

# User Centered Design and Prototyping

Human Computer Interaction

Based on slide deck

**Part 3: Designing with the user. User Centered Design and Prototyping**

Human Computer Interaction I: Principles and Design

by

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*The new slides are marked with a \**

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# User Centered Design and Prototyping

Why user-centered design is important

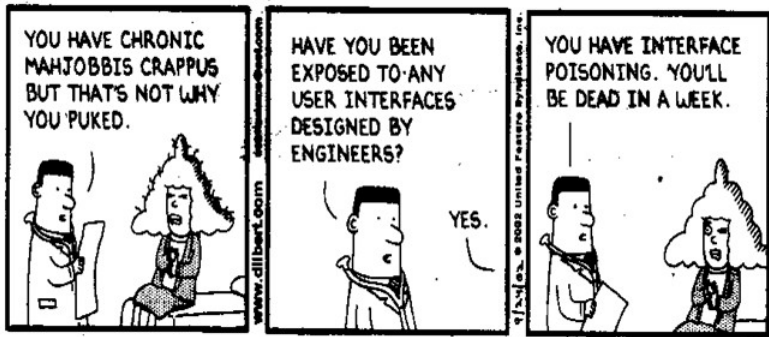
Prototyping and user centered design

Prototyping methods

- ▶ Sketches
- ▶ Storyboarding
- ▶ Tutorials as storyboarding
- ▶ Pictive
- ▶ Medium fidelity prototypes
- ▶ Scripted simulations
- ▶ High fidelity prototypes
- ▶ Working prototypes
- ▶ Implementation

## \*System Centered Design

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<https://slideplayer.com/slide/7894207/>

# System Centered Design

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What can I easily build on this platform?

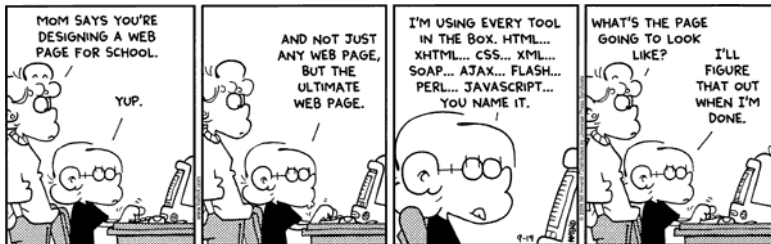
What can I create from the available tools?

What do I as a programmer find interesting?



## \*System Centered Design

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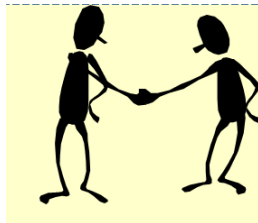
https:  
//newmedia.report/classes/intro-to-interactives/2016/

# User Centered System Design

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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

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... is based on understanding the domain of work or play in which people are engaged and in which they interact with computers ...

## 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 the users* 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

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## 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!





# Participatory Design

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E-Mail: SCOTTADAMS@AOL.COM

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# Participatory Design

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Users are 1<sup>st</sup> 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



# Participatory Design

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## 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

# Participatory Design

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## Down side

- ▶ hard to get a good pool of end users
  - ▶ expensive, reluctance ...
- ▶ users are not expert designers
  - ▶ do not expect them to come up with design ideas from scratch
- ▶ the user is not always right
  - ▶ do not expect them to know what they want

# Methods for involving the user

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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, etc.



# Methods for involving the user

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## 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
- this is why prototypes are critical

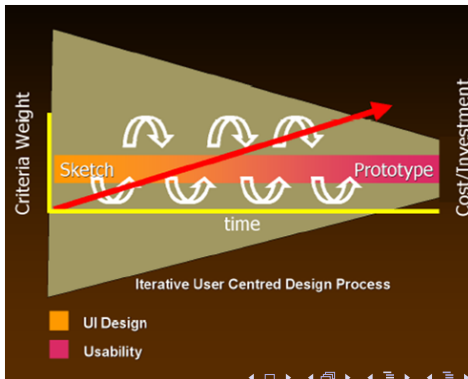


# Sketching and Prototyping

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## Sketches/low/medium/high fidelity prototypes

- as investment in design increases, so does the formality of the criteria whereby concepts are reviewed or accepted

