CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 08:
Human Performance

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

Today

Some example models of human performance

Visual System	Biological Model
Model Human Processor	Higher-Level Model
Fitts's Law	Model by Analogy
Gestalt Principles	Predict Interpretation

“Beating” Fitts’s law

It is the law, right?

$$MT = a + b \log_2(A / W + 1)$$

So how can we reduce movement time?

- Reduce A
- Increase W

Fitts's Law Related Techniques

Put targets closer together

Make targets bigger

Make cursor bigger

- Area cursors
- Bubble cursor

Use impenetrable edges

Fitts's Law Related Techniques

Gravity Fields

- Pointer gets close, gets "sucked in" to target

Sticky Icons

- When within target, pointer "sticks"

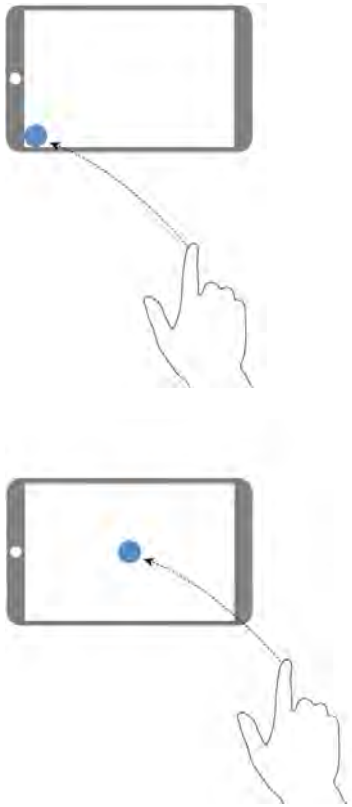
Constrained Motion

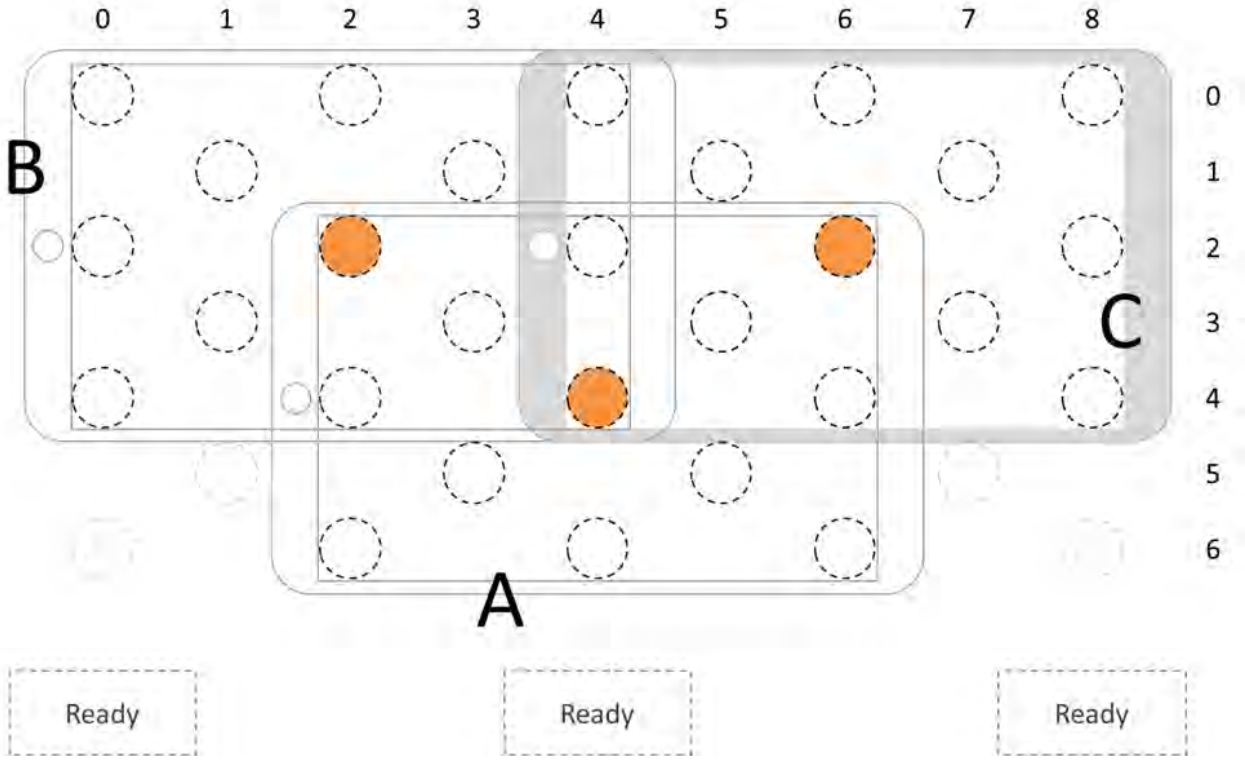
- Snapping,
  holding Shift to limit degrees of movement

