



Prototyping

Human Computer Interaction
CSCI 4620U | SOFE 4850U | CSCI 5540G
Dr. Christopher Collins

Acknowledgement: Parts of this lecture are based on material prepared by Scott Klemmer and Ilona Posner

REVIEW

Last Week

- Toolkits
- I/O Event Handling

Event Handling

- We considered the following three approaches to event handling in Java Swing user interfaces:
 - Centralized approach
 - Inner classes
 - Anonymous inner classes
- In this course we will use anonymous inner classes
 - Why? Code is more maintainable, extendable, readable, etc.

ANNOUNCEMENTS

Announcements

- Group project 3a is being graded, please start 3b!

Learning Objectives

- By the end of the lesson, you will be able to:
 - Define prototyping
 - Select between low and high fidelity prototypes depending on the goals of the prototyping
 - Create a paper prototype of your project interface
 - Begin working on an interactive prototype

Practical HCI

PROTOTYPING

The only way to engineer
the future is to have lived it
in yesterday.

- Bill Buxton

Uh, that's a piece of wood.

- SANTA CLARA, California -- People thought Jeff Hawkins was crazy when they saw him taking notes, checking appointments, and synchronizing a small block of wood with his PC, pretending all the while that the block was a handheld computer.
- "If I wanted to check the calendar I'd take it out and press the wooden button"

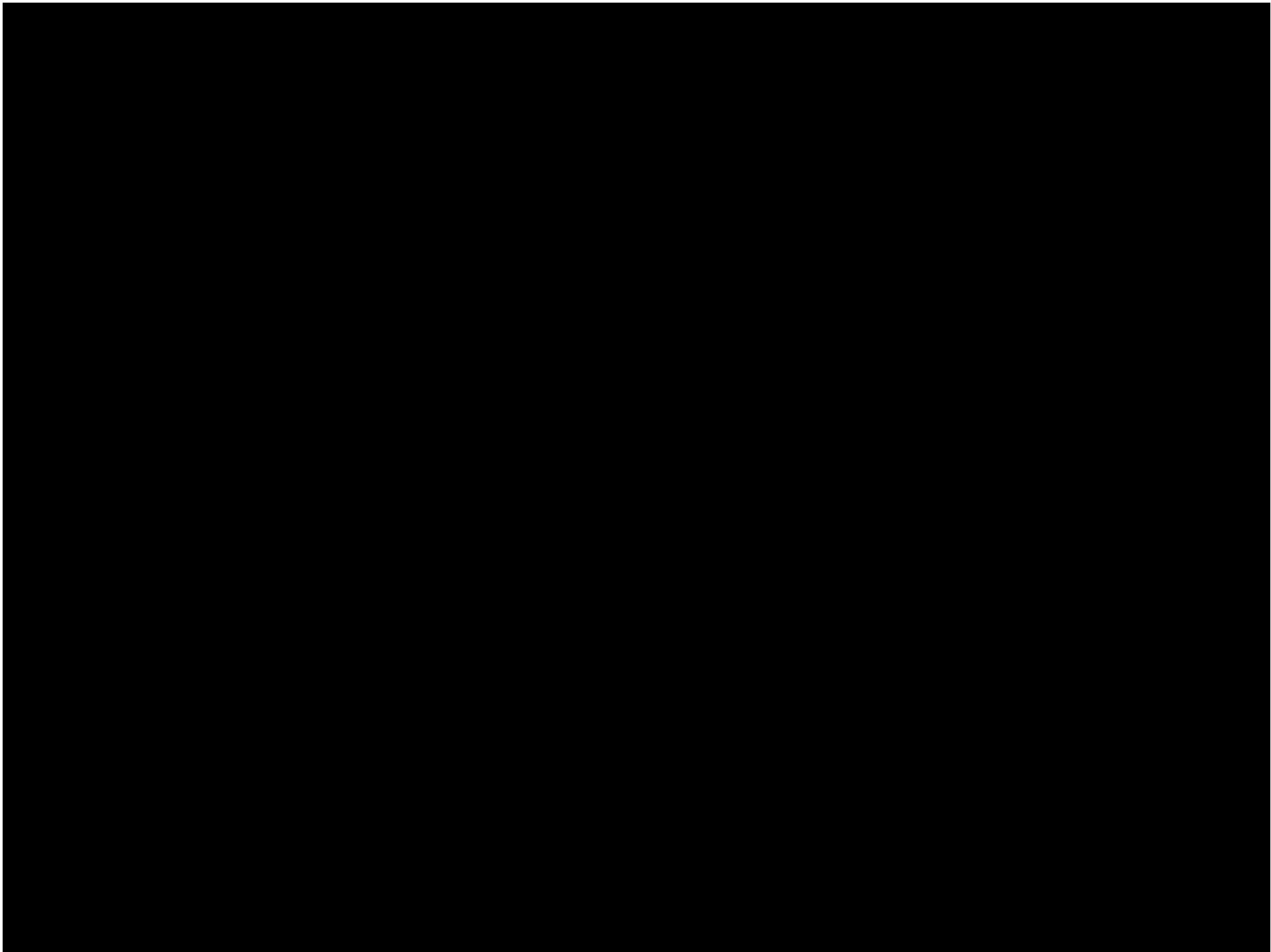
Source: "The Philosophy of the Handheld." Wired Magazine, October 1999.

