interviews

- used to discover user's culture, requirements, expectations, etc.
- contextual inquiry:
 - interview users in their workplace, as they are doing their job

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

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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 / restricted systems

Working systems

Late design

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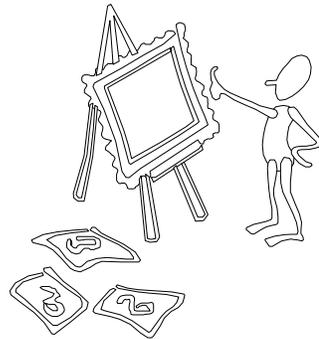
Low fidelity prototypes

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



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Low fidelity prototypes

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

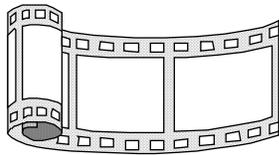
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Phone:

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Low fidelity prototypes

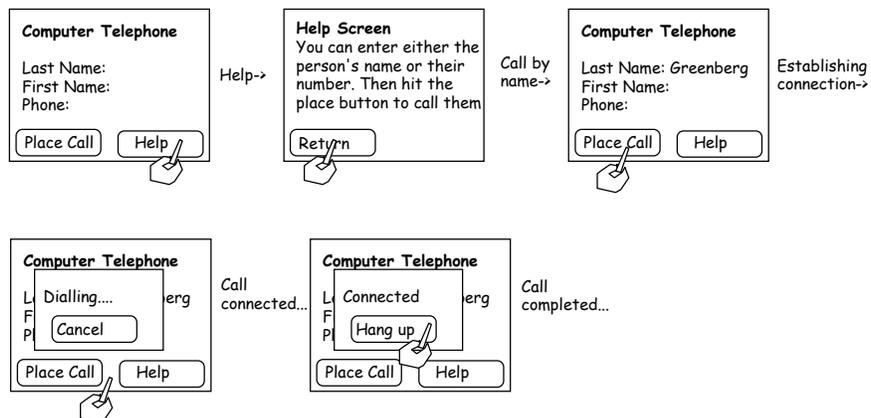
Storyboarding

- 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



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Storyboard of a computer based telephone

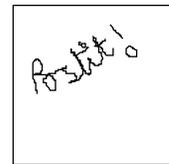


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Low fidelity prototypes

Pictive

- “plastic interface for collaborative technology initiatives through video exploration”
- 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 is videotaped for later analysis
 - usually end up with mess of paper and plastic!



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Low fidelity prototypes

Pictive

- can create pre-made interface components on paper
- eg, these empty widgets were created in visual basic and printed out:

buttons



combo box



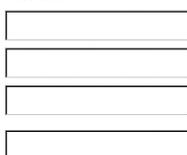
list box



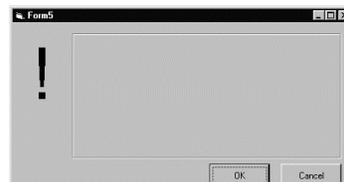
menu



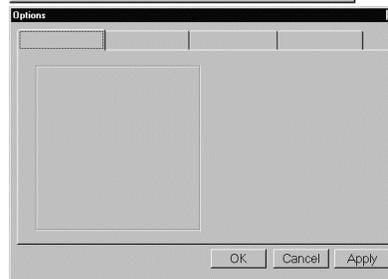
entries



alert box



tabs



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Low fidelity prototypes

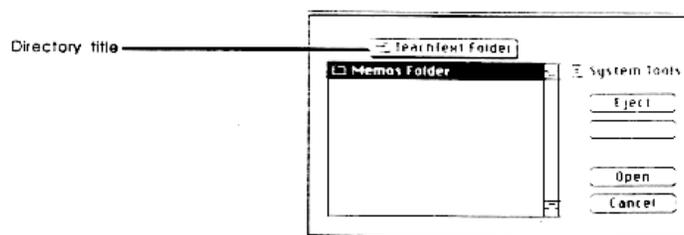
Tutorials and manuals

- write them in advance of the system
- what are they?
 - tutorial for step by step description of an interaction
an interface “walk-through” with directions
 - manual for reference of key concepts
in-depth technical description
- if highly visual, then storyboard is set within textual explanations
- does this work?
 - people often read manuals of competing products to check:
interface
functionality
match to task



