Rapid Prototyping Techniques

SCOTT KLEMMER

FALL 2011

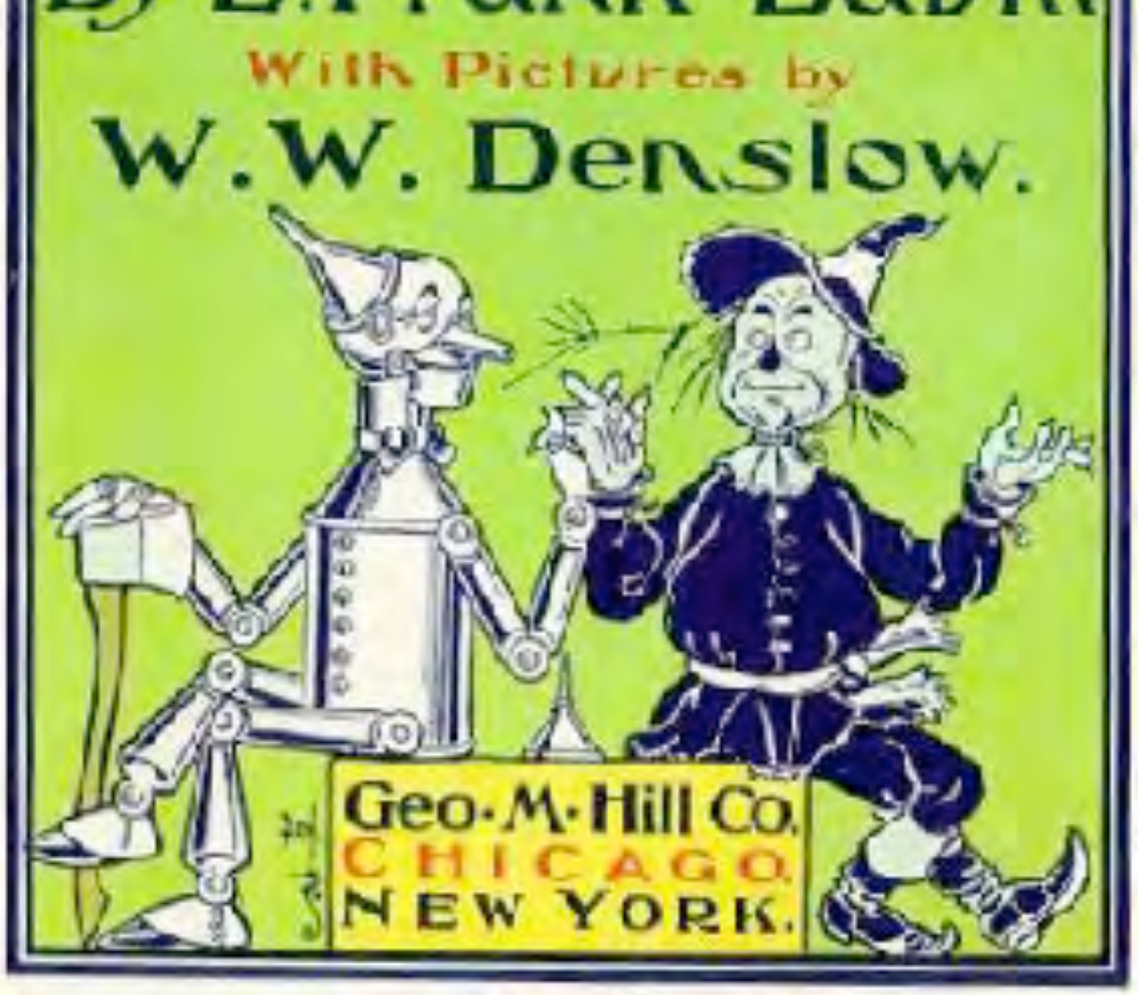
cs147.stanford.edu

The WONDERFUL WIZARD OF OZ

By L. Frank Baum

With Pictures by

W. W. Denslow.



Geo. M. Hill Co.
CHICAGO.
NEW YORK.

1900

Wizard-of-Oz technique

Defn (v): To prototype an interactive system by using human operators to simulate machine behavior

Wizard-of-Oz technique

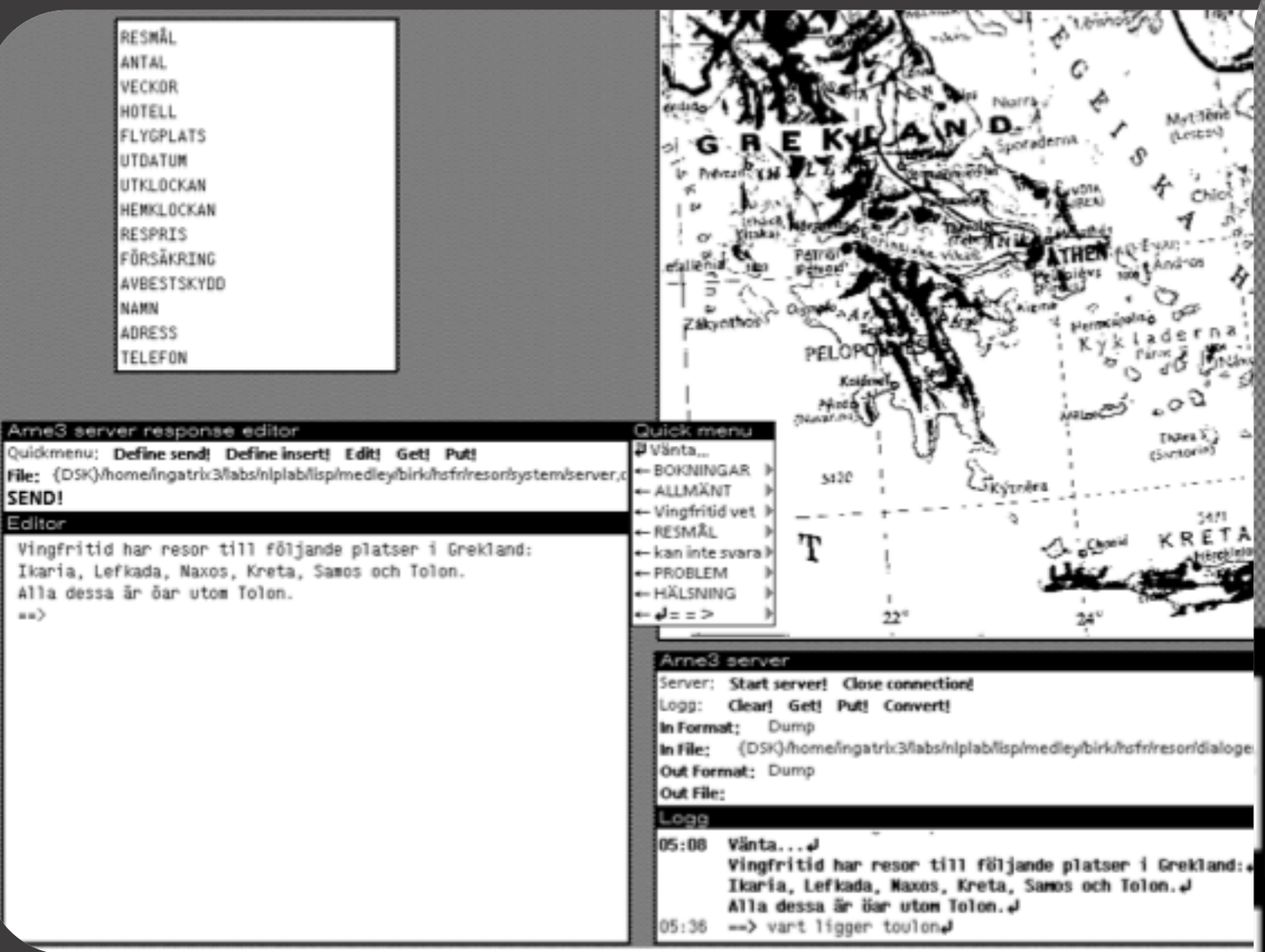
- Make an application operate without (much) code
  - Front end interface (hard to fake this part)
  - Remote (wizard) interface to control user interface
    - Must take less time/money than building the real thing
- Get feedback from users (fidelity issues)
  - Hi-fidelity == users think it's real, their behavior matters
  - Low-fidelity == users have license to suggest changes

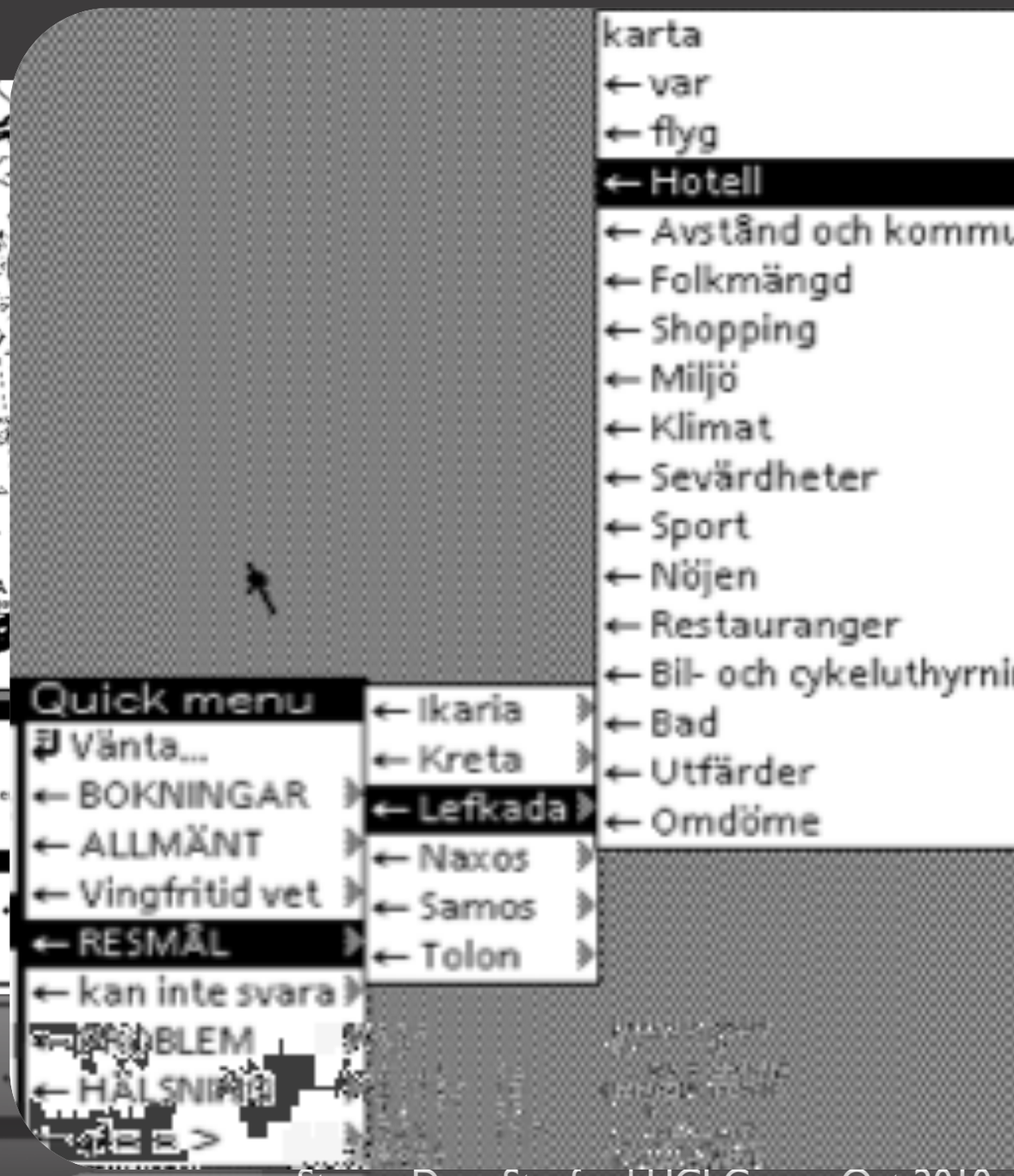
Steven Dow, Stanford HCI Group, Oct 2010

