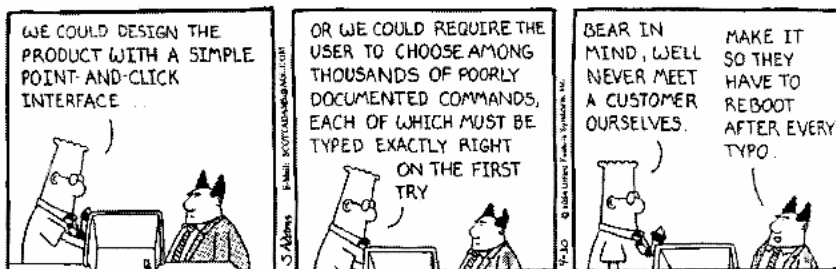


# User Centered Design and Prototyping

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

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## System Centered Design

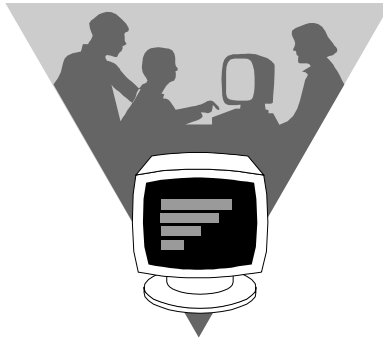


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## System Centered Design

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

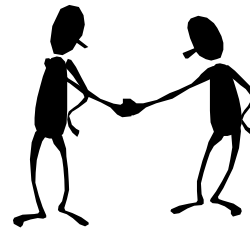


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## User Centered System Design

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***

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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. ...

### 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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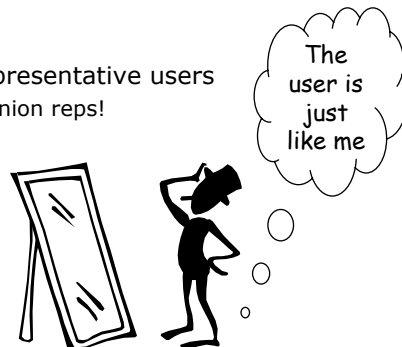
## Participatory Design

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



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## 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



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## 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!

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**

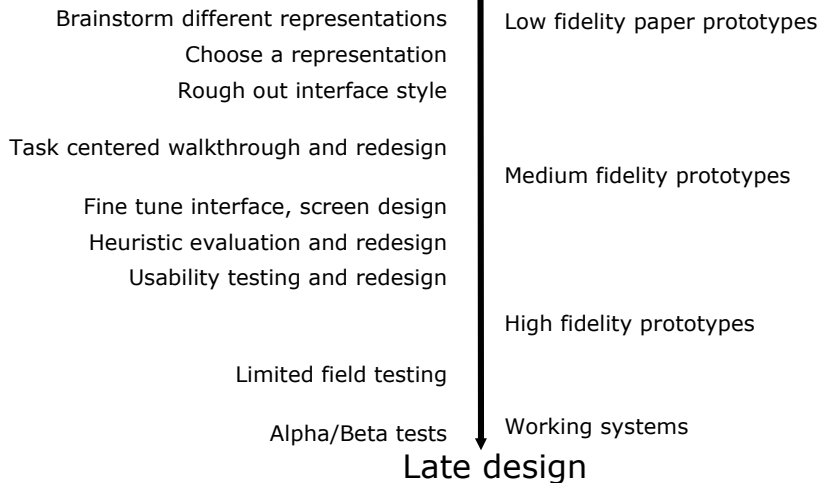
Explain designs

- 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



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# Low fidelity prototypes

## Paper prototypes

- 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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## 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

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



**What you selected**



**JPG Stroller**  
For children between  
1-3 years old ...\$98.

Green  
 Blue  
 Red (out of stock)