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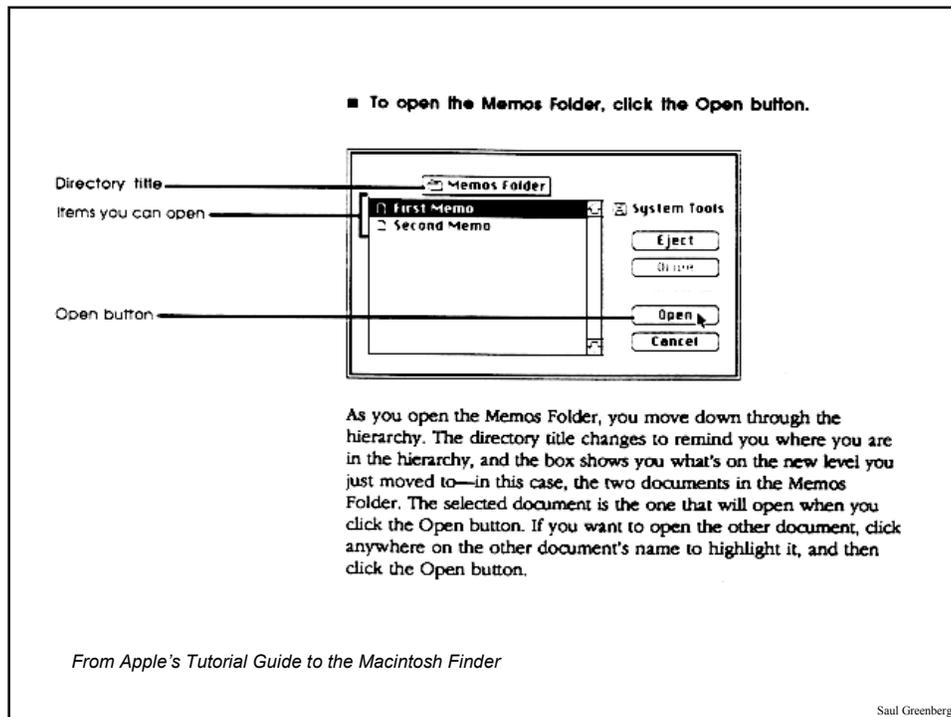
You see this dialog box:



A directory title shows you the name of the folder you're presently working in—in this case, the TeachText Folder. The box beneath it shows you all the other items in the TeachText Folder that you can open with this application—in this case, only the Memos Folder.

From Apple's Tutorial Guide to the Macintosh Finder

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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

Danger

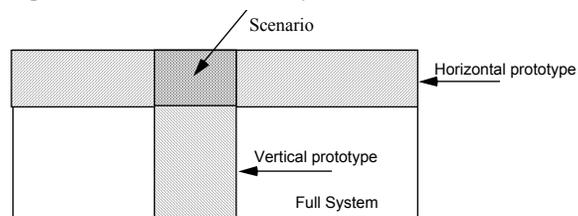
- user's reactions are usually "in the small"
 - blinds people to major representational flaws
- users reluctant to challenge / change the design itself
 - designs are too "pretty", egos...
- management may think its real!

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Medium fidelity prototypes

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



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Medium fidelity prototypes

Approaches to integrating prototypes and product:

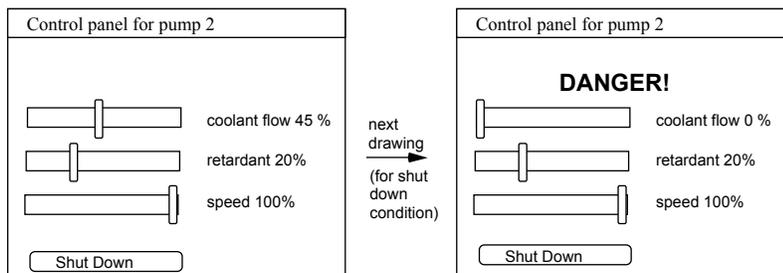
- throw-away
 - prototype only serves to elicit user reaction
 - creating prototype must be rapid, otherwise too expensive
- incremental
 - product built as separate components (modules)
 - each component prototyped and tested, then added to the final system
- evolutionary
 - prototype altered to incorporate design changes
 - eventually becomes the final product

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Medium fidelity prototypes

Painting/drawing packages

- draw each storyboard scene on computer
 - neater/easier (?) to change on the fly than paper
- a very thin horizontal prototype
- does not capture the interaction “feel”

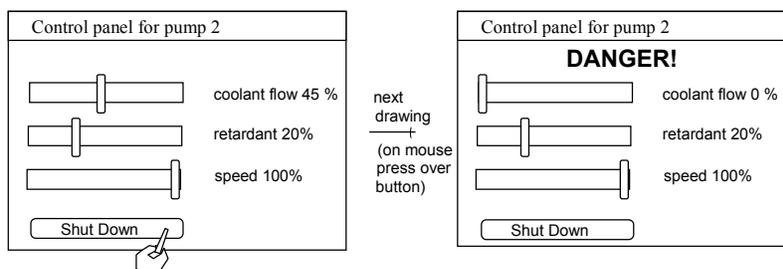
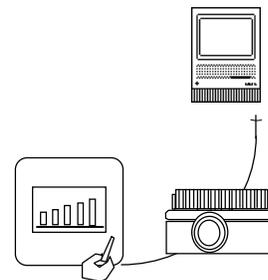