Wizard-of-Oz technique

natural dialogue interfaces

Dahlbäck, Jönsson, & Ahrenberg, 1993



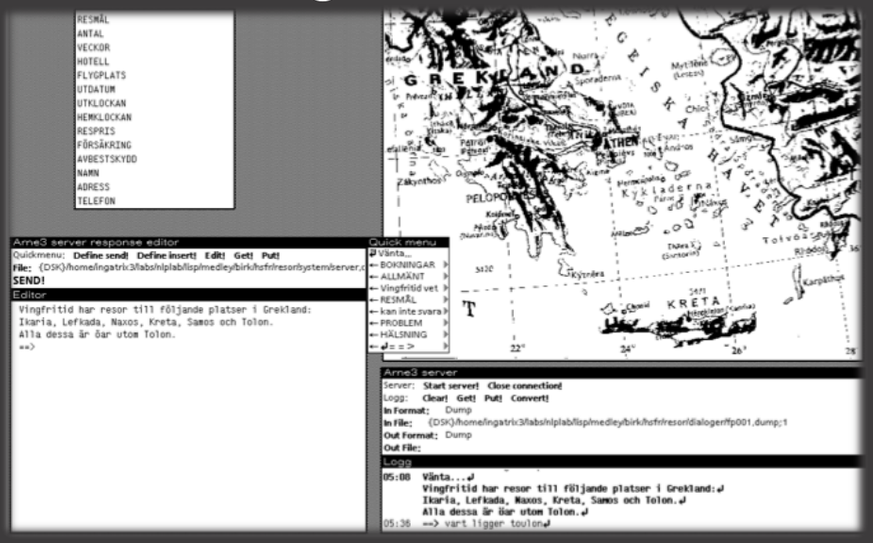


Aardvark

"Why Start-Ups Must Pay Attention To What's Behind The Curtain"
Venture Capital Dispatch - WSJ

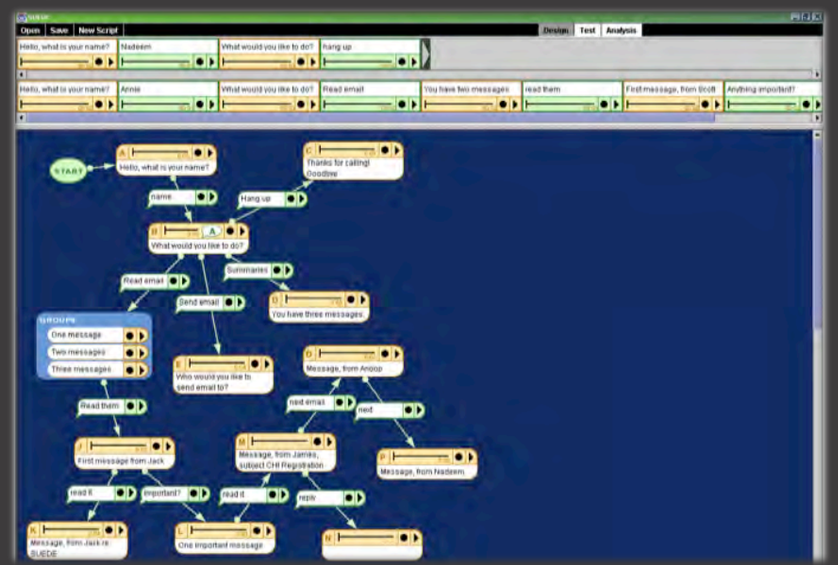
Wizard-of-Oz technique

natural dialogue interfaces



Dahlbäck, Jönsson, & Ahrenberg, 1993

speech-based interfaces

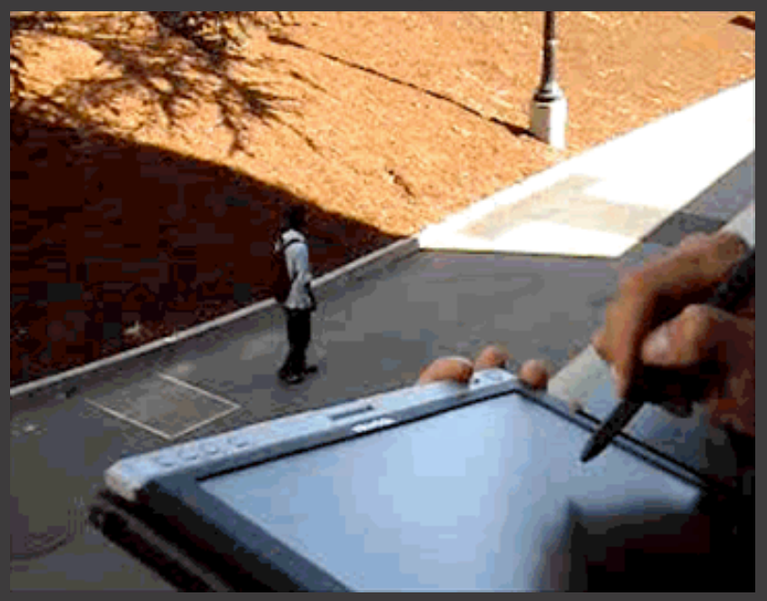


Klemmer, et al., 2000

computer vision

Tran, Mynatt, et al., 2005

location-based apps



Li, Hong, & Landay, 2004

How to make a WOz prototype

Map out scenarios and application flow (what should happen in response to user behavior?)

Put together interface “skeletons” (minimal autonomy)

Develop “hooks” for wizard input

- Where and how the wizard will provide input (e.g., selecting the next screen, entering text, entering a zone, recognizing speech, etc.); Must be possible to replace later with computer

Rehearse wizard role with a colleague (Wizard should be able to perform the task)

How to test a WOz prototype

Recruit samples users (IRB concerns)

Give users tasks or a clear indication of what they should be doing (paper instructions)

One team member operates WOz interface (more authentic if hidden or in a remote location)

One team member conducts evaluation, observes user

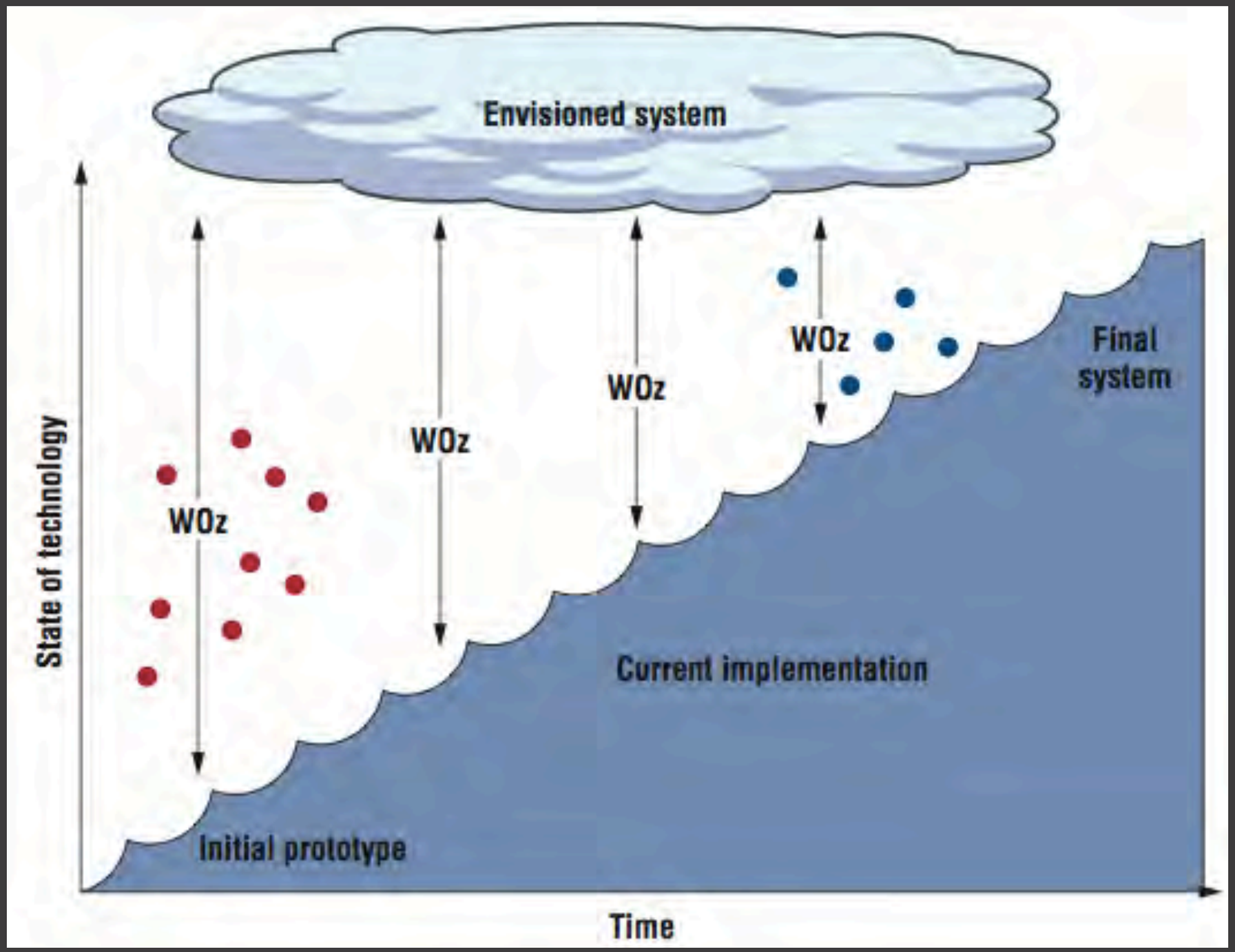
-Think aloud (speak freely as performing tasks)
-Retrospective (best when think aloud distracts)
-Heuristic evaluation (works with experts too)

Debrief users, reveal wizard

How Might We...?