<u>Item</u>	<u>Style</u>	<u>Cost</u>	
JPG Stroller	Green	98.00	Delete

tax: 6.98

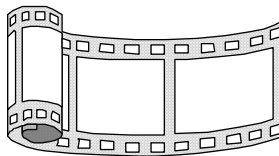
**Total:** \$104.98

**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



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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	Style	Cost

tax: \_\_\_\_\_  
Total: \$ 0.00

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

Scan the stroller ->

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

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

Item	Style	Cost	Delete
JPG Stroller	Green	98.00	Delete

tax: 6.98  
Total: \$104.98

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

Change the color ->

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

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

Item	Style	Cost	Delete
JPG Stroller	Blue	98.00	Delete

tax: 6.98  
Total: \$104.98

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

Place the order ->

**What to do**  
To get your items, bring your printout to the front counter.

**What you selected**

Item	Style	Cost
JPG Stroller	Blue	98.00

tax: 6.98  
Total: \$104.98

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





## **Pictive** plastic interface for collaborative technology initiatives through video exploration

### Designing with office supplies

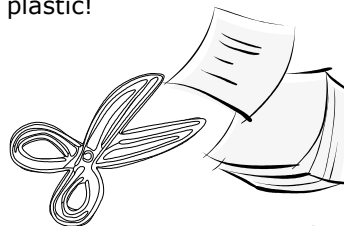
- multiple layers of sticky notes and plastic overlays
- different sized stickies represent icons, menus, windows etc.

### interaction demonstrated by manipulating notes

- new interfaces built on the fly

### session videotaped for later analysis

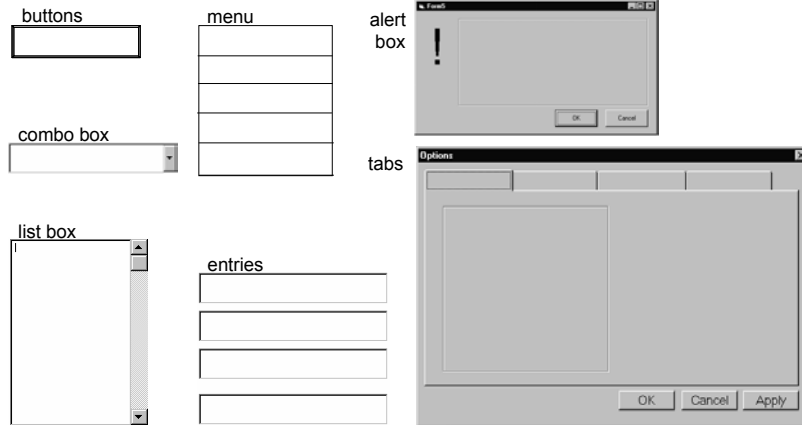
- usually end up with mess of paper and plastic!



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## Pictive

Can pre-make paper interface components

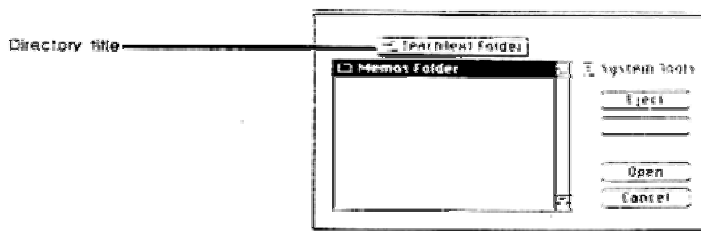


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## Tutorial manuals

Write them in advance of the system

- a step by step storyboard walkthrough with detailed explanations
- key interface concepts for programmers



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.

Apple's Tutorial Guide  
to the Macintosh Finder

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## 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!

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## Limiting prototype functionality

### vertical prototypes

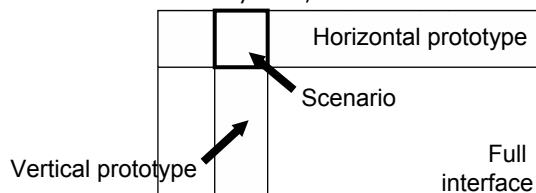
- includes in-depth functionality for only a few selected features
- common design ideas can be tested in depth

### 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



Nielsen, J. (1993) *Usability Engineering*, p93-101, Academic Press.