Jeff believed we had to make the product considerably smaller than current PDAs. He carved up a piece of wood in his garage and said this is the size he wanted. He'd walk around with this block in his pocket to feel what it was like. I would print up some screenshots as we were developing UI, and he'd hold it and pretend he was entering things, and people thought he was weird. He'd be in a meeting furiously scribbling on this mockup, and people would say, "Uh, Jeff, that's a piece of wood."









Multiple Prototypes



Danger Sidekick 1



Danger Sidekick 2



Danger Sidekick 3

Note: these aren't the prototypes, but Danger used an extensive prototyping process

Source: Danger, Wikipedia

Simultaneous Prototypes Add Value

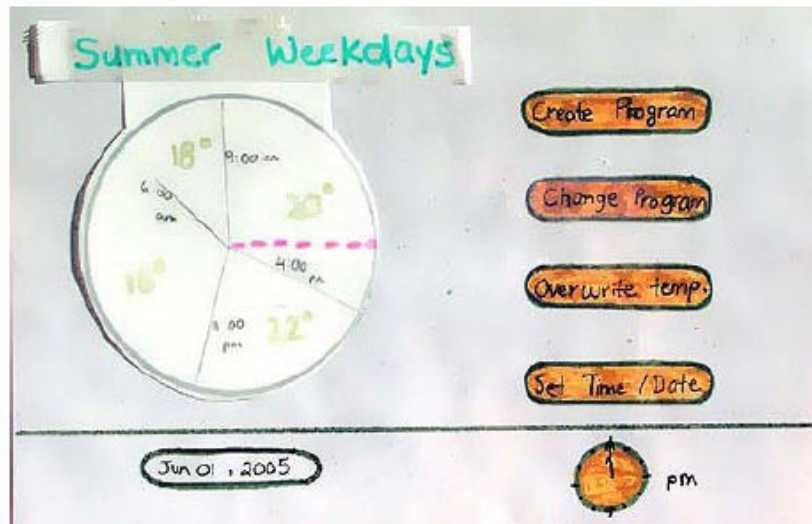


Figure 1. The "Circular" paper prototype

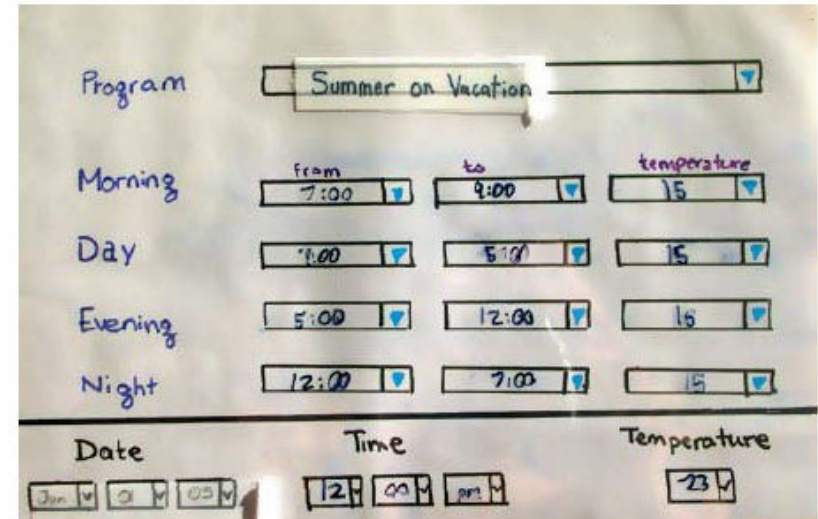


Figure 2. The "Tabular" paper prototype

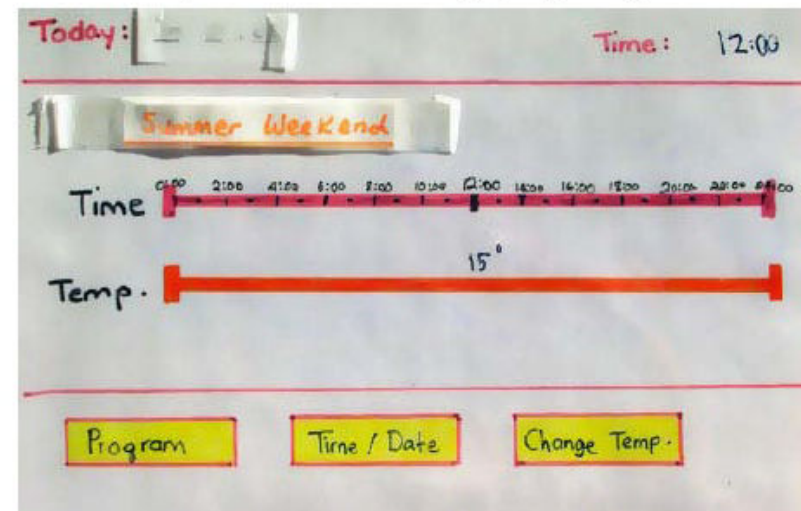


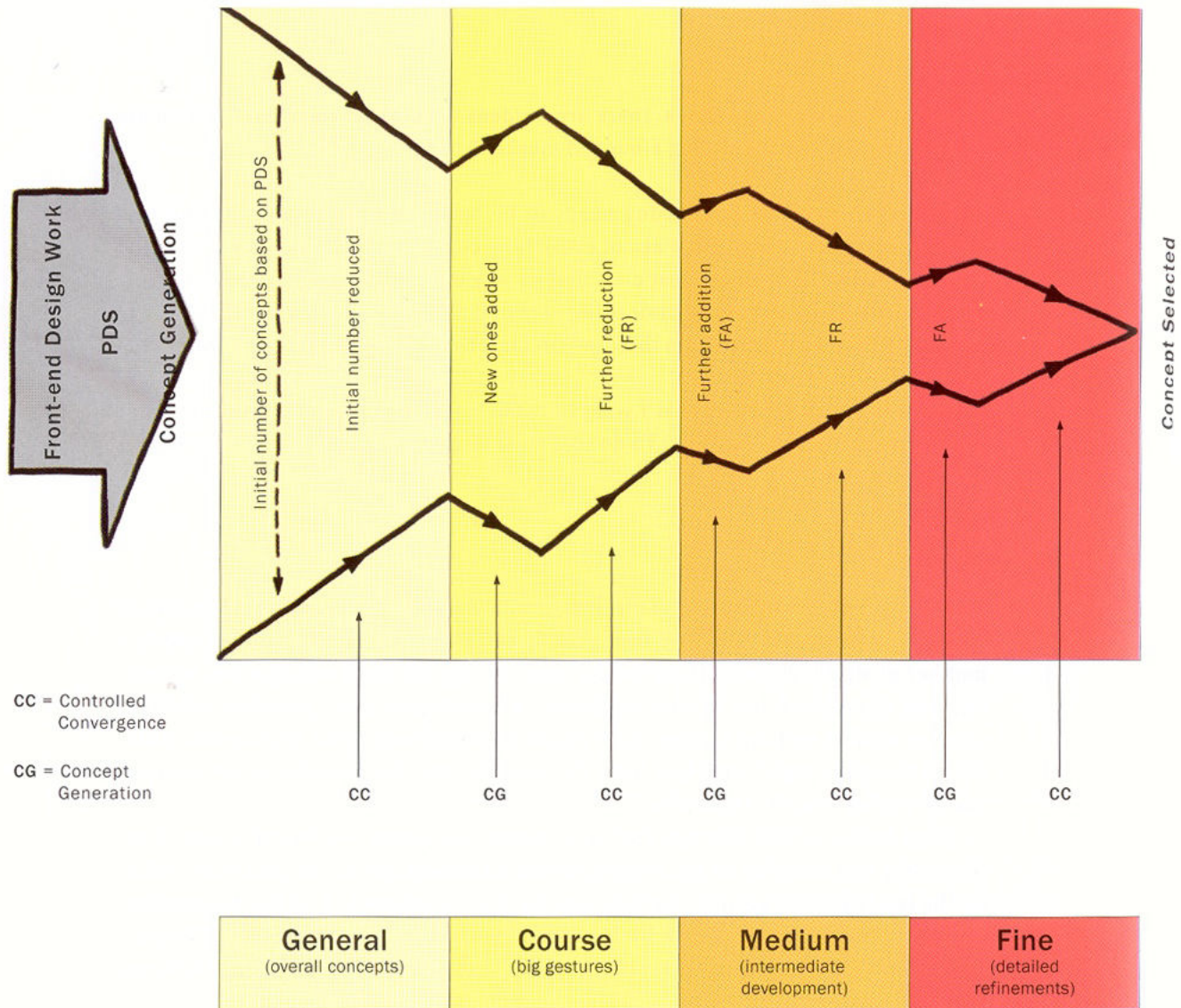
Figure 3. The "Linear" paper prototype

Source: Maryam Tohidi, Bill Buxton, Ronald Baecker, and Abigail Sellen, "Getting the Right Design and the Design Right: Testing Many is Better than One." CHI 2006.

Design is choice, and there are two places where there is room for creativity:

- 1) the creativity that you bring to enumerating meaningfully distinct options from which to choose