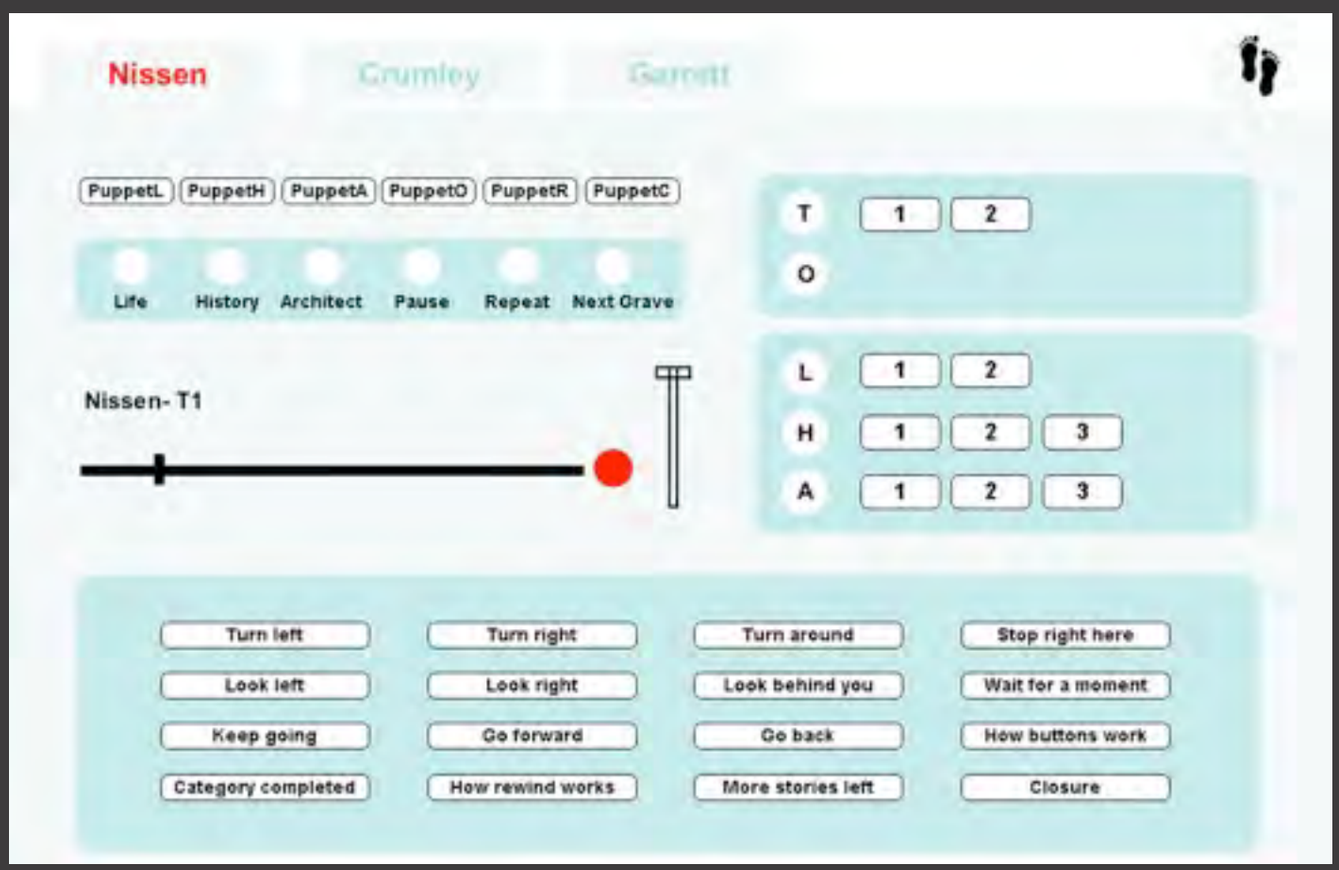
Wizard a wake-up call service

Wizard throughout development



Steven Dow, Stanford HCI Group, Oct 2010

Wizard throughout development



Voices of Oakland project
Dow, MacIntyre, Lee, Oezbek, Bolter and Gandy, 2005

Tradeoffs in Wizard prototyping

Advantages

Disadvantages

Tradeoffs in Wizard prototyping

Advantages

- Fast (faster) and thus, cheaper and more iterative prototypes
- Creating multiple variations is easy
- More “real” than paper prototyping
- Identifies bugs and problems with current design
- Places the user at the center of development
- Can envision challenging-to-build applications
- Designers learn by playing wizard

Disadvantages

Steven Dow, Stanford HCI Group, Oct 2010

Tradeoffs in Wizard prototyping

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Disadvantages

- Simulations may misrepresent otherwise imperfect tech
- May simulate technologies that do not exist (and may never)
- Wizards may need to be trained and can be inconsistent
- Playing the wizard can be exhausting
- Some system features (and limitations) cannot be simulated
- May be inappropriate for certain venues (e.g., home)

Storyboarding

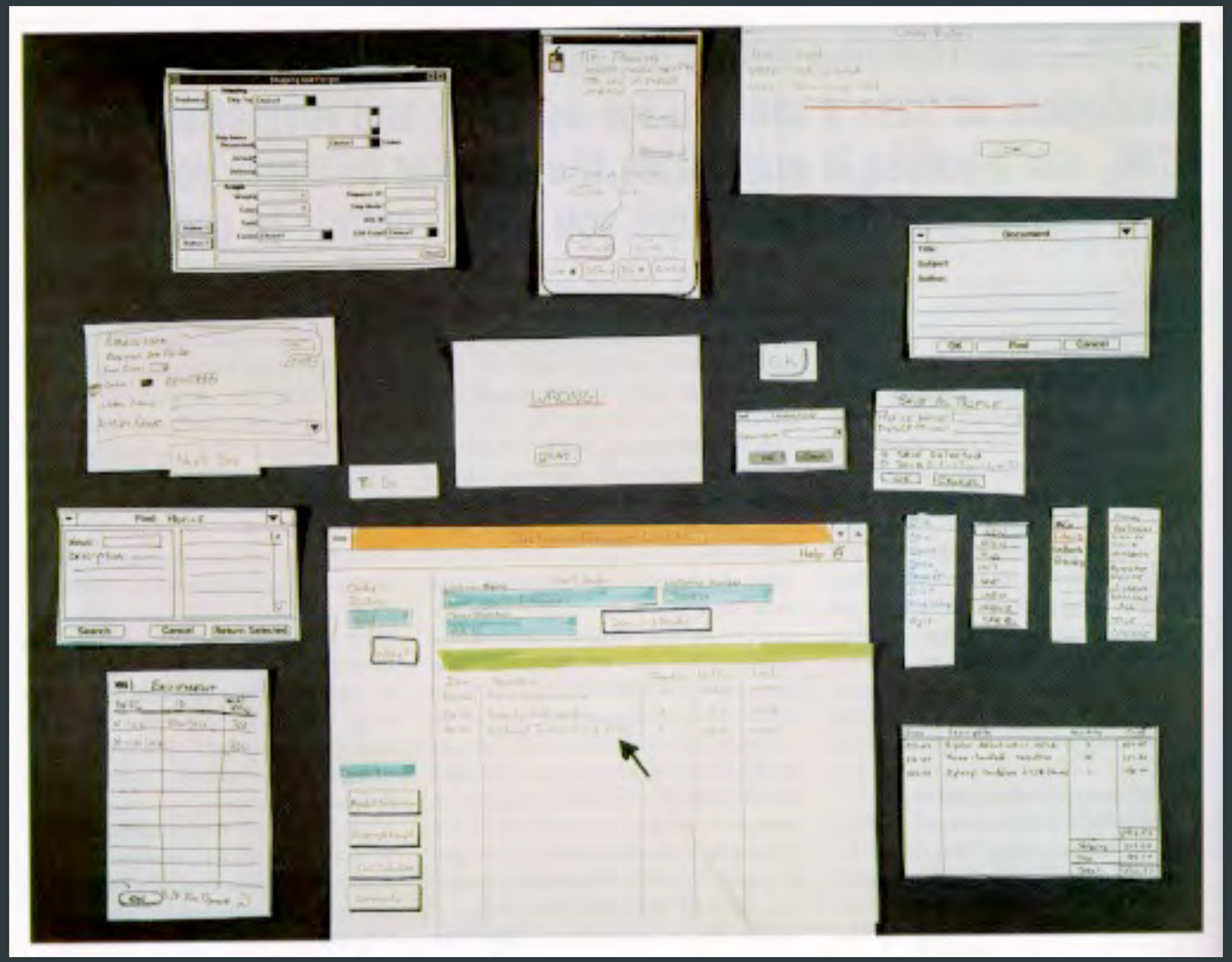
- Versatile
- Quick
- Powerful

Source: McCloud, Scott. Understanding Comics.

Storyboards

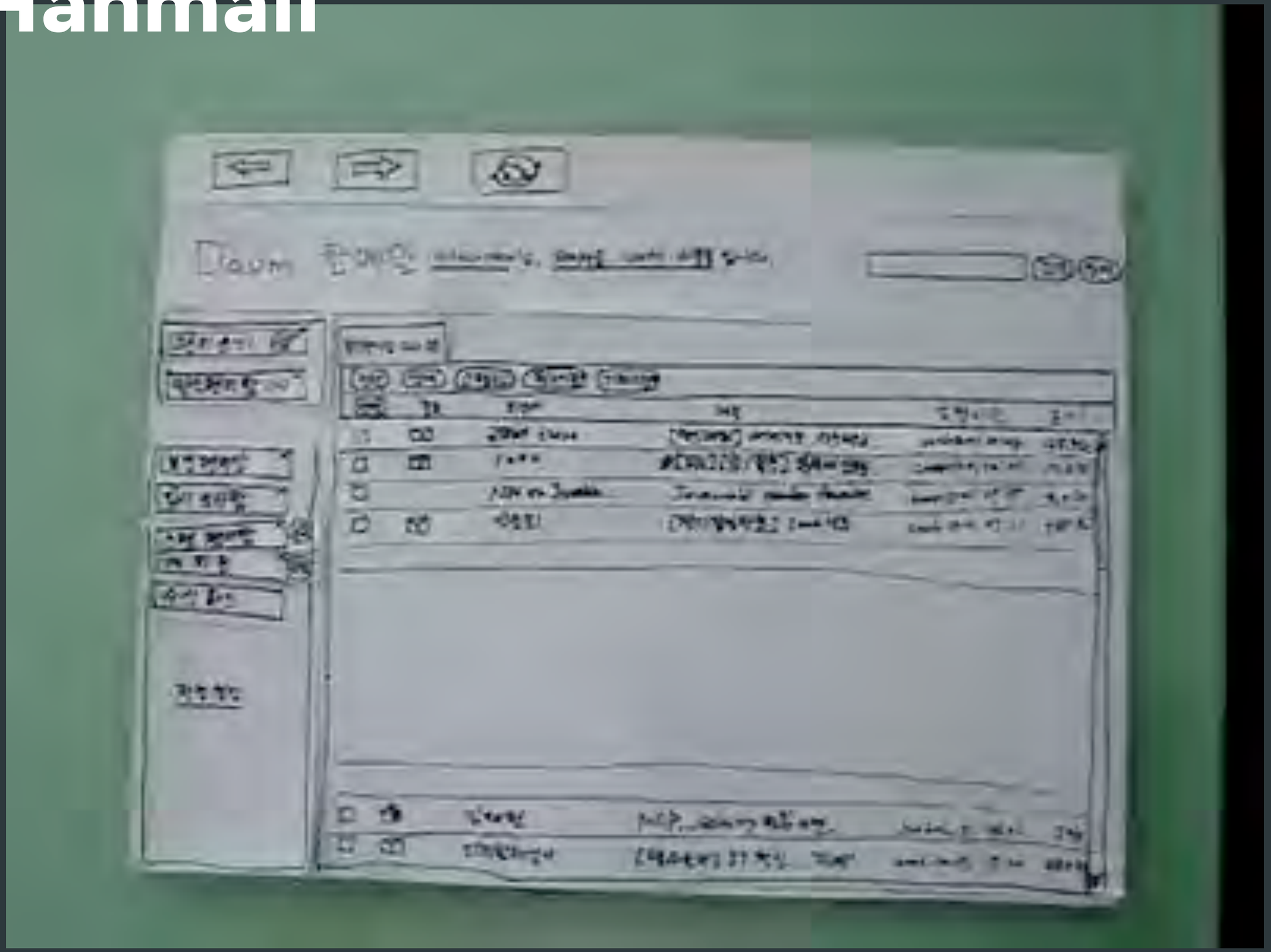
http://www.storyboards-east.com/sb_dismoi.htm