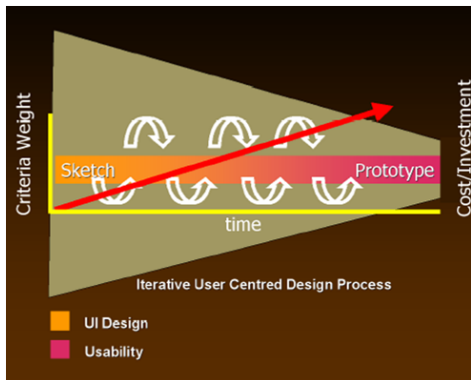


# Sketching and Prototyping

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## From design to evaluation

- similarly, interface design (idea generation) progresses to usability testing (idea debugging and refinement)





# Sketching vs Prototyping

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## ▶ Sketches

- ▶ Invite
- ▶ Suggest
- ▶ Explore
- ▶ Question
- ▶ Propose
- ▶ Provoke

## ▶ Prototypes

- ▶ Attend
- ▶ Describe
- ▶ Refine
- ▶ Answer
- ▶ Test
- ▶ Resolve

# Sketching vs Prototyping

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## 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
- ▶ Sketches & low fidelity paper prototypes
- ▶ Medium fidelity prototypes
- ▶ High fidelity prototypes
- ▶ Working systems

## Late design

# Sketches & Low Fidelity Prototypes

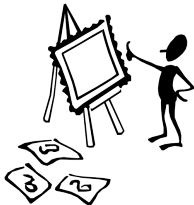
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**Paper** mock-up of the interface look, feel, functionality

- quick and cheap to prepare and modify

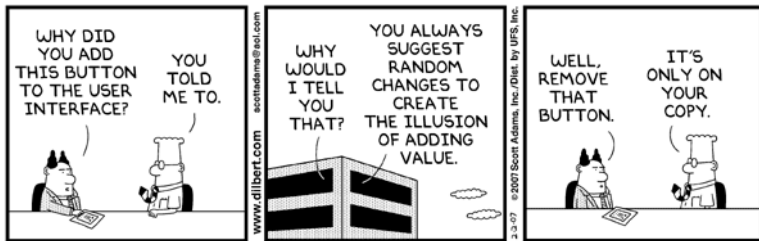
## Purpose

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



## \*Sketches & Low Fidelity Prototypes

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https:

[//www.cfgigolo.com/2007/02/agregando-valor/index.html](https://www.cfgigolo.com/2007/02/agregando-valor/index.html)

# Sketches

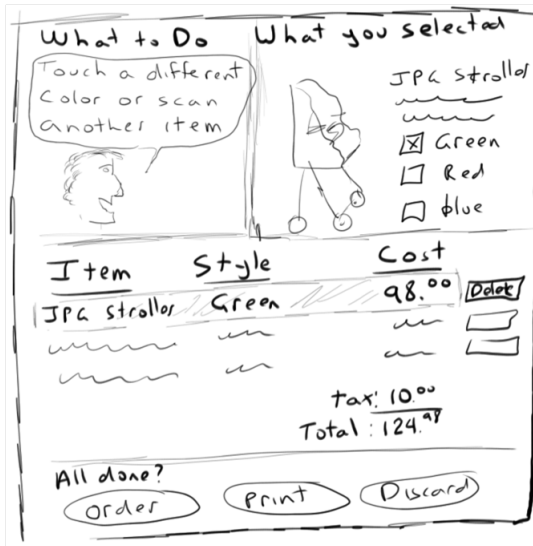
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- drawing of the outward appearance of the intended system
- crudity means people concentrate on high level concepts
- but hard to envision a dialog's progression

A hand-drawn sketch of a computer telephone interface. The title "Computer Telephone" is at the top. Below it are three input fields: "Last name:", "First name:", and "Phone:". At the bottom are two buttons: "Place call" and "Help".


A clean, digital version of the computer telephone interface. The title "Computer Telephone" is at the top. Below it are three input fields: "Last Name:", "First Name:", and "Phone:". At the bottom are two buttons: "Place Call" and "Help".