- 2) the creativity that you bring to defining the criteria, or heuristics, according to which you make your choices

- Bill Buxton



Source: Buxton, Sketching User Interfaces

What is a Prototype?

- Definition: ***Prototype:***

a test machine, circuit or program which is designed for demonstration purposes. It also enables the testing of the new product's design before the product is put into production. Problems or deficiencies in the product's design can be discovered and corrected. When the prototype is sufficiently refined and meets the functionality, robustness, manufacturability and other design goals, the product is ready for production.

www.wordiq.com/definition/prototype

What's a Prototype? (cont'd)

- Other design fields: Prototype = small scale model
 - miniature car
 - miniature building or town
- In Interaction Design: Prototype can be...
 - series of screen sketches
 - storyboard, i.e. a cartoon-like series of scenes
 - slide show i.e. powerpoint
 - video simulating the use of a system
 - lump of wood (e.g. PalmPilot)
 - cardboard mock-up
 - piece of software with limited functionality

What to Prototype?

- Technical issues
- Work flow, task design
- Screen layouts & information display
- Difficult, controversial, critical areas

Prototyping as Communication



Prototypes are
Disposable

The Rights of a Prototype

- Should not be *required to be* complete
- Should not *need* to be updated
- Should be easy to change

What do Prototypes Prototype?