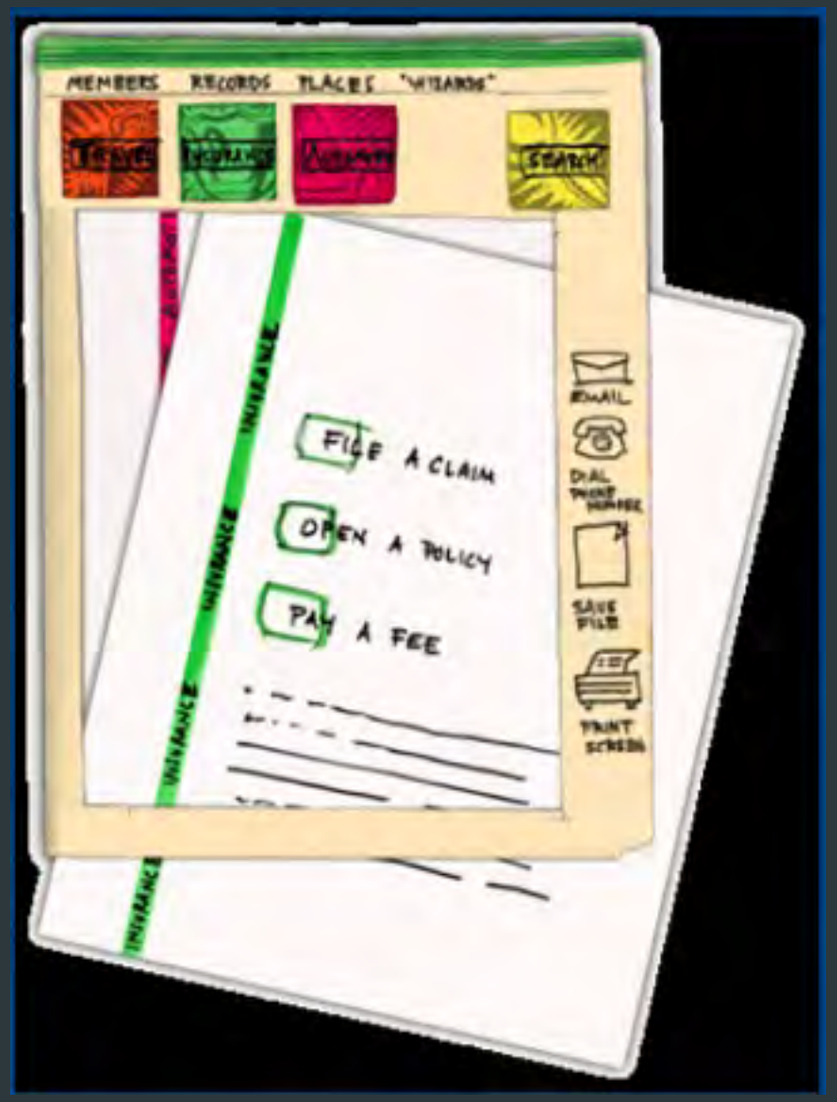
Paper prototyping

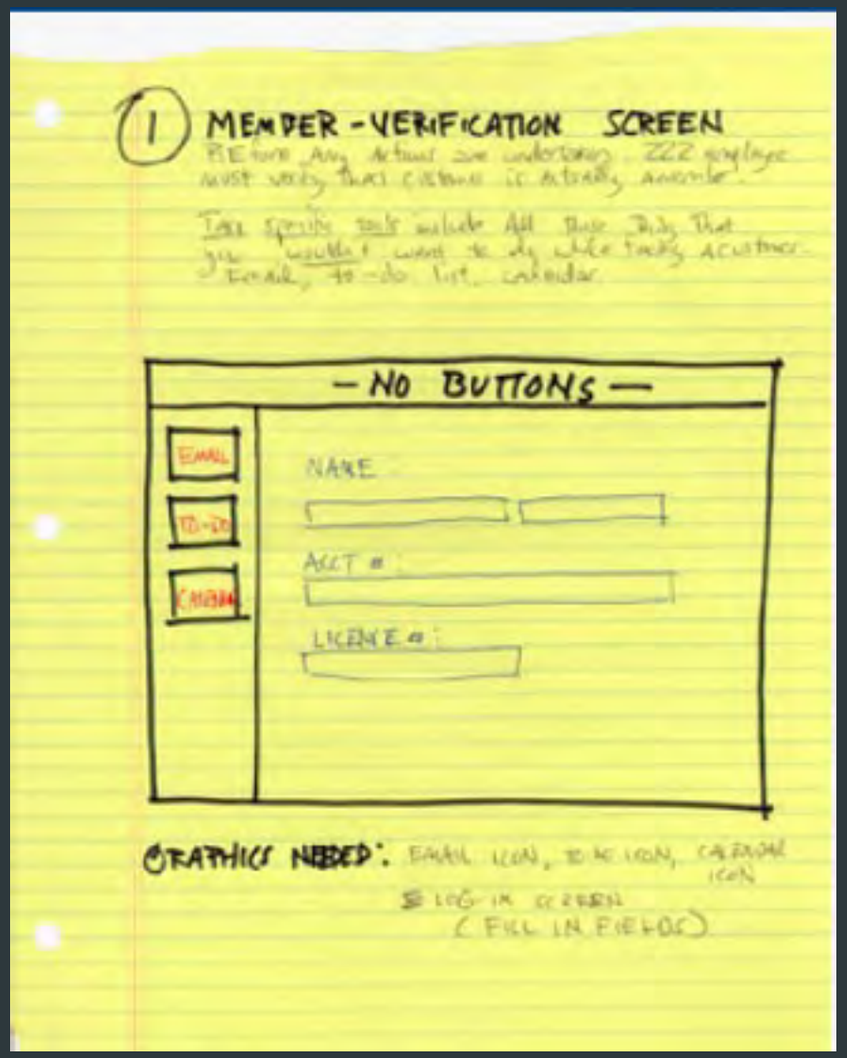


Source: Rettig, Marc. “Prototyping for Tiny Fingers.” Communications of the ACM archive Volume 37 , Issue 4 (April 1994)