# Sketches




# Sketches

**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	<input type="button" value="Delete"/>

tax: 6.98

**Total:** \$104.98

**All done?**

# The attributes of sketches

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## Quick

- to make

## Timely

- provided when needed

## Disposable

- investment in the concept,  
not the execution

## Plentiful

- they make sense in a  
collection or series of ideas



# The attributes of sketches

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## Clear vocabulary

- rendering and style indicates it's a sketch, not an implementation

## Constrained resolution

- doesn't inhibit concept exploration

## Consistency with state

- refinement of rendering matches the actual state of development of the concept

## Suggest and explore rather than confirm

- value lies in suggesting and provoking what could be i.e., they are the catalyst to conversation and interaction

# Storyboarding

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- a series of key frames as sketches
  - 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

► **note how each scene in this storyboard is annotated**

Source: <https://www.storyboardthat.com/>

# \*Storyboarding



Hangry Henry goes to the breakroom before a meeting. He finds the remnants of some cupcakes...



The vending machine is also out of Hangry Henry's favorite junk food.



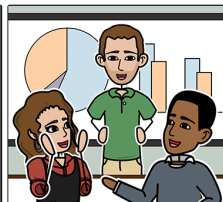
Hangry Henry is a bit rude during his next meeting. His friends suggest he tries SoLoMoFoo.



Baking Bridget drops off some fresh cupcakes she made over the weekend.




Baking Bridget tells SoLoMoFoo about her cupcakes and Hangry Henry immediately gets alerted!



After his cupcake - Happy Henry is awesome in the meeting.

# Storyboarding

Initial  
screen

What to do		What you selected
Find the item you want in the catalog and scan the bar code next to it.		
		
Item	Style	Cost
tax:		
Total: \$		0.00
All done?		
<a href="#">Place your order</a>	<a href="#">Print this list</a>	<a href="#">Throw this list away</a>


Change  
the  
color→

What to do		What you selected
Touch a different color, or scan another item.		
		
	 <b>JPG Stroller</b> For children between 1-3 years old ...\$98.	
	<input type="checkbox"/> Green <input checked="" type="checkbox"/> Blue <input type="checkbox"/> Red (out of stock)	
Item	Style	Cost
JPG Stroller	Blue	98.00 <a href="#">Delete</a>
tax: 6.98		
Total: \$		\$104.98
All done?		
<a href="#">Place your order</a>	<a href="#">Print this list</a>	<a href="#">Throw this list away</a>

Scan the  
stroller→

What to do		What you selected
Touch a different color, or scan another item.		
		
	 <b>JPG Stroller</b> For children between 1-3 years old ...\$98.	
	<input checked="" type="checkbox"/> Green <input type="checkbox"/> Blue <input type="checkbox"/> Red (out of stock)	
Item	Style	Cost
JPG Stroller	Green	98.00 <a href="#">Delete</a>
tax: 6.98		
Total: \$		\$104.98
All done?		
<a href="#">Place your order</a>	<a href="#">Print this list</a>	<a href="#">Throw this list away</a>


Place the  
order→

What to do		What you selected
To get your items, bring your printout to the front counter.		
		
Item	Style	Cost
JPG Stroller	Blue	98.00
tax: 6.98		
Total: \$		\$104.98
All done?		
<a href="#">Place your order</a>	<a href="#">Print this list</a>	<a href="#">Throw this list away</a>


# Storyboarding

Alternate path...

**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	Blue	98.00	Delete

tax: 6.98


**Total:** \$104.98

**All done?**


Place your order Print this list Throw this list away

Touch previous item→

**What to do**  
Touch a different size, 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	Blue	98.00	Delete
Rad Shirt	Large	45.99	

tax: 10.08

**Total:** \$154.07


**All done?**

Place your order Print this list Throw this list away


Scan the shirt→

Delete that item→

**What to do**  
Touch a different size, 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	Blue	98.00	
Rad Shirt	Large	45.99	Delete