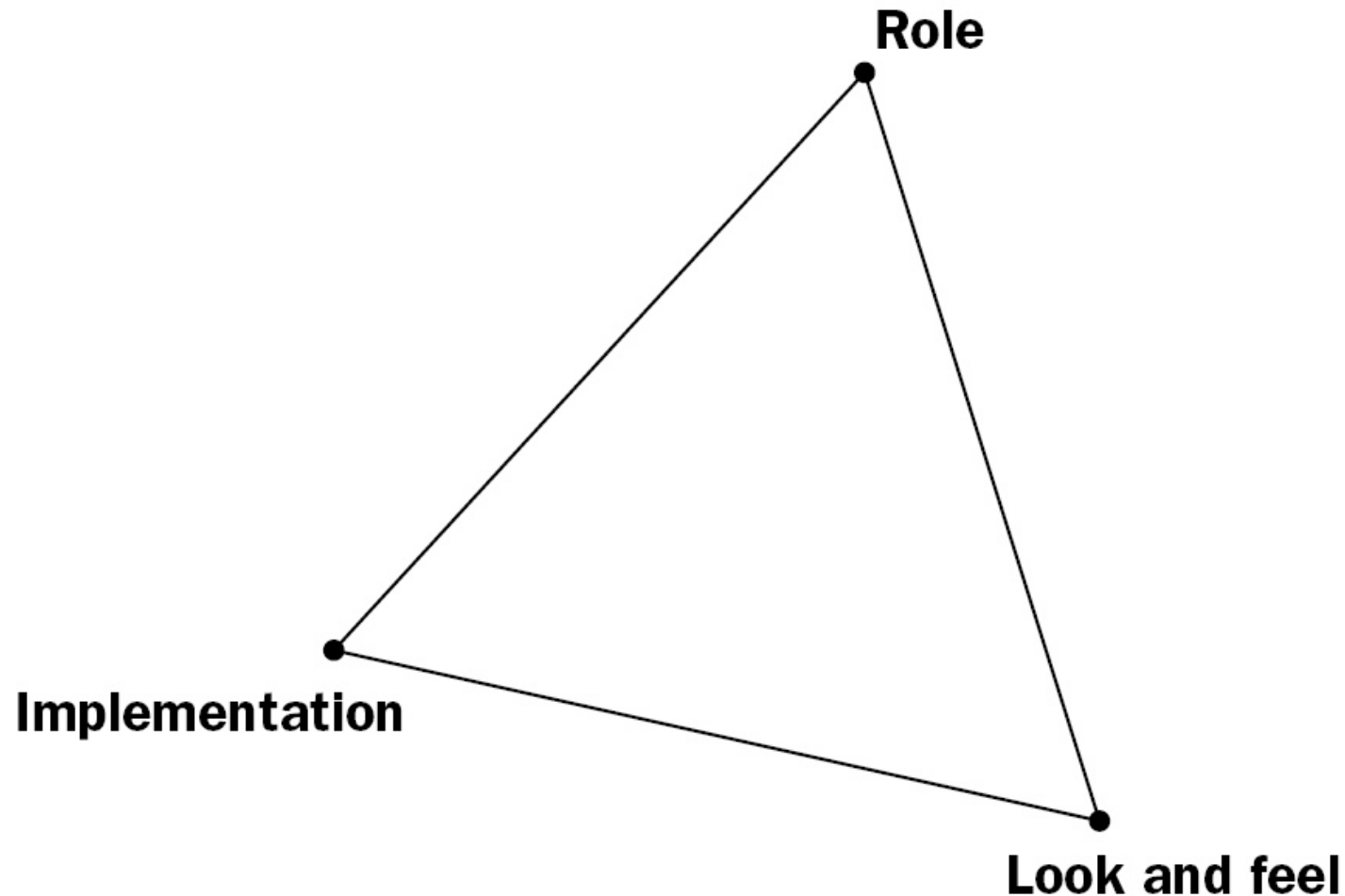


Figure 1. A model of what prototypes prototype.

The WON-
DERFUL
WIZARD
OF
By L. Frank Baum
With Pictures by
W. W. Denslow.



Geo. M. Hill Co.
CHICAGO
NEW YORK.

1 9 0 0

Messages from “Oz”

- Fidelity of the *experience* not the prototype is most important from the perspective of ideation and early design
- We can use anything we want to conjure up these experiences
- The earlier we do it, the more valuable it is
- It is much easier, faster, cheaper, and more reliable to find a little old man, a microphone, and some loud speakers than it is to find a real wizard.

*Fake it before you
build it.*

Form Prototype

- Looks good
- Doesn't work



Project inkwell “Spark”
computing device concept



Nintendo Wiimote mockups

Source: Buxton, Bill. Sketching User Experiences. Morgan Kaufman, 2007. Nintendo via 37signals.com blog, IDEO.

Function Prototype

- Looks like wireframes (no fonts, colors)
- Interactive functionality (basic up to working all the way)



Functional keyboard prototype



Functional water faucet

Source: Buxton, Bill. Sketching User Experiences. Morgan Kaufman, 2007.

Experience Prototype

- Video prototyping
- Role playing



Figure 2: Experiencing a train journey.

The team combined objective passenger research with subjective discovery as they played out roles they assigned each other.



Figure 1: The patient's experience kit.

When participants were paged this indicated that they had received a defibrillating shock; they recorded their surroundings with the camera, and noted their impressions.