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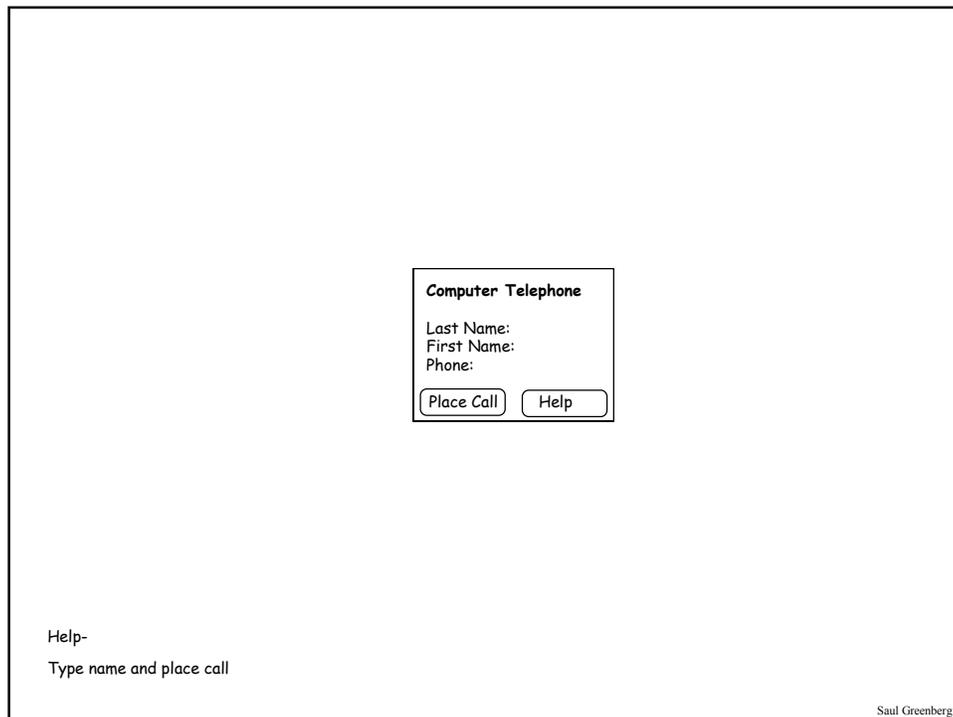
Medium fidelity prototypes

Scripted simulations and slide shows

- encode the storyboard on the computer
 - created with media tools
 - scene transition activated by simple user inputs
 - a simple horizontal and vertical prototype
- user given a very tight script/task to follow
 - appears to behave as a real system
 - but script deviations blows the simulation



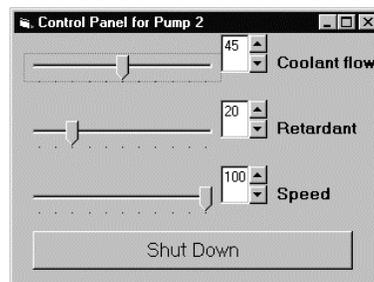
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Medium fidelity prototypes

Interface builders

- tools for letting a designer lay out the common widgets
- construct mode
 - change attributes of objects
- test mode:
 - objects behave as they would under real situations
- excellent for showing look and feel
 - a broader horizontal prototype
 - but constrained to widget library
- vertical functionality added selectively
 - through programming

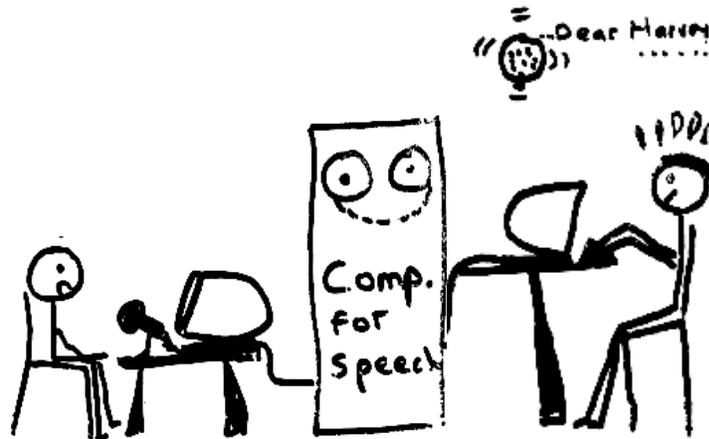


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Wizard of Oz

A method of testing a system that does not exist

- the voice editor, by IBM (1984)



What the user sees

The Wizard

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Medium fidelity prototypes

Wizard of Oz

- 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" (sometimes hidden):
 - interprets subjects input according to an algorithm
 - has computer/screen behave in appropriate manner
- good for:
 - adding simulated and complex vertical functionality
 - testing futuristic ideas

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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!

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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

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