tax: 10.08

**Total:** \$154.07


**All done?**

Place your order Print this list Throw this list away

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



**What you selected**



**Rad Shirt**  
Casual adult wear \$45.99

☒ Large  
☐ Medium  
☐ Small

Item	Style	Cost	
Rad Shirt	Large	45.99	Delete

tax: 3.22

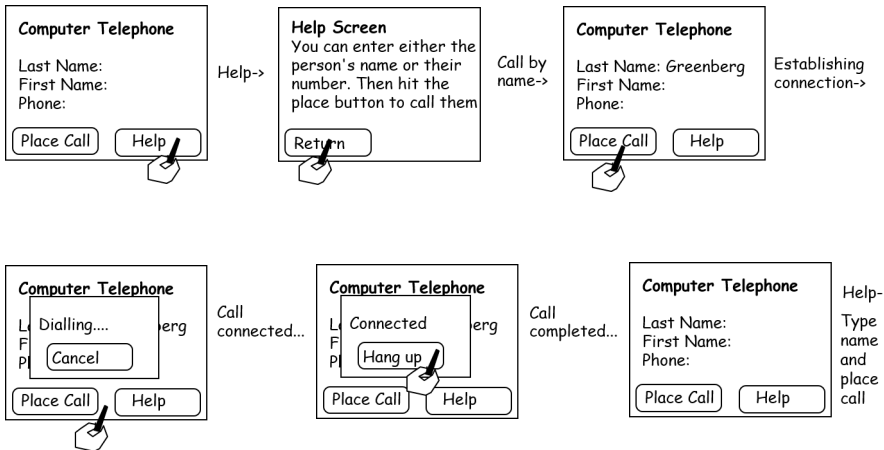
**Total:** \$ 49.21

**All done?**

Place your order Print this list Throw this list away

# Storyboard of a computer telephone

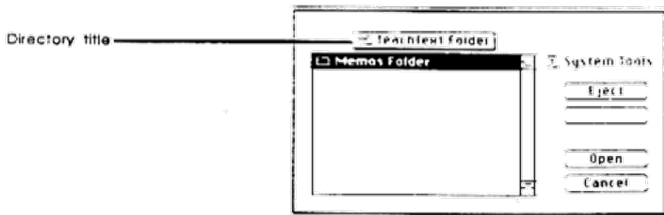
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# Tutorials as storyboarding

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- a step by step storyboard walk-through with detailed explanations
- written in advance of the system implementation
- also serves as an interface specification 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.

# Pictive

plastic interface for collaborative technology initiatives through video exploration

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## 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!





# Pictive

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## Can pre-make paper interface components

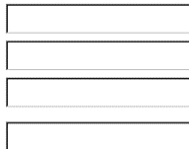
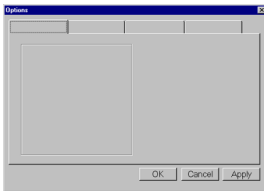
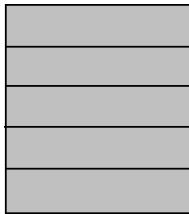
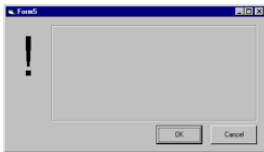
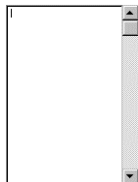
button



combo box



list box



# Medium fidelity prototypes

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## 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

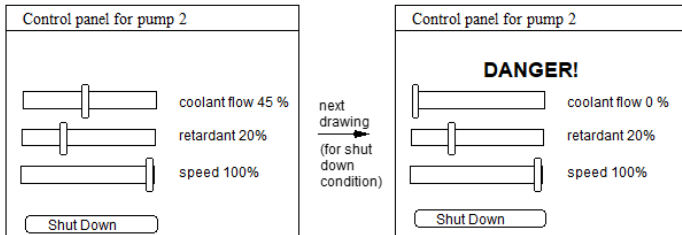
- user's reactions often "in the small"
- users reluctant to challenge designer
- users reluctant to touch the design
- management may think its real!