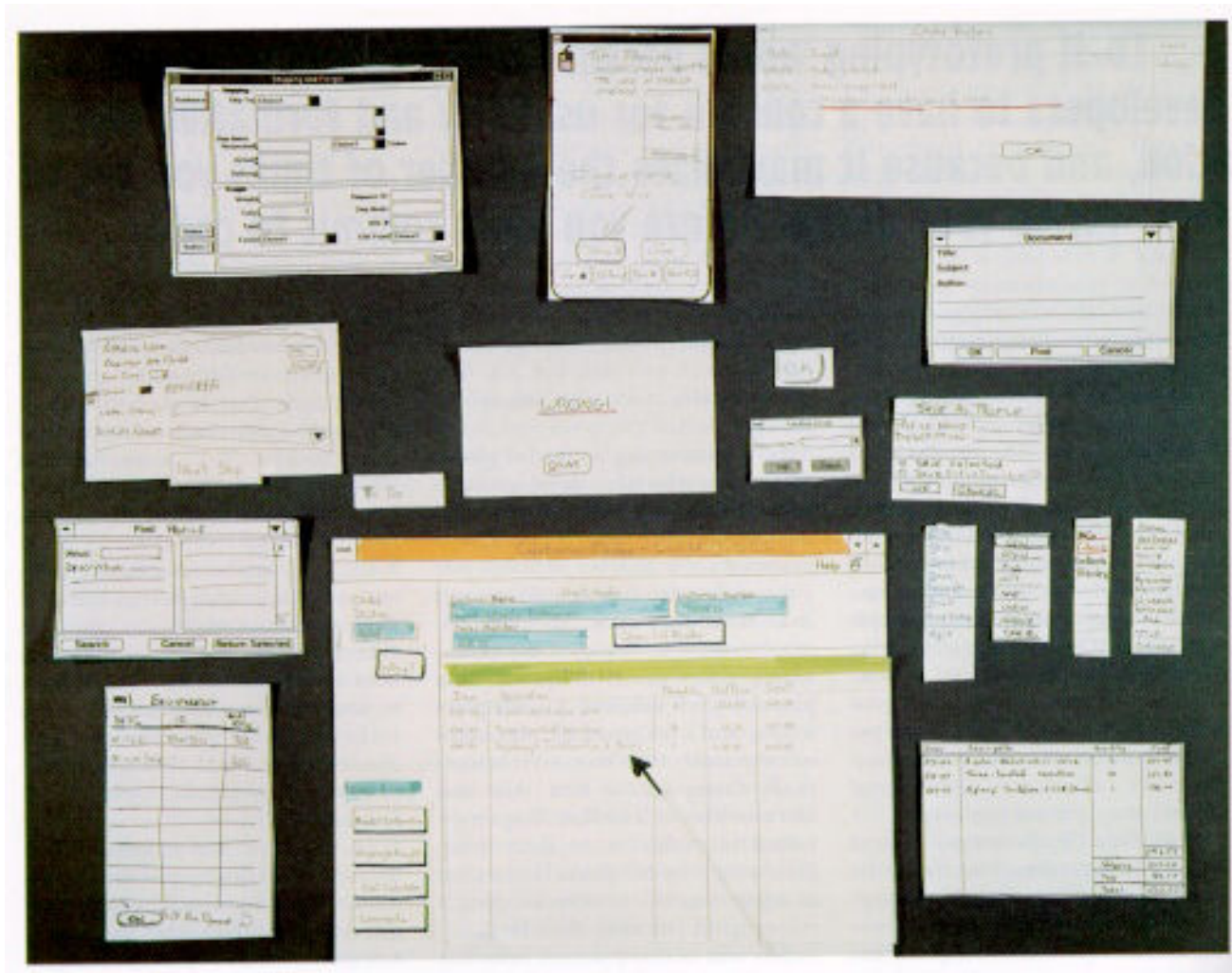


Figure 8: The Kiss Communicator.

This pair of prototypes let people have the hands-on experience of creating, sending and receiving subtle sensual messages. Video helped to create an appropriate context.