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## 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

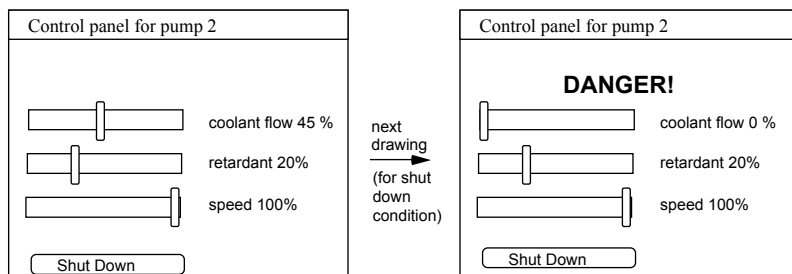
- prototype altered to incorporate design changes
- eventually becomes the final product

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## Painting/drawing packages

### draw each storyboard scene on computer

- very thin horizontal prototype
- does not capture the interaction "feel"



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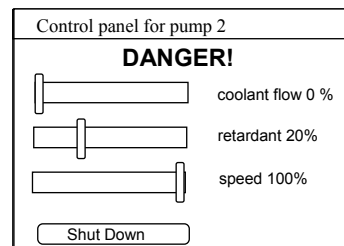
## Scripted simulations

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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**What to do**  
Find the item you want in the catalog and scan the bar code next to it.



**What you selected**


<u>Item</u>	<u>Style</u>	<u>Cost</u>

tax: \_\_\_\_\_


**Total:** \$ 0.00

**All done?**


Place your order    Print this list    Throw this list away



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



**What you selected**



**JPG Stroller**  
For children between  
1-3 years old ...**\$98.**

Green  
 Blue  
 Red (out of stock)

Item	Style	Cost
JPG Stroller	Green	98.00 <span style="float: right; border: 1px solid gray; padding: 2px 5px;">Delete</span>


tax: 6.98

**Total:** \$104.98

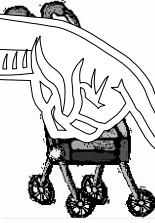
**All done?**

Place your order
Print this list
Throw this list away

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



**What you selected**



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tax: 6.98

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**All done?**

Place your order
Print this list
Throw this list away



## Interface builders

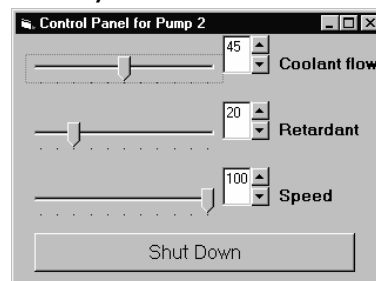
Design tools for laying out common widgets

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

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## 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



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## 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