## Medium fidelity prototypes

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draw each storyboard scene on computer

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



# Scripted simulations

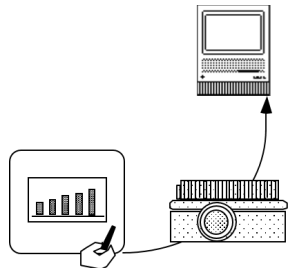
---

## 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



# Scripted simulations

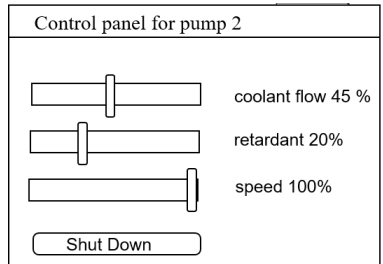
---

## create storyboard with media tools

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# Scripted simulations

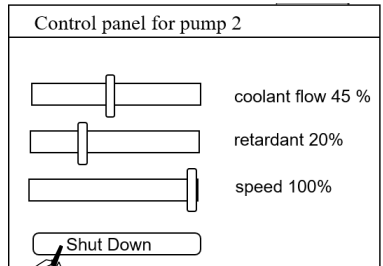
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# Scripted simulations

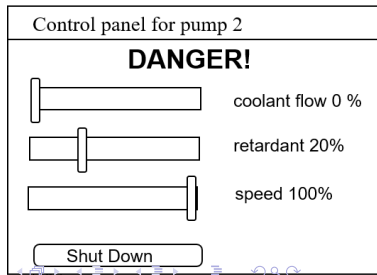
---

## 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



# Scripted simulations


**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

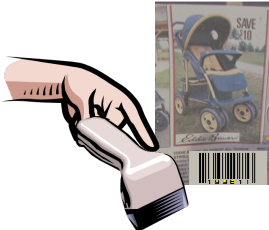


# Scripted simulations

**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

# Scripted simulations

## 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

JPG Stroller

## Style

Green

## Cost

98.00

Delete

tax: 6.98

**Total:** \$104.98

## All done?

Place your order


Print this list

Throw this list away

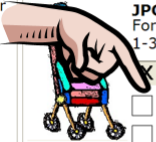
# Scripted simulations

**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	<button>Delete</button>

tax: 6.98

---

**Total:** \$104.98


**All done?**

Place your orderPrint this listThrow this list away

# Scripted simulations

**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	Blue	98.00	<input type="button" value="Delete"/>

tax: 6.98


---

**Total:** \$104.98


**All done?**

# Scripted simulations

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**What you selected**



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☐ Green  
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☐ Red (out of stock)

<u>Item</u>	<u>Style</u>	<u>Cost</u>	
JPG Stroller	Blue	98.00	<input type="button" value="Delete"/>

tax: 6.98

---


**Total:** \$104.98

Done?

# Scripted simulations

**What to do**

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



**What you selected**

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

tax: 6.98

**Total:** \$104.98

Done?

Place your order

Print this list

Throw this list away



## \*High fidelity prototypes

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### Prototyping tools

- ▶ **Axure**  
<https://www.axure.com/>
- ▶ **Balsamiq Mockups**  
<https://balsamiq.com/>
- ▶ **HotGloo**  
<https://www.hotgloo.com/>
- ▶ **MockFlow**  
<https://www.mockflow.com/>
- ▶ <http://lmgtyfy.com/?q=online+prototyping+tools>

## \*Working prototypes

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- simple algorithms
  - ▶ ignore special cases
- fake data
  - ▶ similar data, images instead of videos, etc.
- Wizard of Oz
  - ▶ human expert operating behind the scenes to simulate interface responses



# Working prototypes

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## vertical prototypes

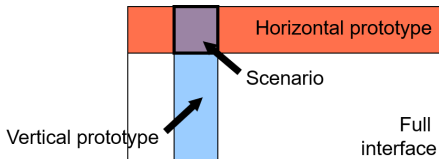
- includes in-depth functionality for only a few selected features
- common design ideas can be tested in depth

## horizontal prototypes

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

## scenario prototypes

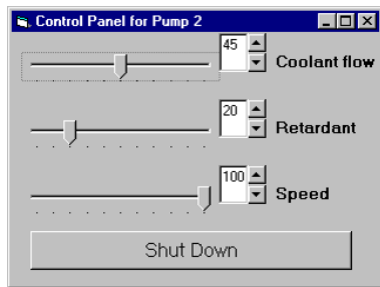
- only features and functionality along the specific scenarios or paths



# Implementation

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- ▶ 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