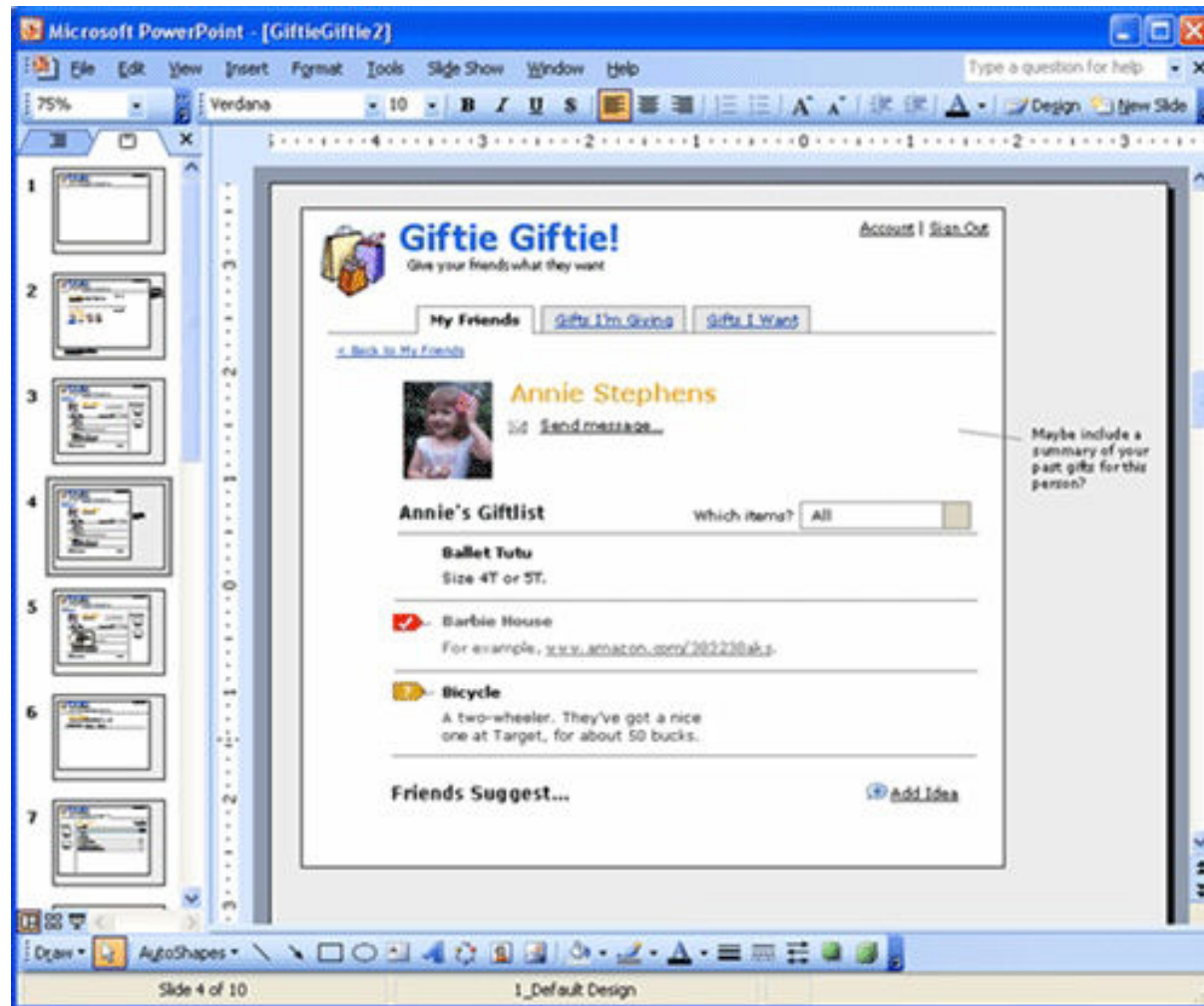
Source: Buchenau, Marion and Suri, Jane Fulton. "Experience Prototyping." DIS, 2000.

Paper Prototype



Source: Rettig, Marc. "Prototyping for Tiny Fingers." Communications of the ACM archive Volume 37 , Issue 4 (April 1994)

Powerpoint Prototype



Source: Kelly, Maureen. "Interactive Prototypes with PowerPoint".
<http://www.bboxesandarrows.com/view/interactive>

Powerpoint Prototype



Source: Brunette, Kynthia, et. al. "Meeteetse". Indiana University. Student Contest Entry. CHI 2005.

“Iceberg Secret”

- Visual part of the User Interface (UI) takes 1% of the programming effort (ppt version)
- **Secret:**
People who are not programmers do not understand this!
- **Corollary 1:**
If you show a nonprogrammer a screen which has a UI that is 90% worse, they will think that the program is 90% worse.
- **Corollary 2:**
If you show a nonprogrammer a screen which has a UI which is 100% beautiful, they will think the program is almost done.

TASKS FOR PROTOTYPING

Designing Good Tasks

- Based on goals that matter to users
- Covers questions key to success of the product
- Appropriate scope - not too broad or narrow
- Finite & predictable set of possible solutions
- Clear end point recognizable to the user
- Elicits action, not just opinion
(focus groups & surveys better for opinions)