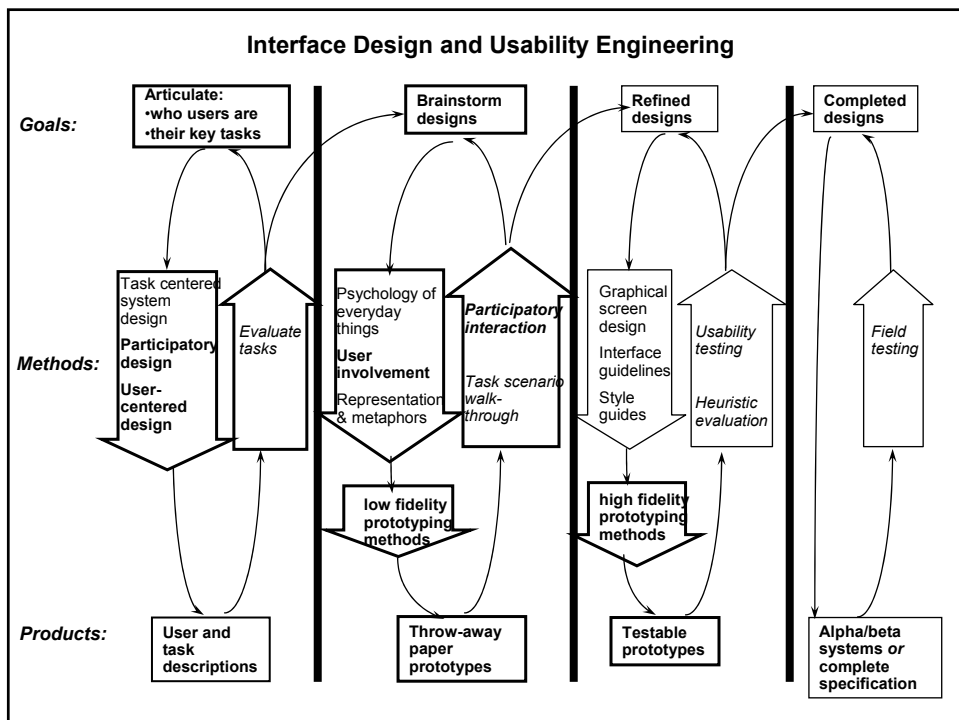
### Prototyping

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

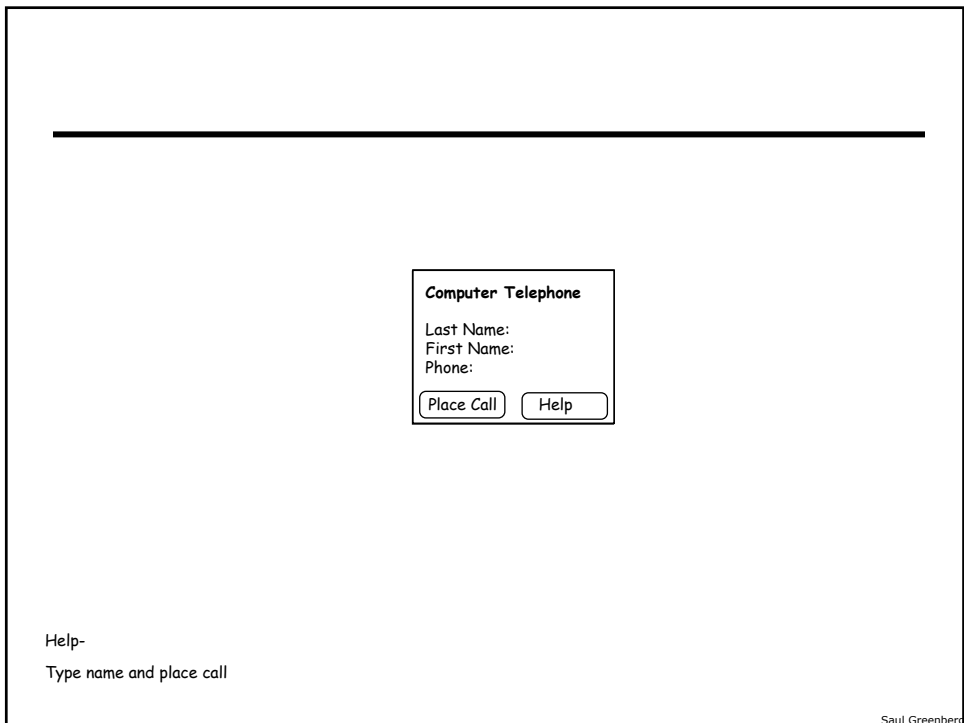
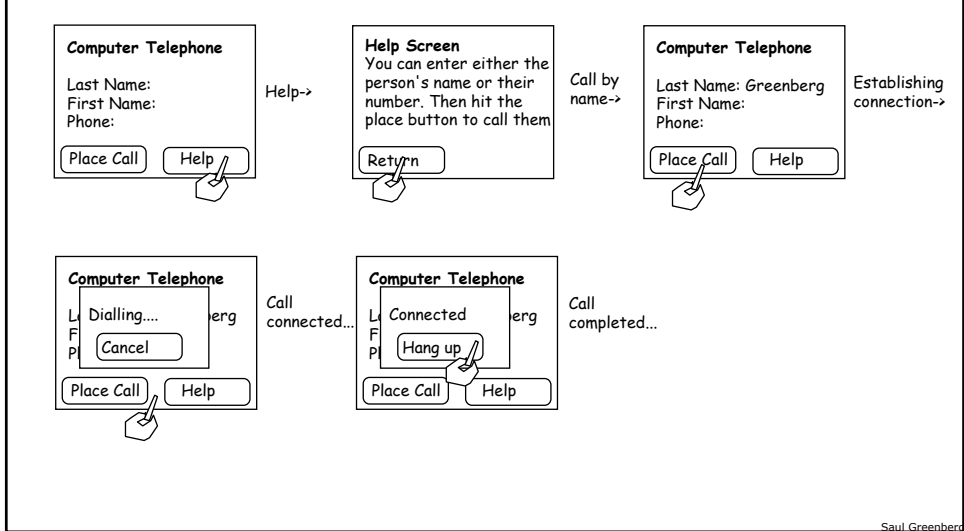
### Prototyping methods

- vertical, horizontal and scenario prototyping
- sketches, storyboarding, pictive
- scripted simulations, Wizard of Oz

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# Storyboard of a computer telephone



## **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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