Target Prediction

- Determine likely target,
  move it nearer or expand it

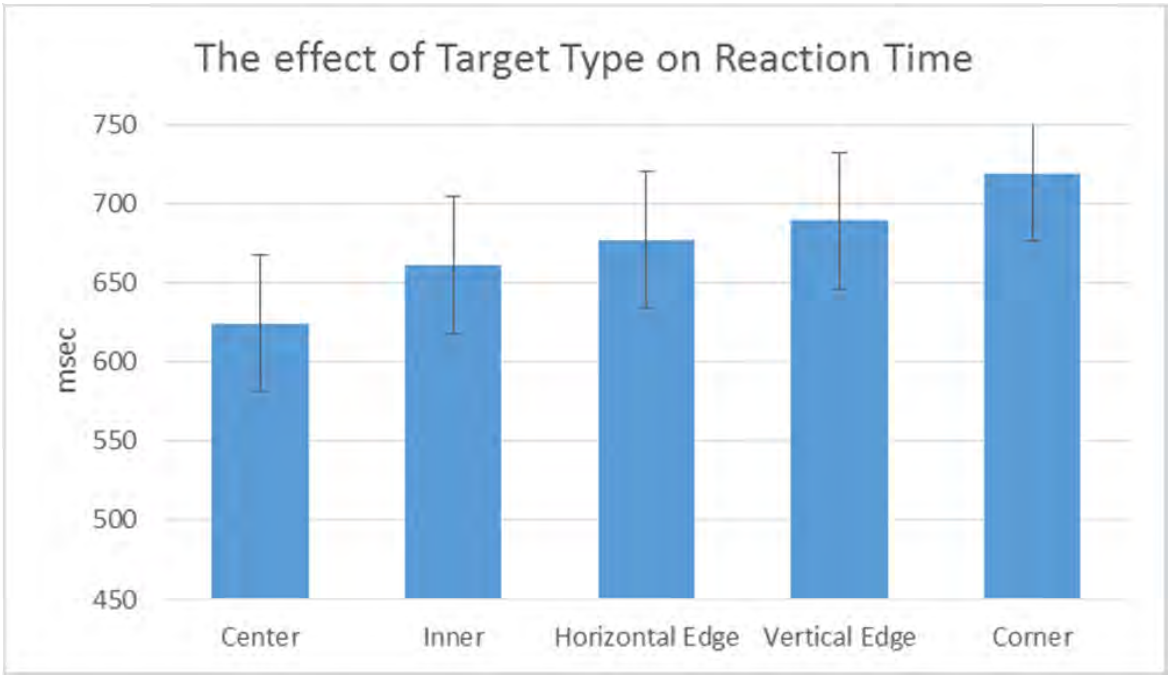
Fitts's Law, Edge Targets, and Touch





Fitts's Law, Edge Targets, and Touch

Avrahami finds edge targets are actually slower with touch devices, at same physical location



Are people border cautious?