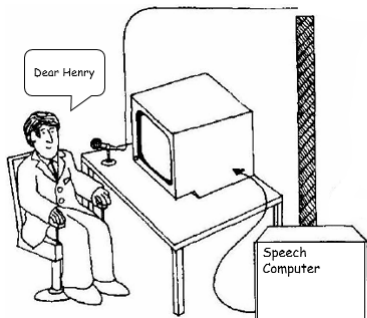
- ▶ already covered in introduction

# Wizard of Oz

## aka Wizard of Oz Experiment

A method of testing a system that does not exist

- the listening typewriter, IBM 1984



## What the user sees

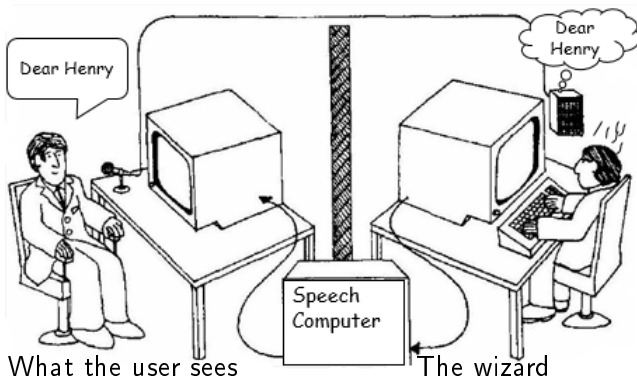
# Wizard of Oz

---

aka **Wizard of Oz Experiment**

A method of testing a system that does not exist

- the listening typewriter, IBM 1984



# Wizard of Oz

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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 idea



## Wizard of Oz - Examples

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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!

## \*Wizard of Oz - Examples

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### Facebook

- ▶ *Facebook M*, the social network's text-based virtual assistant
- ▶ it was shut down on 19th of January 2018

[https://www.theverge.com/2015/10/26/9605526/  
facebook-m-hands-on-personal-assistant-ai](https://www.theverge.com/2015/10/26/9605526/facebook-m-hands-on-personal-assistant-ai)

[https://medium.com/@Ganticdotco/  
the-ibm-test-is-a-great-example-of-a-wizard-of-oz-experimen](https://medium.com/@Ganticdotco/the-ibm-test-is-a-great-example-of-a-wizard-of-oz-experimen)

# Integrating prototypes and products

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## 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



## \*Integrating prototypes and products

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- ▶ historically - discard the prototype away and implement the final design from scratch
- ▶ agile development and designing in the web browser produces change
  - ▶ incrementally and evolutionary develop a prototype until it becomes the product

# What you now know

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## 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

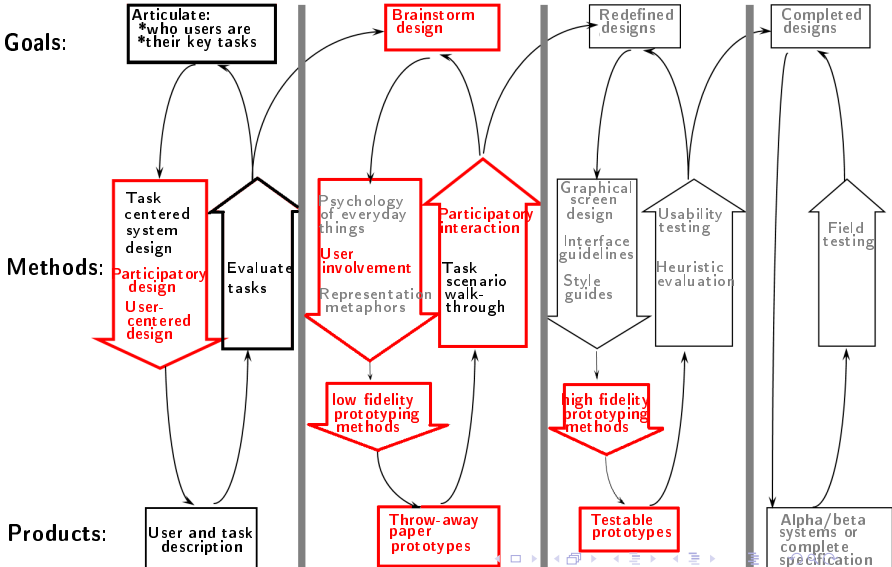
## Prototyping

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

## Prototyping methods

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

# Interface Design and Usability Engineering



## \*Bibliography

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