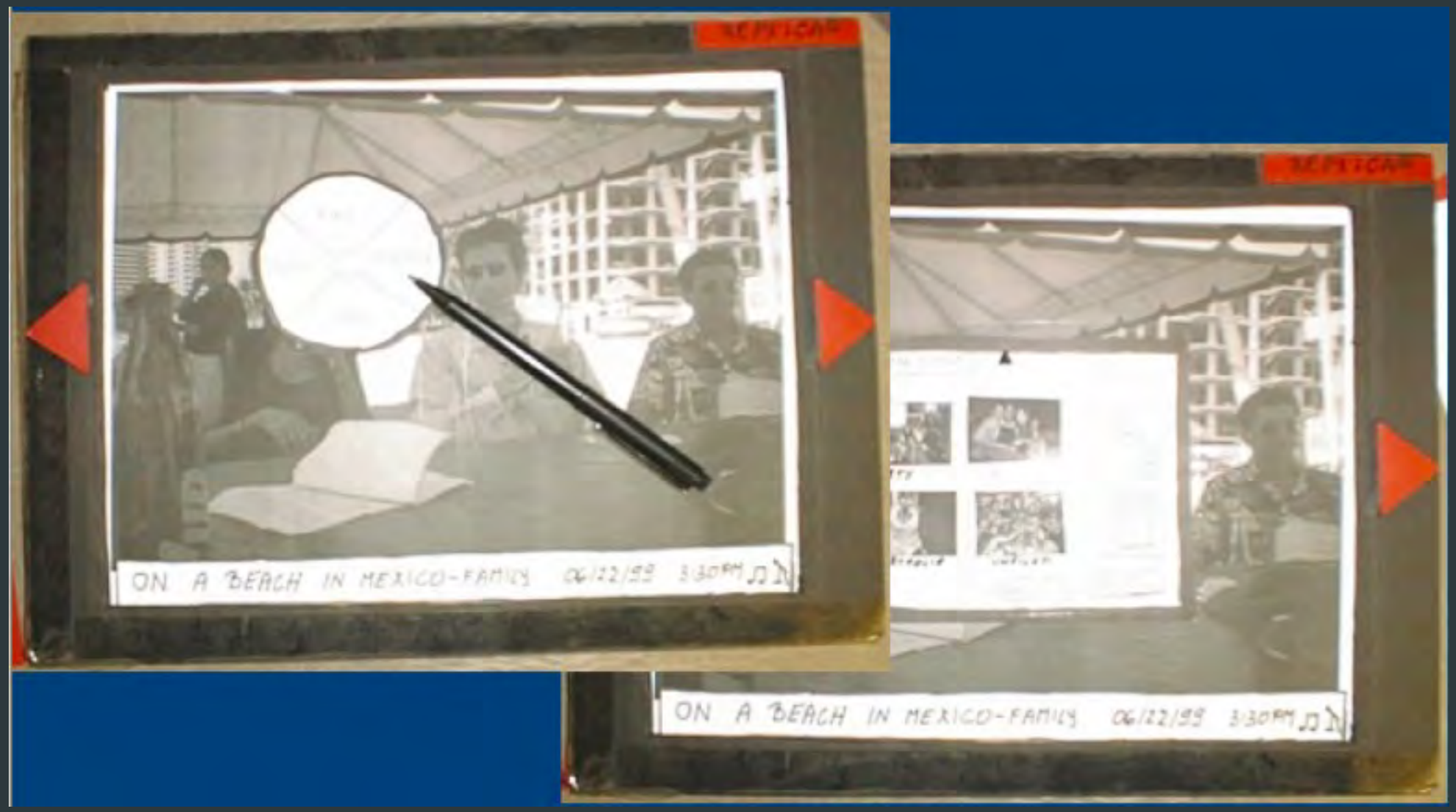
Hanmail





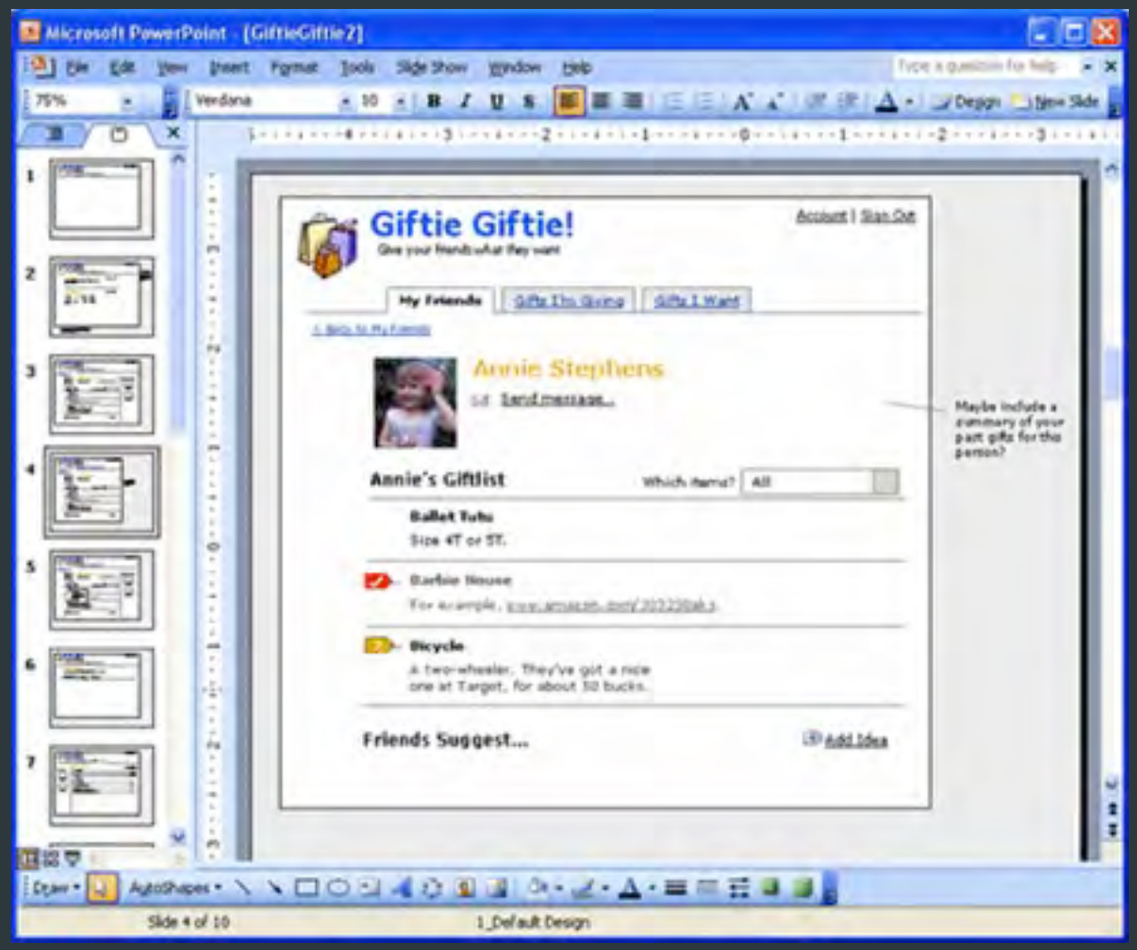


http://www.mindspring.com/~bryce_g/projects/lo_fi.html



http://bmrc.berkeley.edu/courseware/cs160/fall99/projects/t4/body/low-fi/

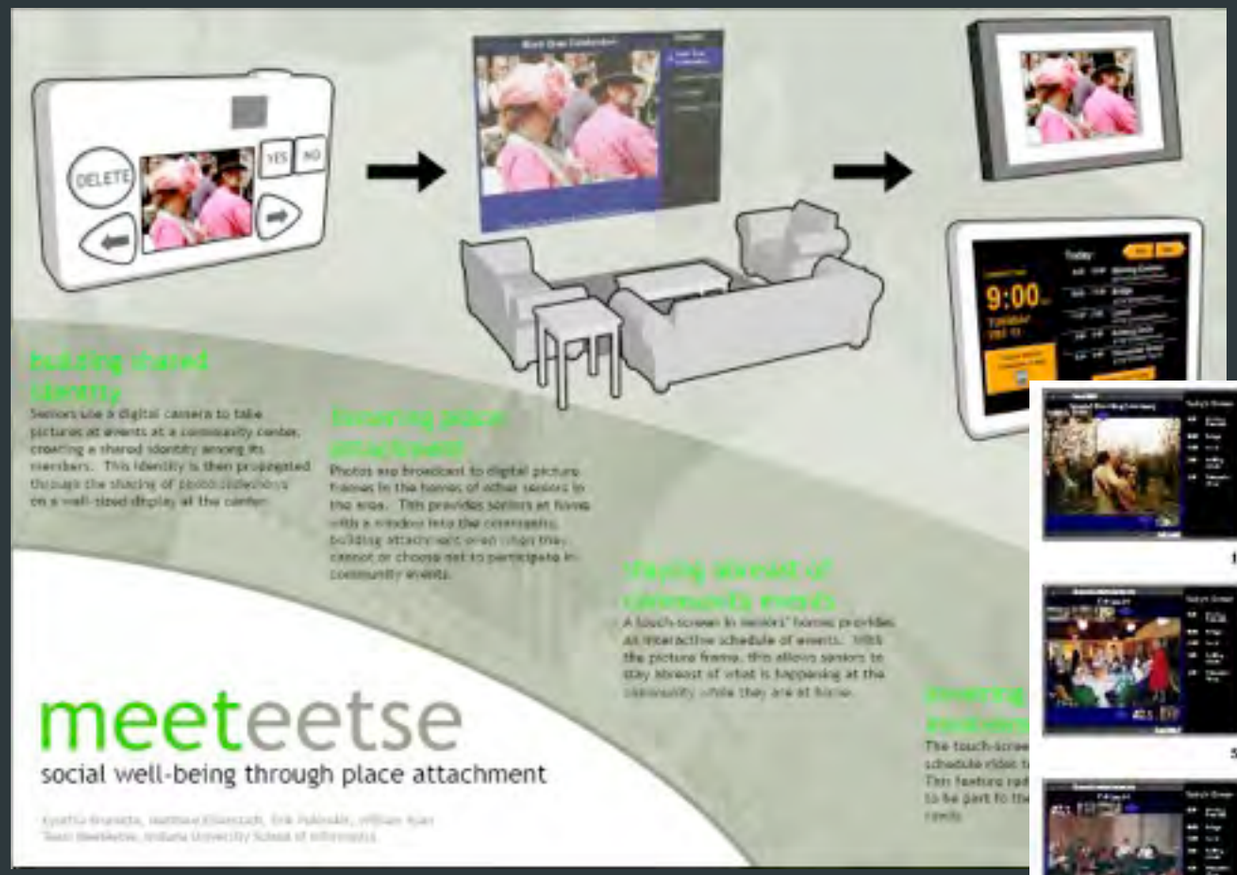
Powerpoint Prototyping

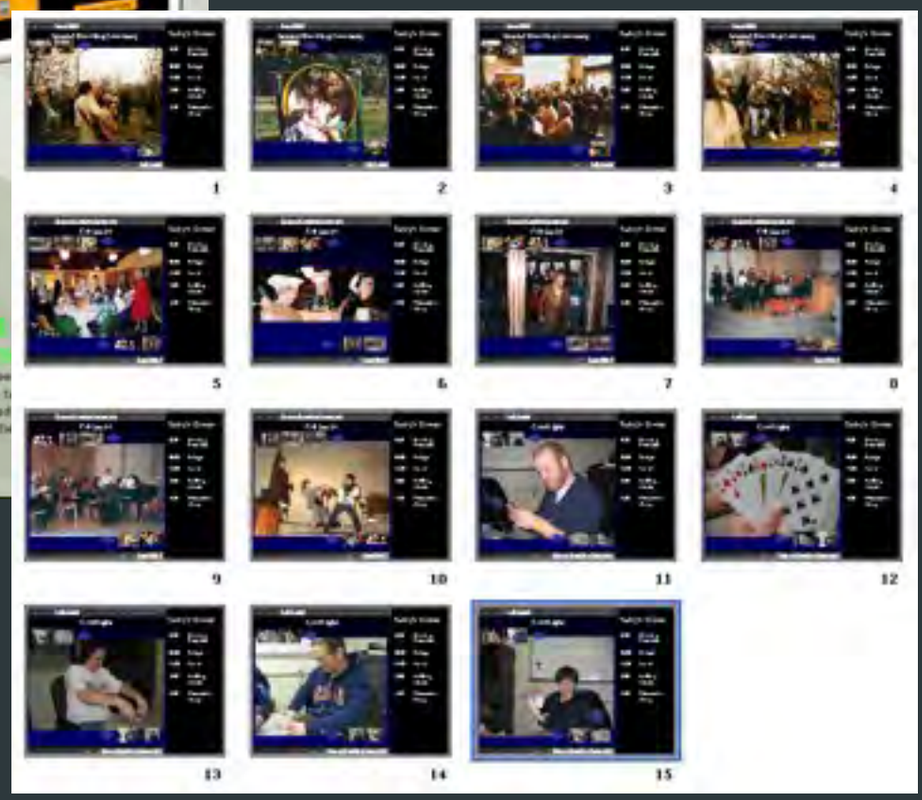


Powerpoint Prototype Website

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

Powerpoint Prototyping





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

Tools

- Paper, Cardboard, Transparencies
- Tape, Glue, Rubber Cement
- Pens, Pencils, Markers
- Scissors
- Plastic Tubes, Paper Cups, CD “Coasters”
- Anything that you can buy in an arts and crafts store
- ...and video

5 User Testing

http://www.cs.waikato.ac.nz/usability/facilities.html

http://www.itl.nist.gov/iad/gallery.html

User Testing Ingredients

- Greeter/Facilitator
- 2 Observers/Note takers
- Prototype
- Users!!!!

Form prototype

- Looks good
- But doesn’t really work

Project inkwell “Spark” computing device concept

Nintendo control pad mockup

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 (spectrum up to working all the way)

Functional keyboard prototype

Functional water faucet

Source: Buxton, Bill. Sketching User Experiences. Morgan Kaufman, 2007. http://www.ammodel.com/PrototypeDesign.aspx

Experience prototype

- Video prototyping
- Role playing

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 2: Experiencing a train journey.

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

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.

Video Prototyping

Starfire Video Prototype: "Julie was looking forward to a good day until Michael O'Connor tried to deep-six her sports car project. Now, only her team, scattered around the world, can save her..."

Technology Featured in the Scene

Meeting room with telepresence for remote members

Large screen for multimedia presentations

Laptop computer with chorded input

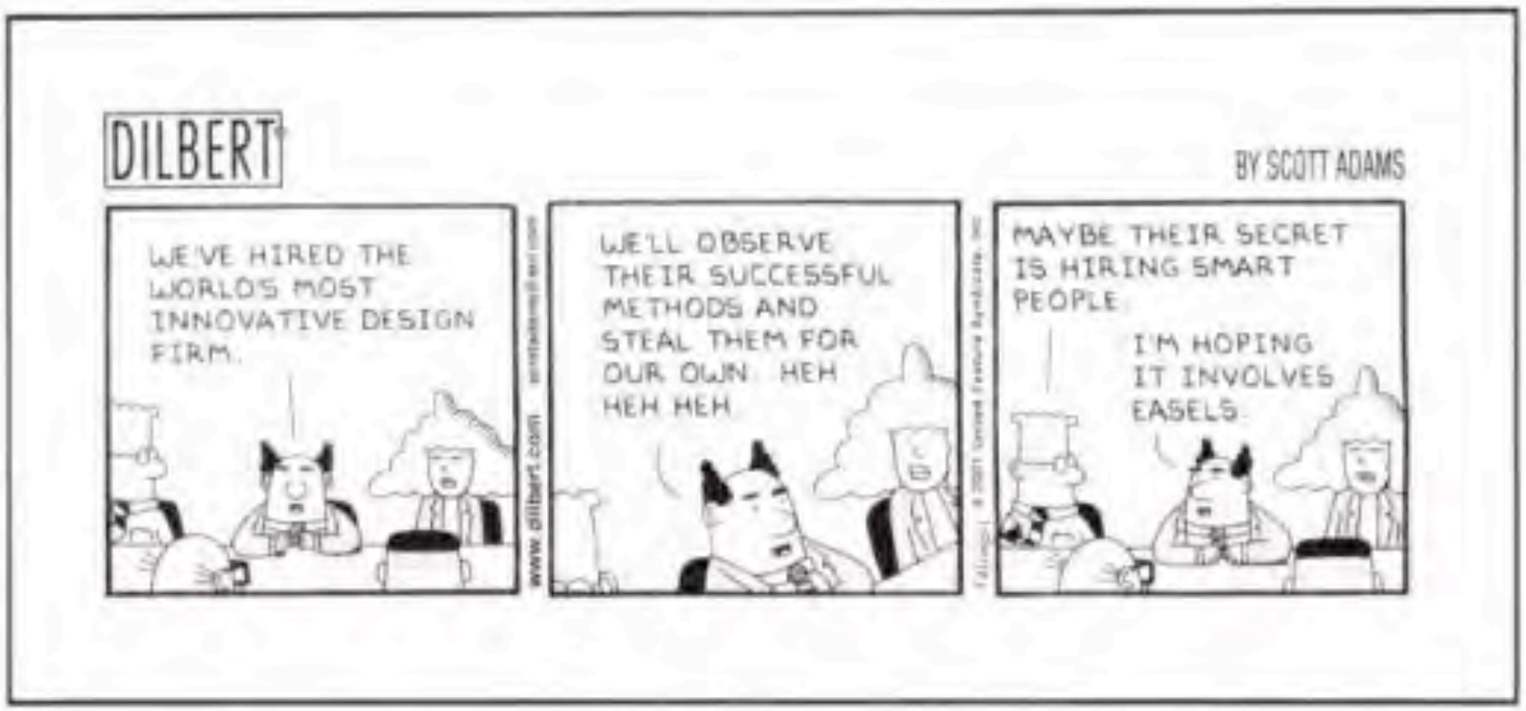
Wireless connectivity between laptop, library server, and the big screen

Bidirectional hypertext links between database items

Source: Tognazzini, Bruce. "The 'Starfire' Video Prototype Project: A Case History". CHI 2004.