Today

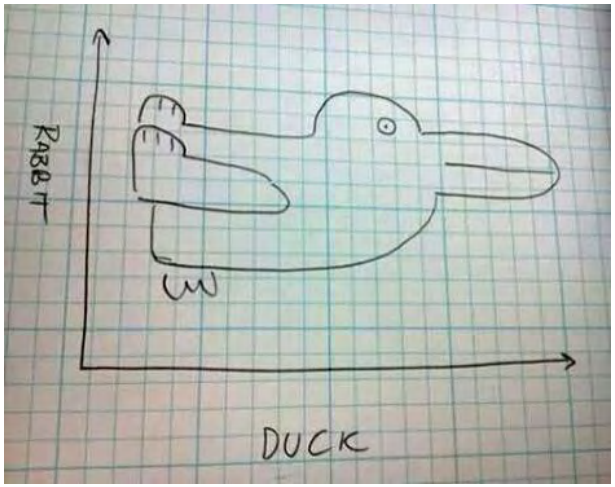
Some example models of human performance

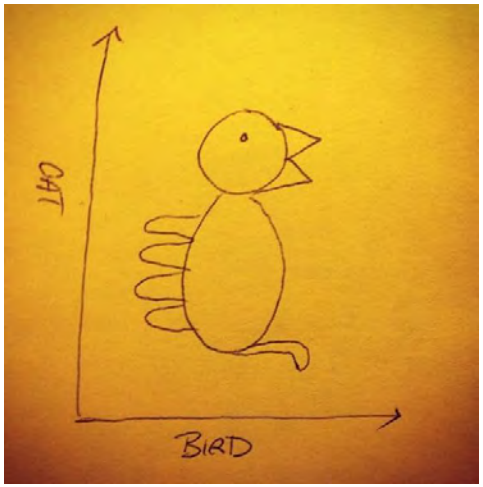
Visual System	Biological Model
Model Human Processor	Higher-Level Model
Fitts's Law	Model by Analogy
Gestalt Principles	Predict Interpretation

Gestalt Psychology

Described loosely in the context of this lecture and associated work, not a real definition

Perception is neither bottom-up nor top-down, rather both inform the other as a whole