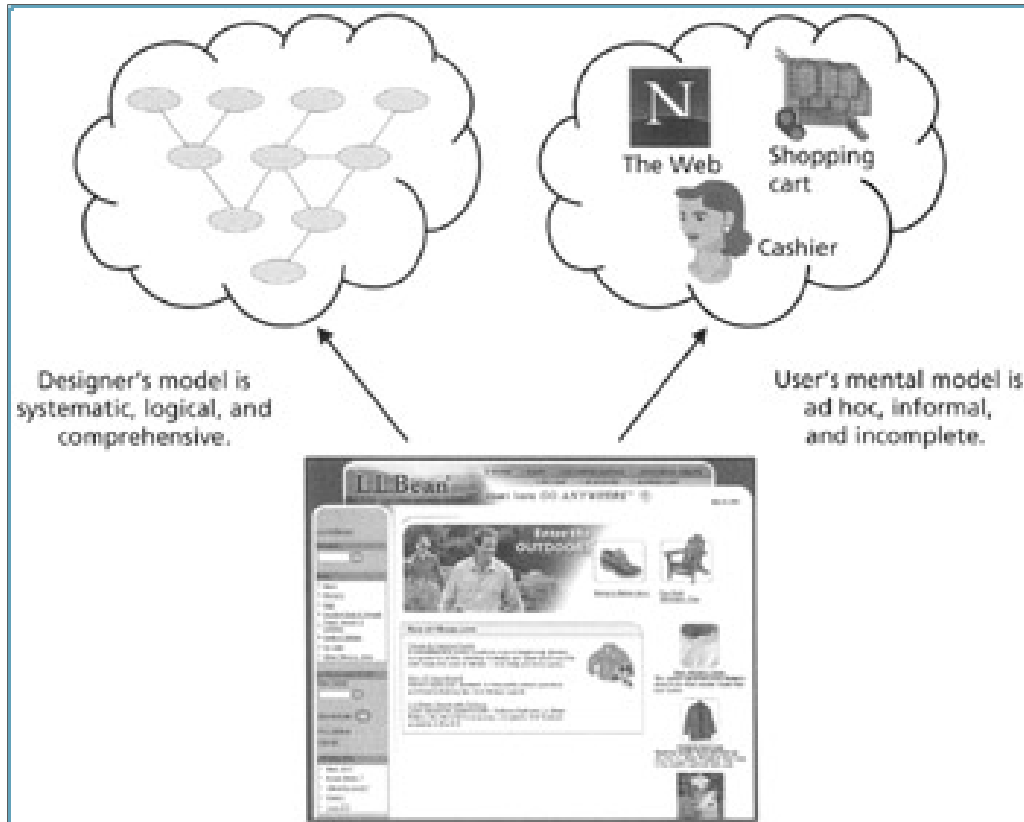
Writing Good Task Instructions

- Describe only the users goal not the instructions how to do it
- Do not use terms that appear in the interface
 - Task: Check if weather icon & label work well
 - User Instructions:
 - Bad : “Find the weather at your destination.”
 - Better: “ You want to know if you will need to wear your rain coat when you arrive.”

Conceptual Models

Designer's Conceptual Model

structured
logical
consistent



User's Conceptual Model

complete?
coherent?
error prone?
superstitious?
like designers?

System Image objects, options, commands, states

Conceptual Model Elements

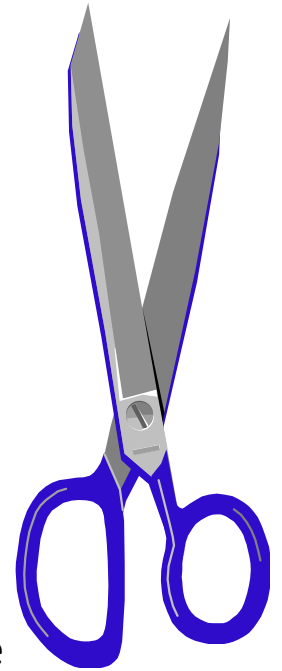
- Affordances - Bathroom Taps
- Constraints - forms for date entry
- Constraints - buttons that look like buttons
- Mapping - Kitchen stoves, computer cables, bathroom taps
- Metaphor - Positive & Negative transfer

Conceptual Model

- Conceptual models may be wrong, particularly if above attributes are misleading
- Conceptual models allow people to mentally simulate/predict operation of device
- Examples:
 - Restaurant
 - Double Bicycles
 - Tea Pot

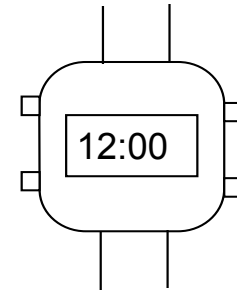
Design Example - Scissors

- affordances:
 - holes for something to be inserted
- constraints:
 - big hole for several fingers, small hole for thumb
- mapping:
 - between holes and fingers suggested and constrained by appearance
- positive transfer and cultural idioms:
 - learnt when young
 - constant mechanism
- conceptual model:
 - implications clear of how the operating parts work



Design Example - Digital Watch

- affordances:
 - four push buttons to push, but not clear what they will do
- constraints and mapping unknown
 - no visible relation between buttons, possible actions and end result
- transfer of training
 - little relation to analog watches
- cultural idiom
 - somewhat standardized core controls and functions but still highly variable
- conceptual model:
 - must be taught



Prototyping During Design

Early design

Brainstorm different representations
Choose a representation
Rough out interface style
Task centered walkthrough and redesign

Low fidelity paper prototypes

Fine tune interface, screen design
Heuristic evaluation and redesign

Medium fidelity prototypes

Usability testing and redesign

High fidelity prototypes / restricted systems

Limited field testing

Working systems

Alpha/Beta tests

Late design



15/16

100

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Case	Age	Sex	Location	Time of Day	Time of Year
1	25	Male	Urban	Evening	Summer
2	30	Female	Suburban	Morning	Spring
3	35	Male	Rural	Afternoon	Autumn
4	40	Female	Urban	Evening	Winter

1992

2000

2000

10

10

2000

<input type="checkbox"/>	<input checked="" type="checkbox"/>	தமிழ்	தமிழ்-தமிழ் மொழி	தமிழ்-தமிழ் மொழி	தமிழ்
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Paper Prototyping - Definition

- “Usability Testing where representative users perform realistic tasks by interacting with a paper version of the interface that is manipulated by a person “playing computer”, who doesn’t explain how the interface is intended to work” (Snyder, 2003, p. 4)

Maximum User Feedback for Minimum Effort

Paper Prototyping - Advantages

- Provides substantive user feedback early (BEFORE significant implementation effort)
- Promotes rapid iterative development
- Facilitates communication (inside development team, between development & customers, ...)
- No technical skills required, ideal for multidisciplinary teams
- Encourages creativity in product development process - “Wizard of Oz”

PP Case Study: Symposium

- Symposium - A web based training environment. A live virtual classroom, students with microphone equipped PC hear & talk with instructor & other students while reviewing class materials on their computer screens
- Users: Large corporations, geographically dispersed employees, training from office or home
- Original Plan: 3D interface with Avatars represent students & showing facial expression & gestures

PP Case Study: Symposium (Cont'd)



































- Results of PP Test:
 - 3D VR interfered with learning - “gamelike”
 - Social issues not addressed
 - who else is there?
 - interruptions at work - solution: “do not disturb” sign
- “There was an undercurrent of doubt about whether we were doing the right thing [with 3D interface]. Paper prototyping helped the company address these issues and change the technical direction. Without it, these decisions would likely have taken 6 to 12 months longer.”