Further Reading

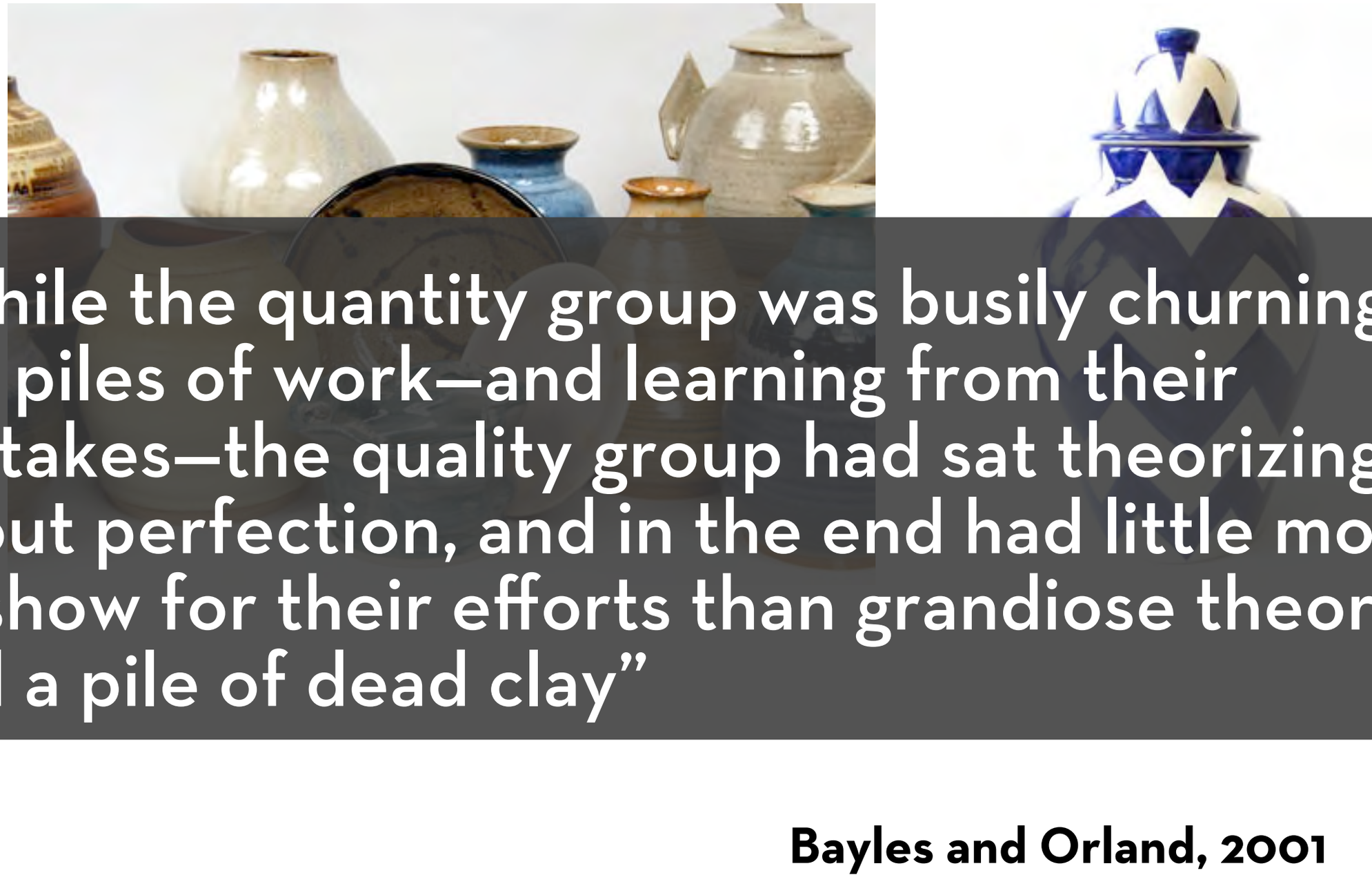
- Bill Buxton, Sketching User Experiences
- Bill Moggridge, Designing Interactions
- Carolyn Snyder, Paper Prototyping
- Michael Schrage, Serious Play
- Houde and Hill, What do Prototypes Prototype?



Quantity vs. Quality?

Bayles and Orland, 2001

Quantity vs. Quality?



“While the quantity group was busily churning out piles of work—and learning from their mistakes—the quality group had sat theorizing about perfection, and in the end had little more to show for their efforts than grandiose theories and a pile of dead clay”

Bayles and Orland, 2001

(How) can we measure this?

Steven Dow *et al.*

Design an Egg Drop Device

Participants picked their concept early

“[illegible] to be [illegible] to [illegible] possible... I don’t see any other

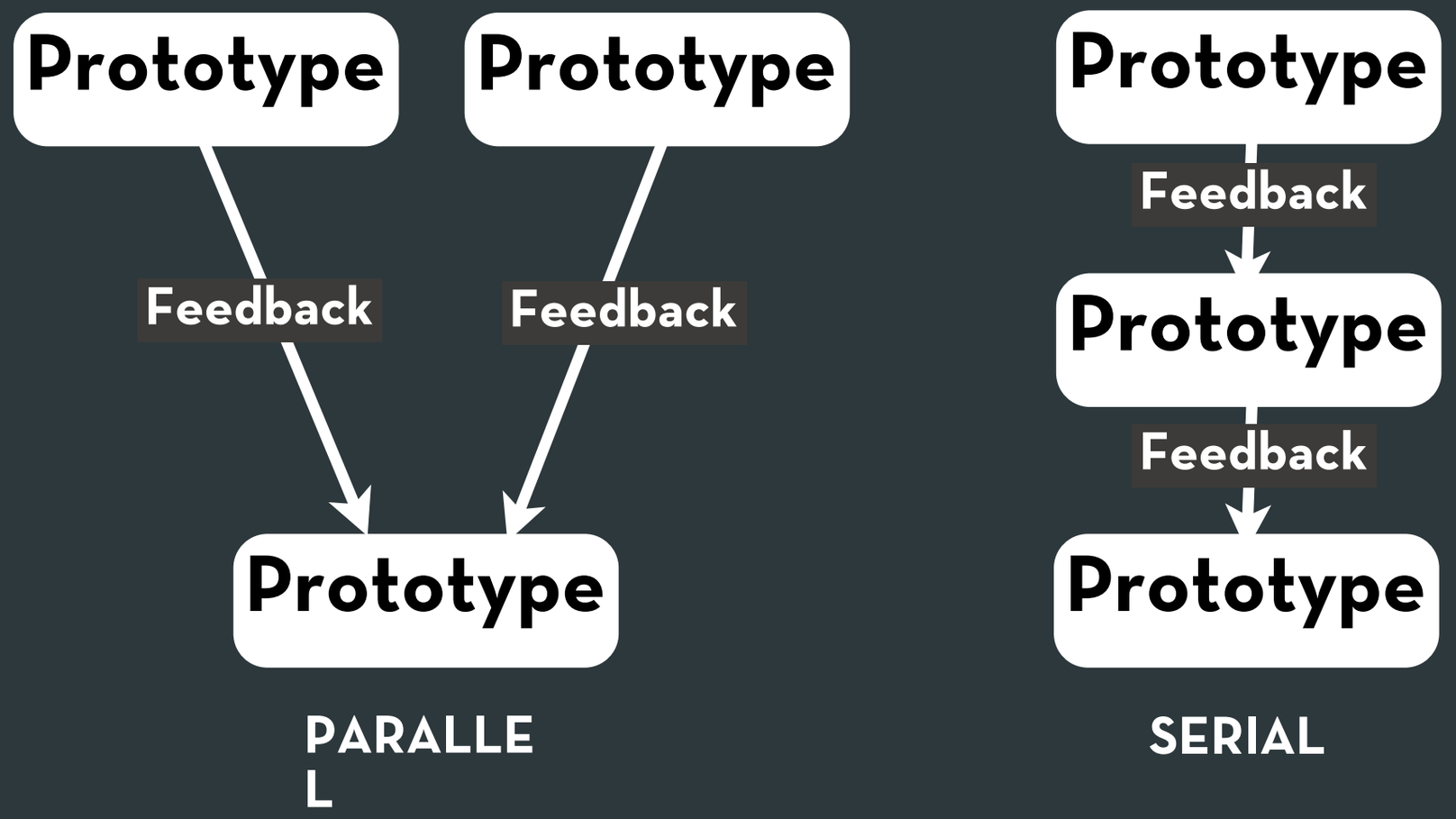
Functional fixation

Duncker, 1945

Functional fixation

Duncker, 1945

How does parallel prototyping – as opposed to a serial approach – affect design performance?



Task: Create an Ad

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issue 11

Spring 2009: Space

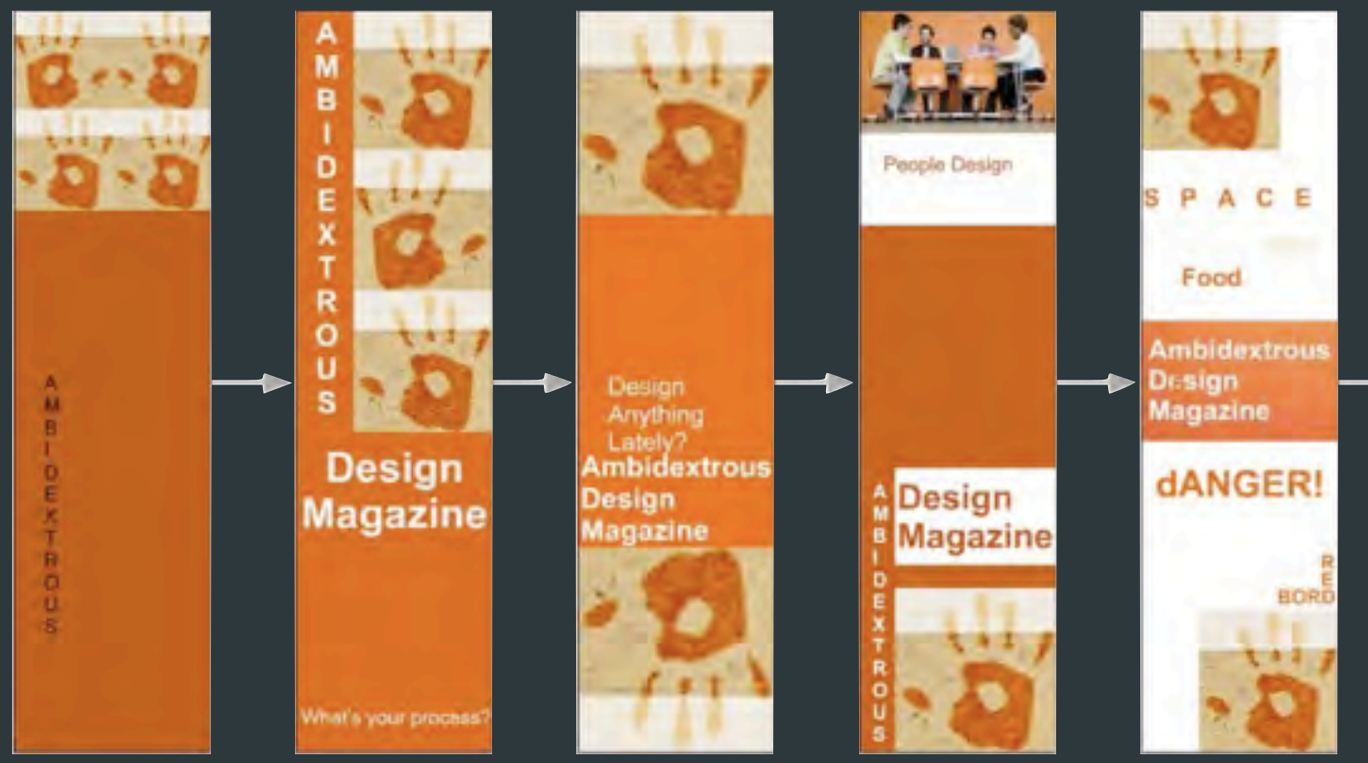
As children some of you may have dreamed of becoming astronauts, or at least vied for a spot in Space Camp. Maybe you were inspired by the worlds of Flash Gordon or those created by Frank Lloyd Wright. In this issue of *Ambidextrous*, we tackle space and beyond in all of its frontiers.