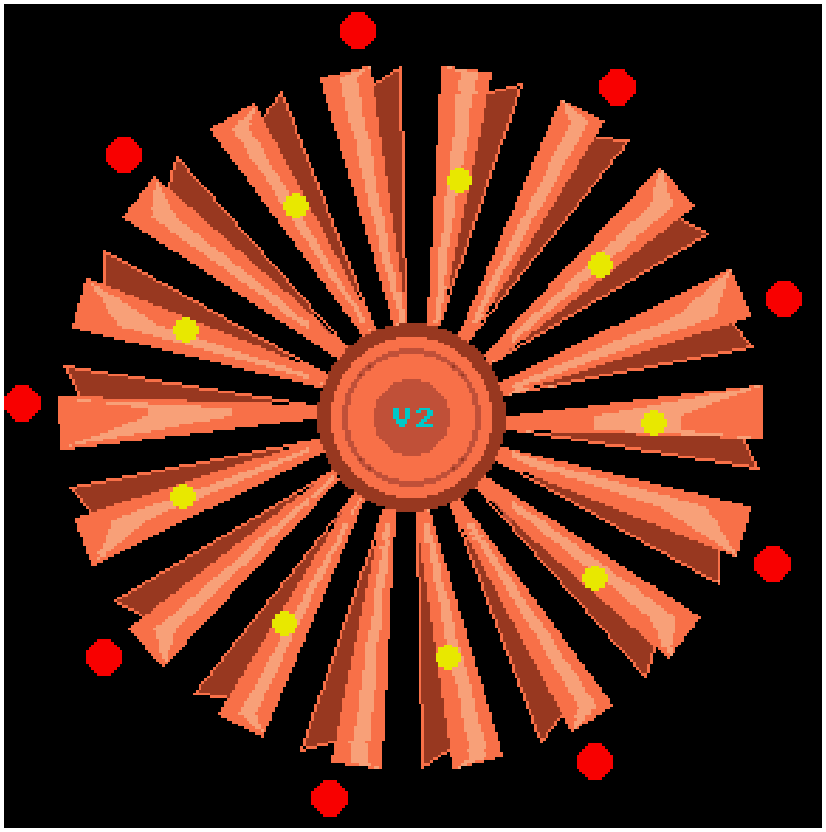
Gestalt Psychology

You can still see the dog…

Gestalt Psychology

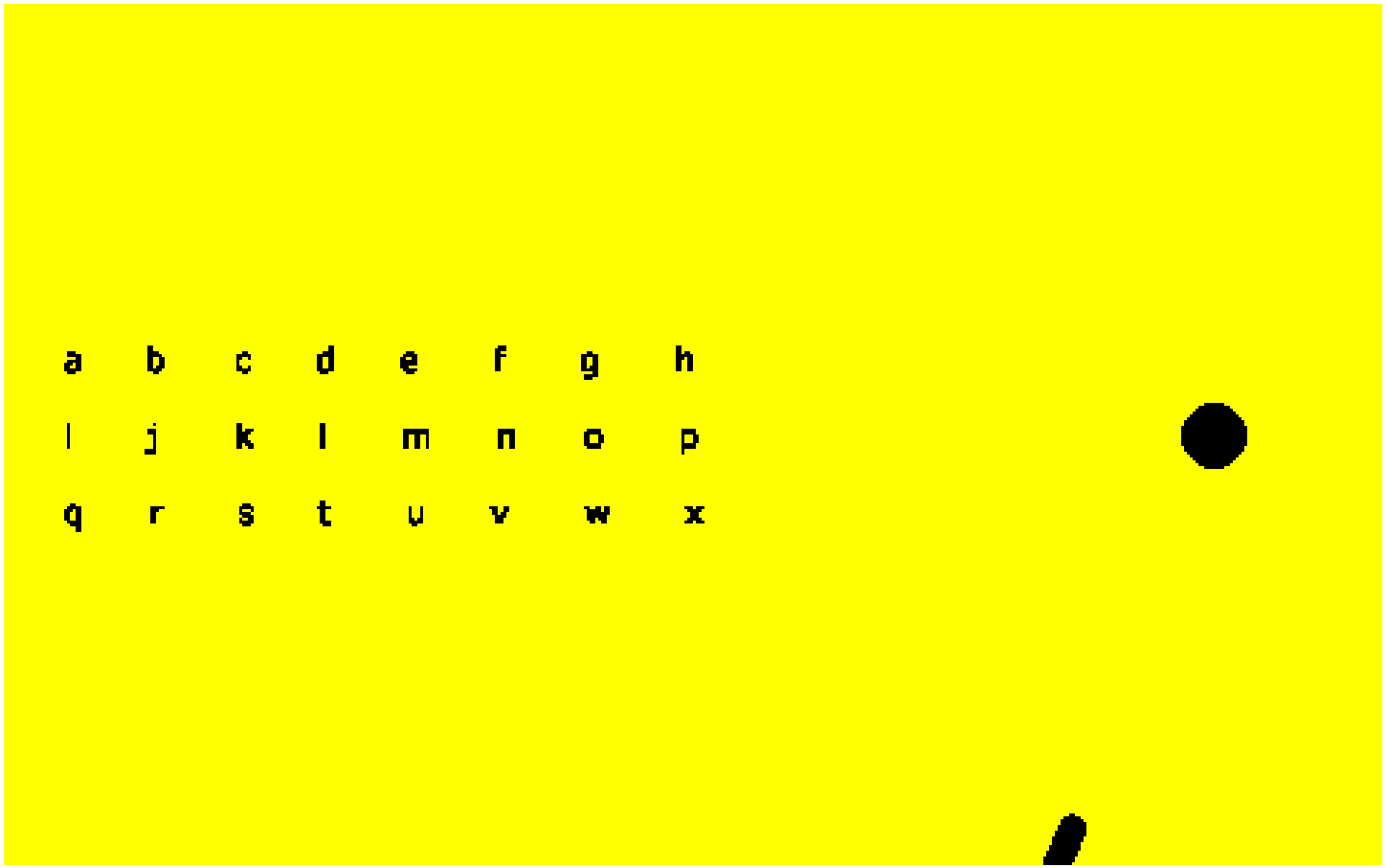
You can still see the dog…

Spinning Wheel



Follow the red dots vs follow the yellow dots

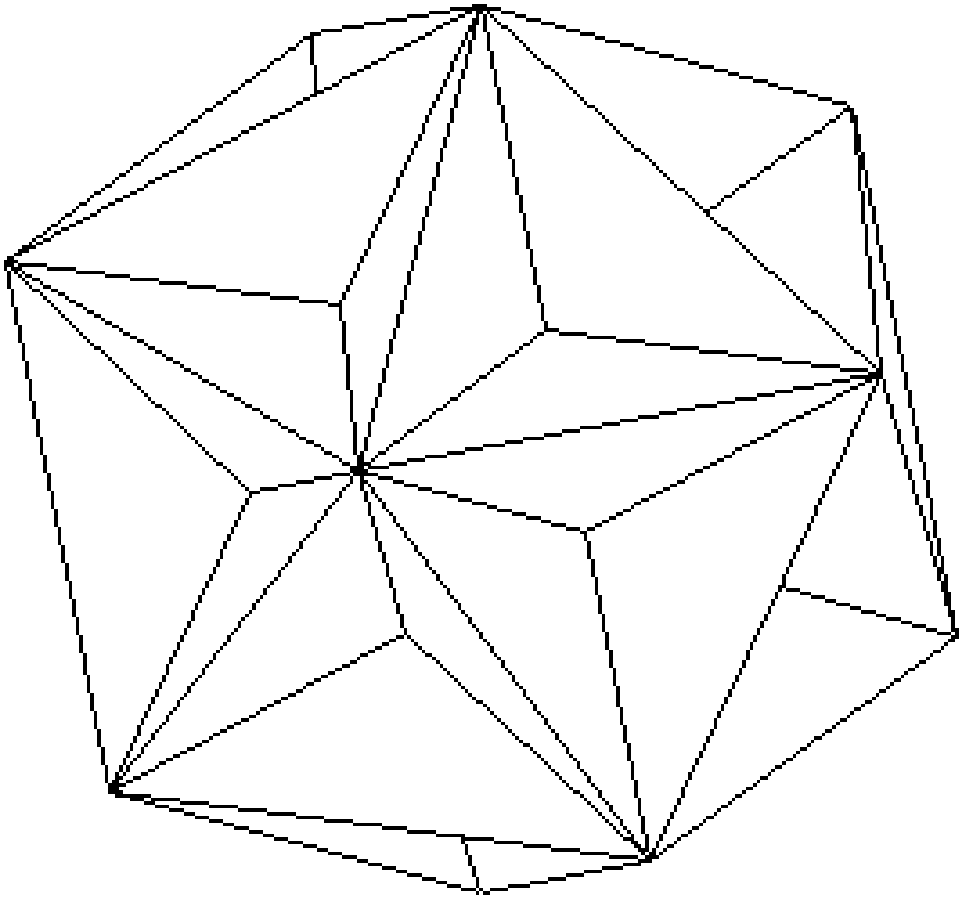
Blind Spot Interpolation



Use right eye, look at letters