Dimensions of Prototypes

Instead of Hi & Low-Fidelity:

- **Breadth**
percentage of product features are represented
- **Depth**
degree to which product functionality works
- **Look**
intended appearance represented in prototype
- **Interaction**
how prototype handles user I/O, response time, cursor changes, sounds, flashing lights, animations, tactile feedback

Problems that PP Will Likely Find

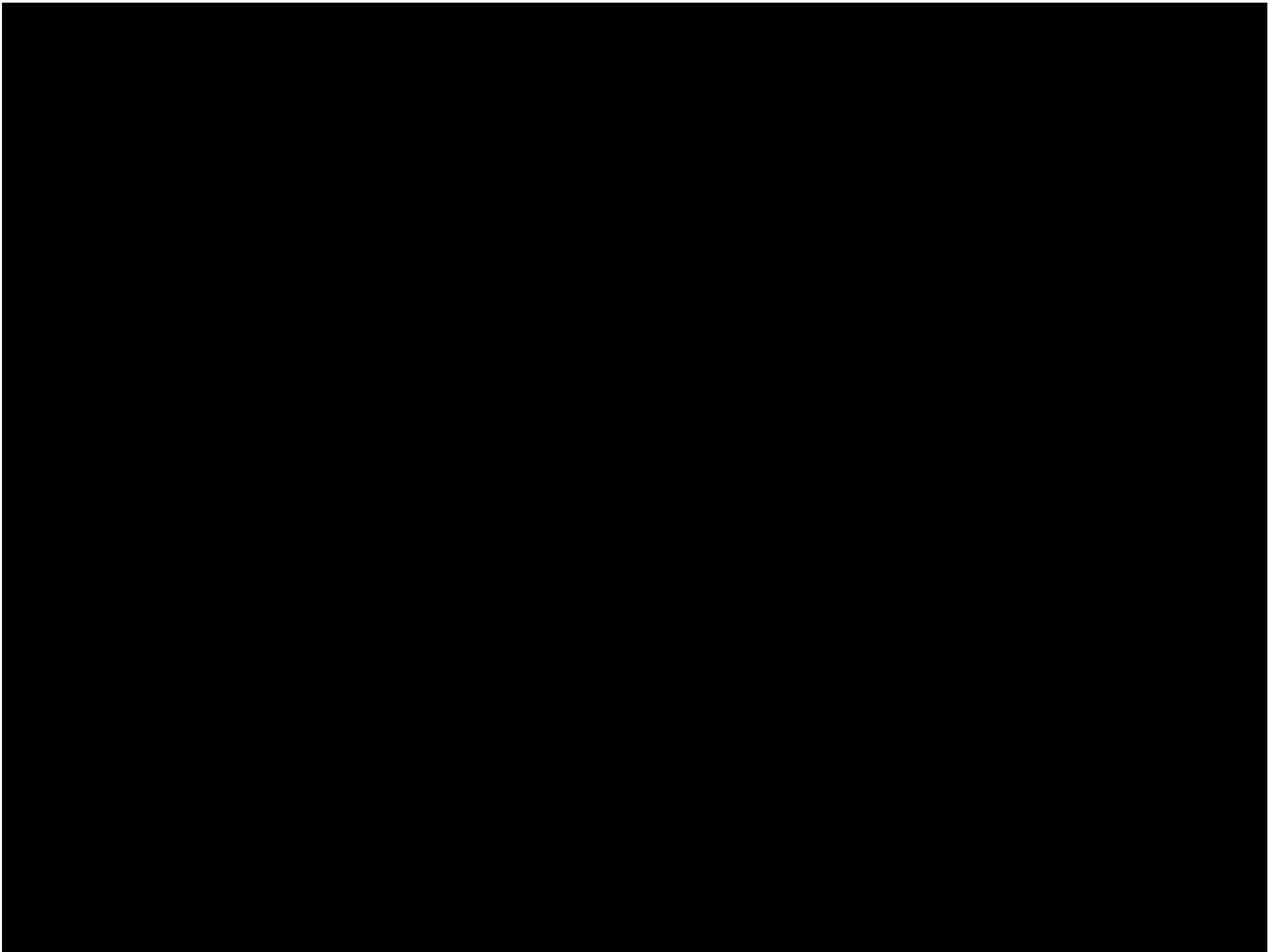
Test Questions	PP	Breadth	Depth	Look	Interact.
Concepts & terminology					
Navigation, work & task flow					
Content				 *	
Documentation, help				 *	
Requirements, functionality				 *	 *
Screen layout					
Brand					
Colours, fonts, graphic elements	 *				
Widgets & controls					
Response time, performance metrics					
Real-world use: Needs context of use +					

* Sometimes

For more information see Snyder, 2003, pg. 268

Paper Prototyping - Image Quality

- Rendering: How good should it look?
Good enough to elicit feedback about issues you're most worried about
- Creation speed is of the essence!
- Modifications - when?
While user is still present, get immediate feedback. Make changes without losing users' context. Allow user to make changes?
- Coding effort in PP is always zero! No code to write or rewrite until design is stabilized.



Summary

- Today we introduced:
 - Prototyping

Your Action Items

- New required readings on paper prototyping
- Watch Scott Klemmer video on Wizard of Oz approach

Ongoing Course Evaluation

- Please complete the feedback survey on Blackboard!