An Ode to White Space
Ellen Lupton

Method (n=33)

FINAL

serial



paralle

Expert critique

OVERALL THEME

Ambidextrous wants an ad that reaches out to design practitioners, students, and researchers.

COMPOSITION AND LAYOUT

Try to create visual flow for the viewer; what should the viewer see?

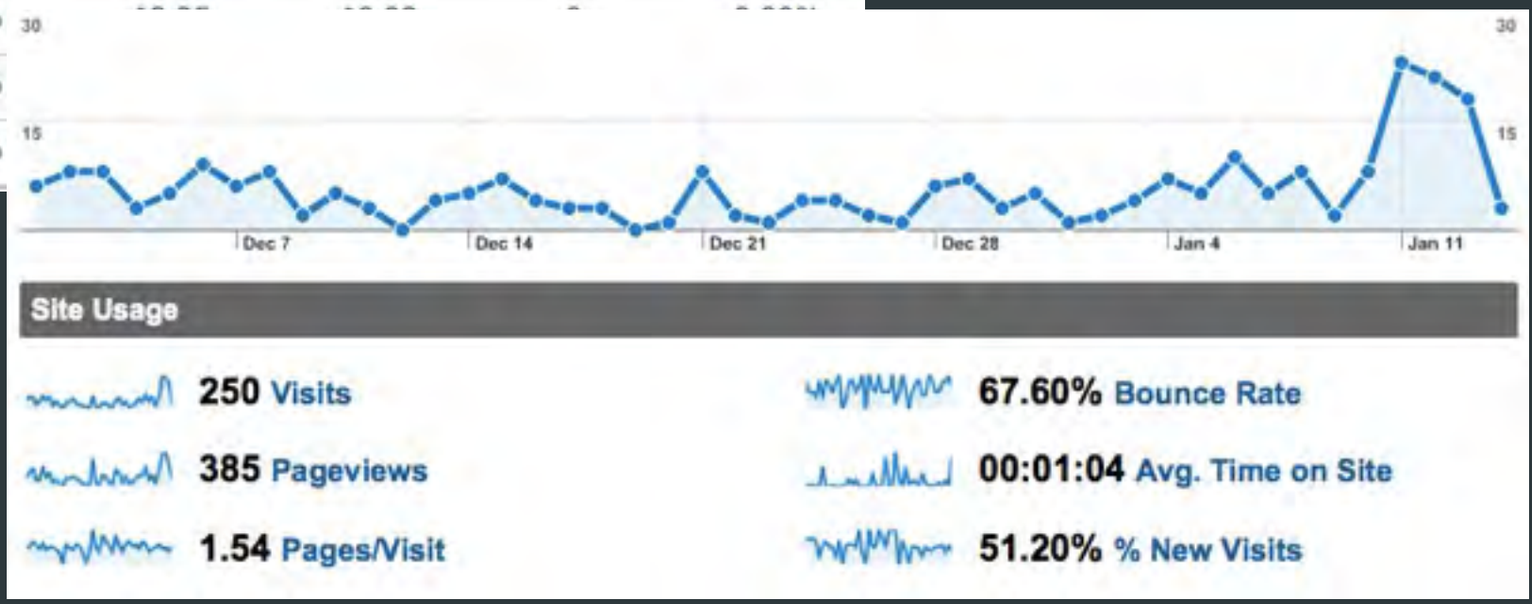
SURFACE FEATURES

Use color to create emphasis, to separate different elements, or to categorize content.

Measures

- **Click-through rate** (clicks per impression)
- **Time on client site** (seconds)
- **Expert ratings** (clients and ad professionals)

Date/Time	Impressions	Clicks	CTR	Avg CPC	Avg CPM	Conv.	Conv. Rate
01/08/2010	7023	3	0.04%	$0.25	$0.11	0	0.00%
01/09/2010	54254	20	0.04%	$0.25	$0.09	0	0.00%
01/10/2010	56309	16	0.03%	$0.25	$0.07	0	0.00%
01/11/2010	29735	12	0.04%	$0.25	$0.10	0	0.00%
01/12/2010	13908	5	0.04%				
01/13/2010	9741	3	0.03%				
01/14/2010	974	0	0.00%				



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JOURNAL OF DESIGN

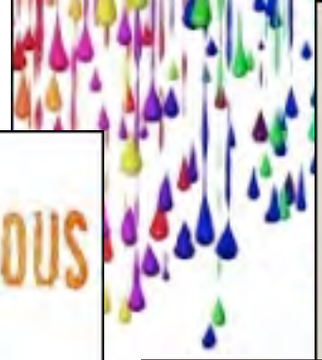
CULTURAL FOODS

FOOD FOR THOUGHT AND COMICS

DESIGN PROCESS FOR ANYTHING

RESEARCH LABS

WRITER'S CRITICISM ON TODAY'S TECHNOLOGY



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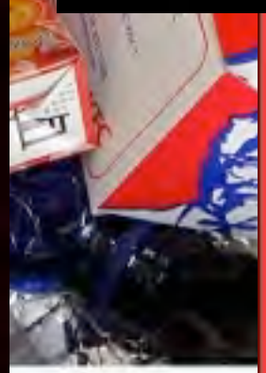
A journal about DESIGNING THE FUTURE