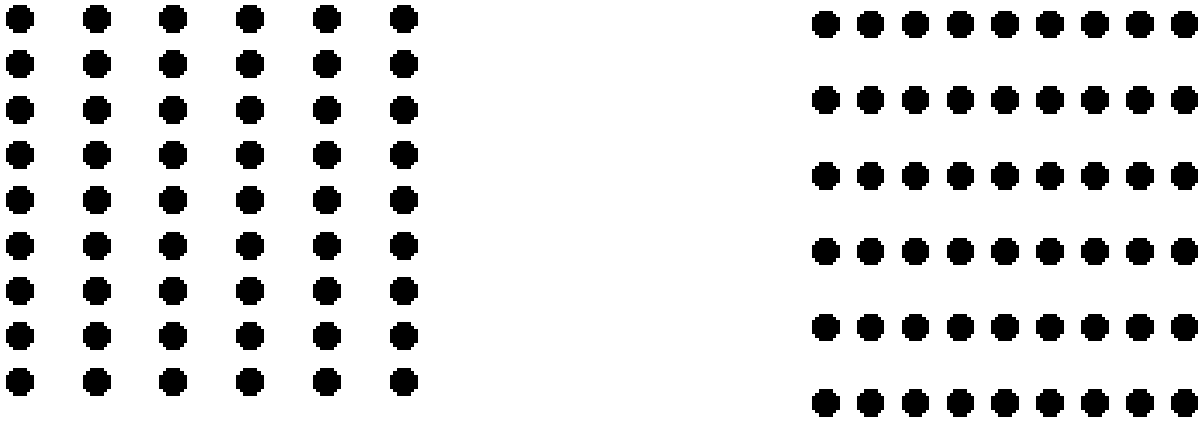
Painful Image Warning

Difficult to Reconcile

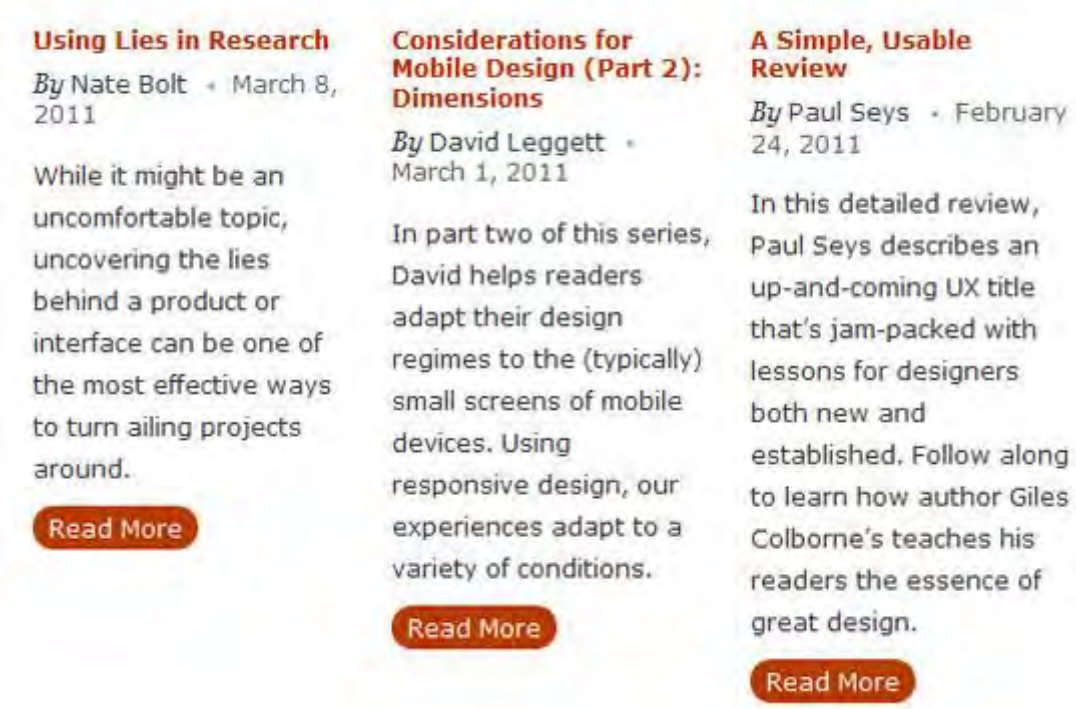


Proximity

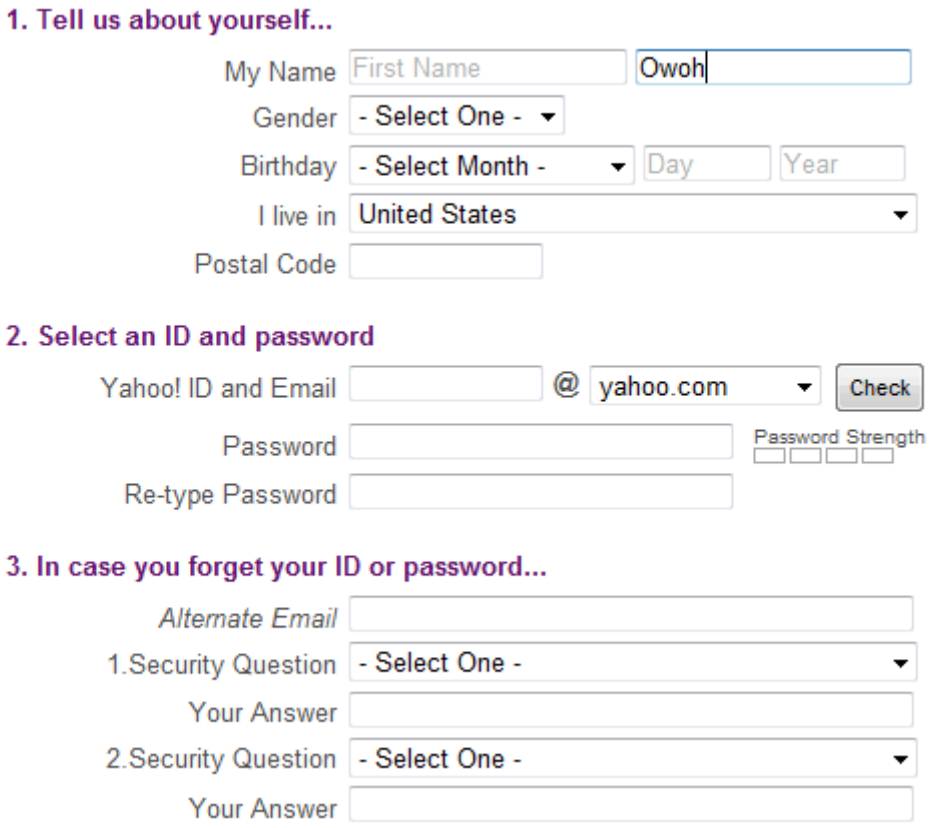
Objects close to each other form a group



Proximity

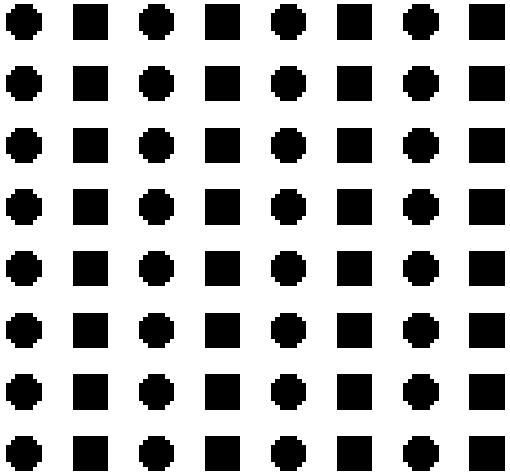

Using Lies in Research
By Nate Bolt • March 8, 2011
While it might be an uncomfortable topic, uncovering the lies behind a product or interface can be one of the most effective ways to turn ailing projects around.
Read More
Considerations for Mobile Design (Part 2): Dimensions
By David Leggett • March 1, 2011
In part two of this series, David helps readers adapt their design regimes to the (typically) small screens of mobile devices. Using responsive design, our experiences adapt to a variety of conditions.
Read More
A Simple, Usable Review
By Paul Seys • February 24, 2011
In this detailed review, Paul Seys describes an up-and-coming UX title that's jam-packed with lessons for designers both new and established. Follow along to learn how author Giles Colborne's teaches his readers the essence of great design.
Read More