both hands at a time

ambi dext rous

magazine

a forum for design researchers, professionals, and thinkers



Who can I

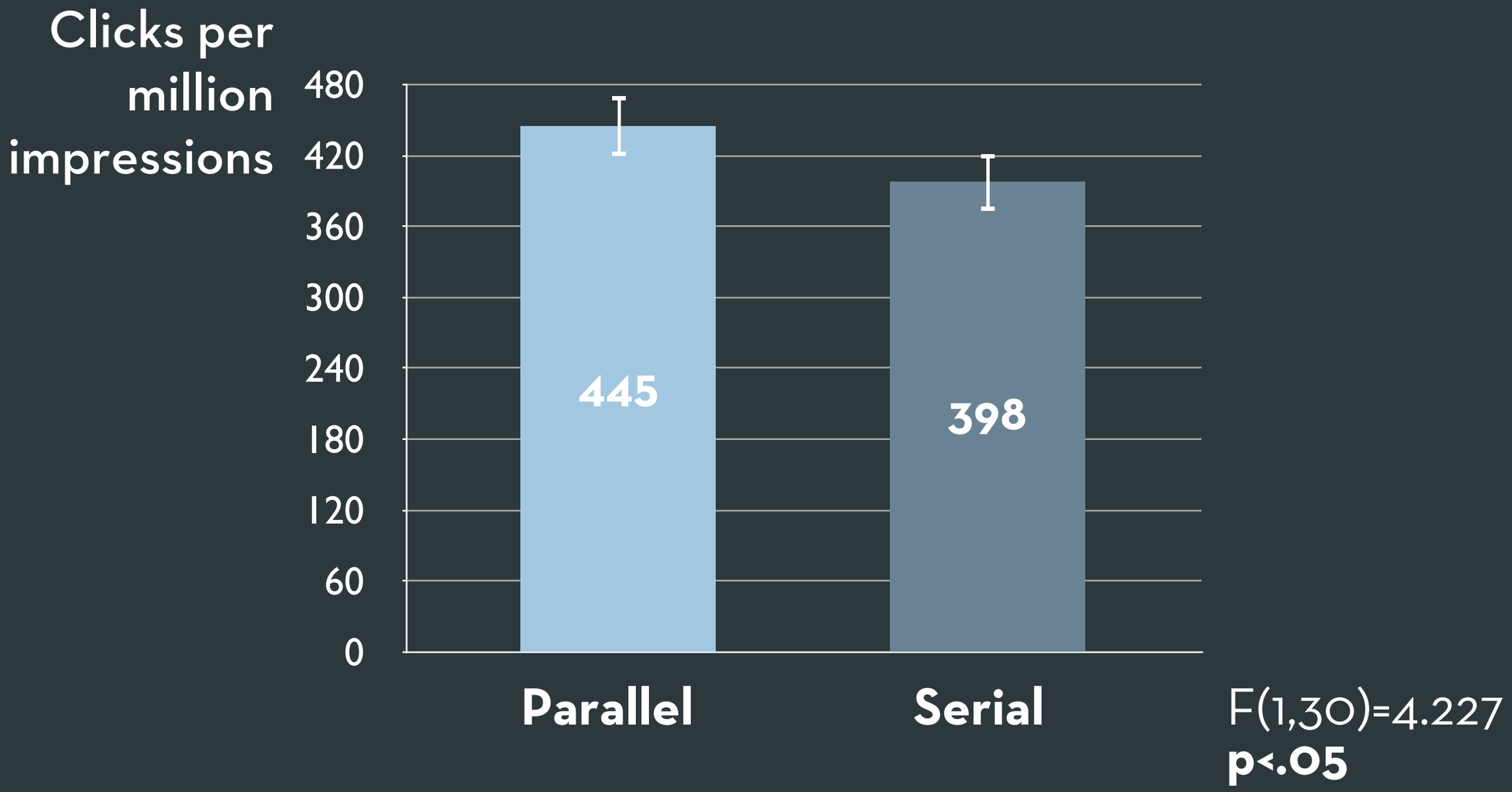
at could I d

Perspectives fo the next decad

Where are we go

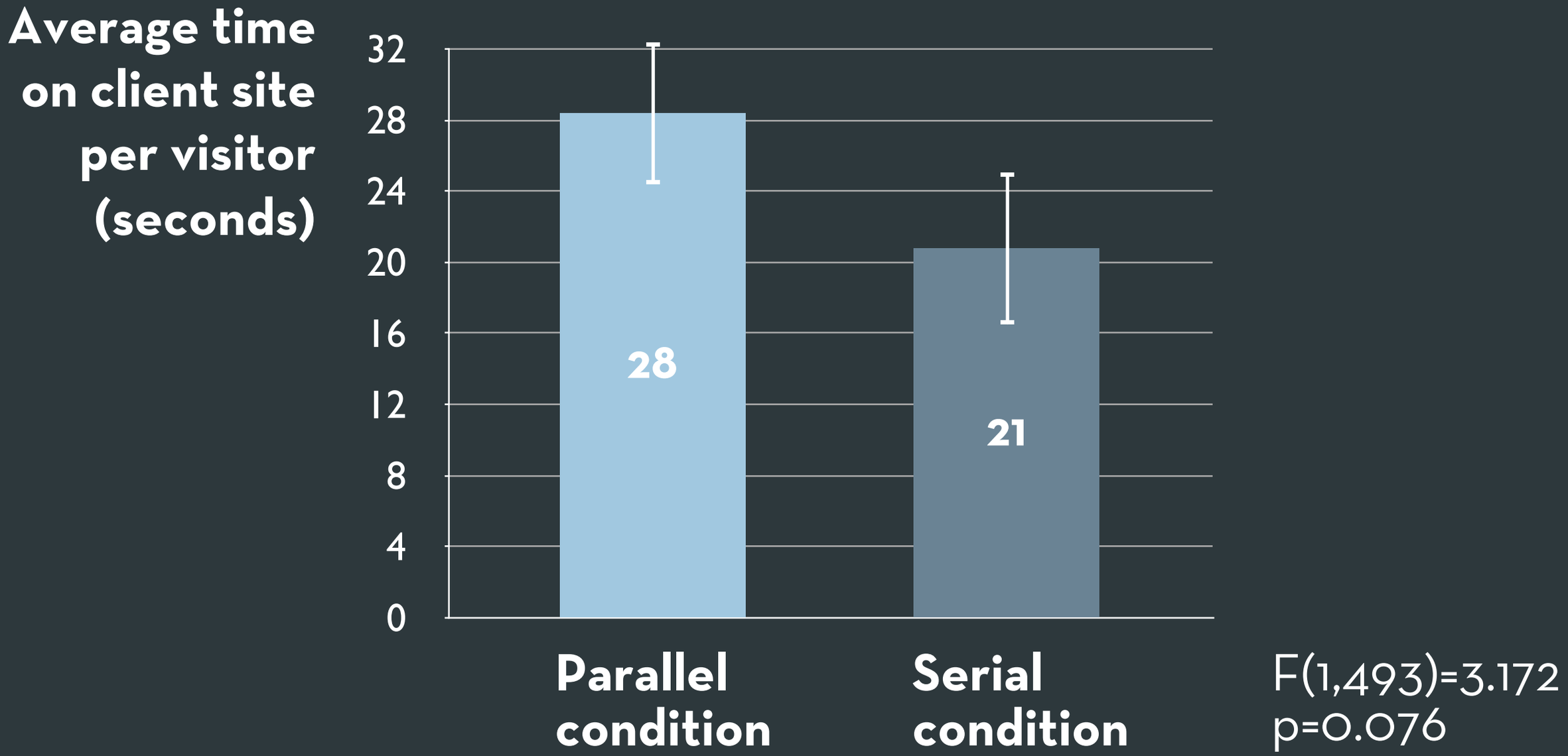
AMBIDEXTROU

Users clicked Parallel ads at a higher rate than serial ads



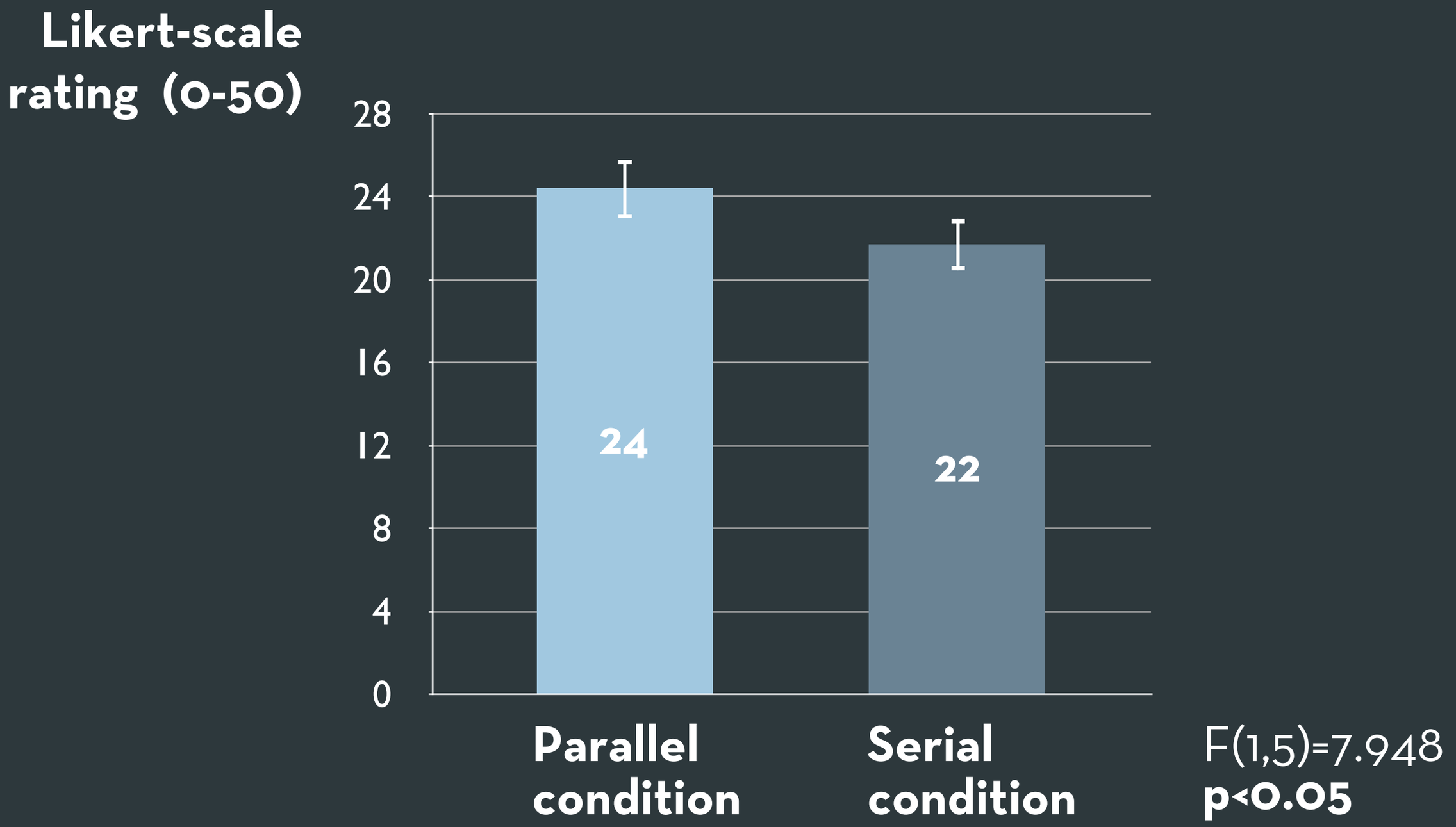
F(1,30)=4.227
p<.05

Visitors from parallel ads spent more time on the client site



F(1,493)=3.172
p=0.076

Experts rated Parallel ads higher than Serial ads



F(1,5)=7.948
p<0.05

Why Did Parallel Outperform Serial?

Comparison aids learning

training session

SEPARATE CASES

CASE#1

"Describe the solution."

CASE#2

"Describe the solution."

COMPARISON CASES

CASE#1

CASE#2

"Describe the **parallels** of these solutions"

~ 3x

learning outcome

Solutions to a landlord-renter lease

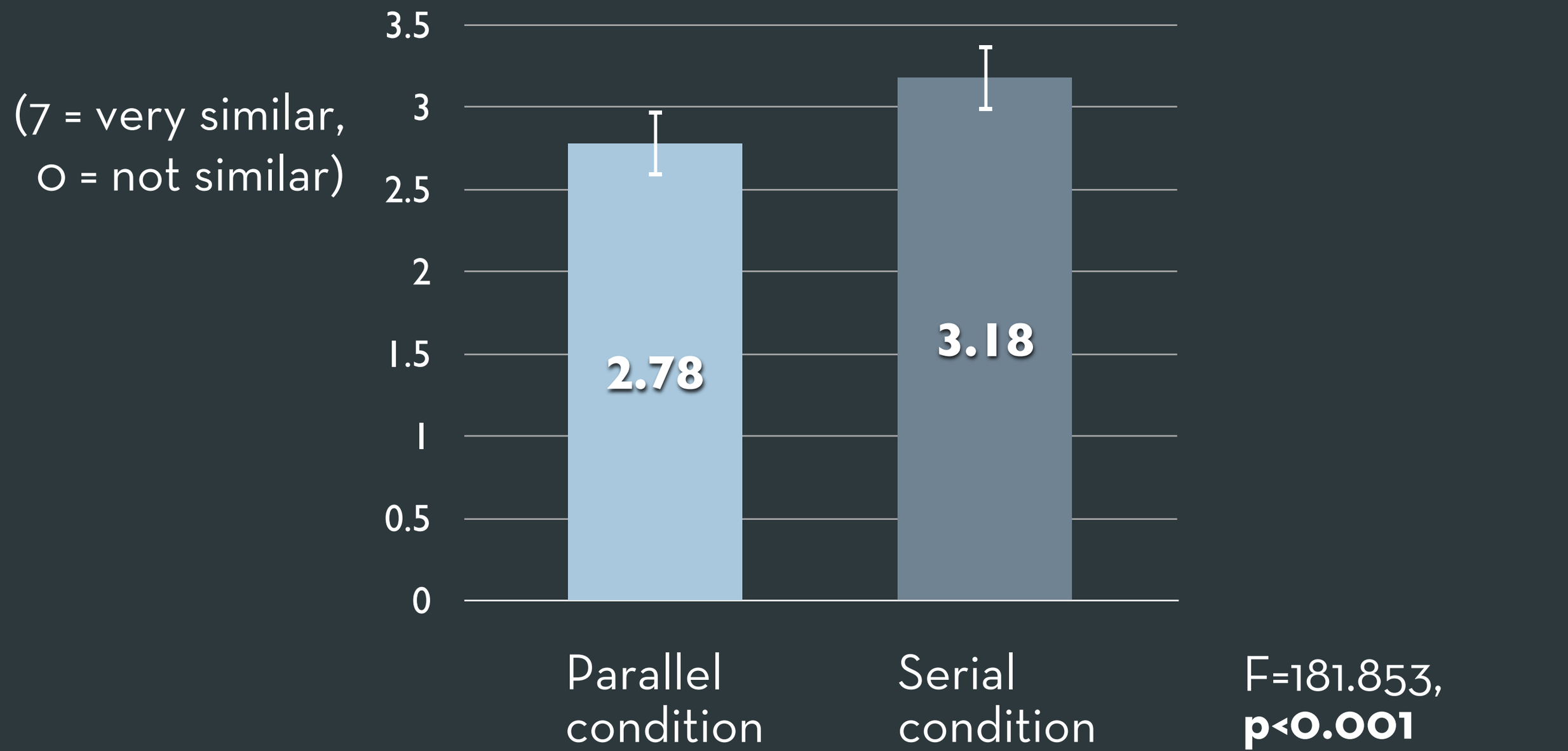
Gentner, Loewenstein, & Thomson, 2003

Fixation in serial

I tried to find a good idea, and then use that idea and keep improving it and getting feedback. So I pretty much stuck with the same idea.

-Serial participant

Parallel ads more diverse



Prototyping tips

1. Make it concrete
2. Make small investments
3. Get desired feedback
4. Iterate, iterate, iterate
5. Share multiple
6. Get the design right

Steven Dow, Stanford HCI Group, Oct 2010