Proximity

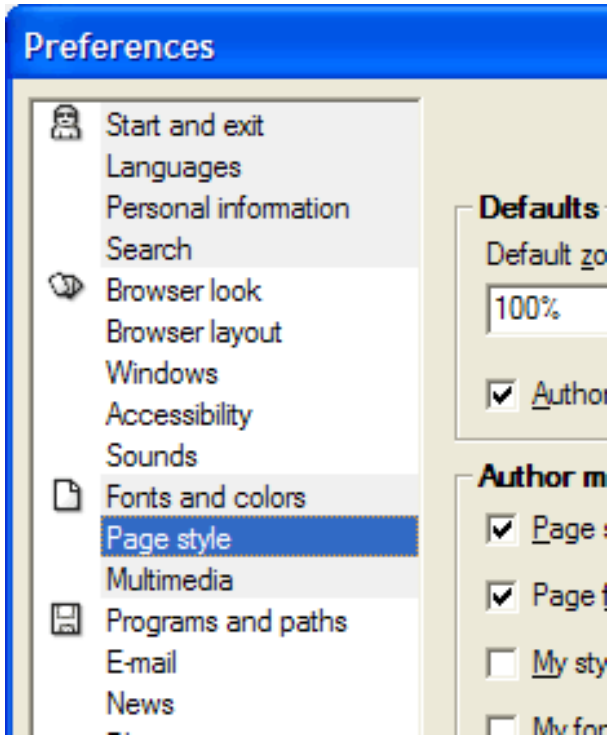

1. Tell us about yourself...
My Name
First Name
Owoh
Gender
- Select One -
Birthday
- Select Month -
Day
Year
I live in
United States
Postal Code
2. Select an ID and password
Yahoo! ID and Email
@
yahoo.com
Check
Password
Password Strength
Re-type Password
3. In case you forget your ID or password...
Alternate Email
1.Security Question
- Select One -
Your Answer
2.Security Question
- Select One -
Your Answer

Similarity

Objects that are similar form a group



Similarity


Preferences
Start and exit
Languages
Personal information
Search
Browser look
Browser layout
Windows
Accessibility
Sounds
Fonts and colors
Page style
Multimedia
Programs and paths
E-mail
News
Defaults
Default zo
100%
Author
Author m
Page
Page
My sty

Proximity and Similarity

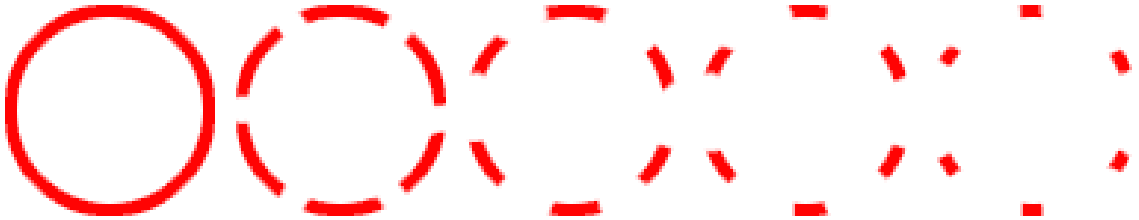
Proximity and Similarity

After discovering that one of these accesses a menu, people will expect they all access a menu. They are the same.

Closure

Even incomplete objects are perceived as whole

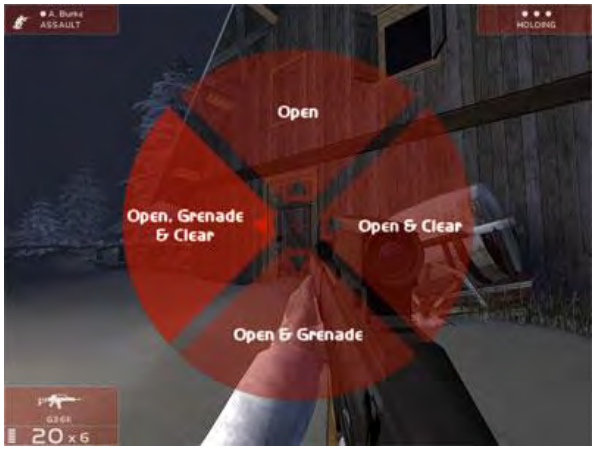
- Increases regularity of stimuli



Closure

The Sims

IBM



Rainbow 6

Symmetry

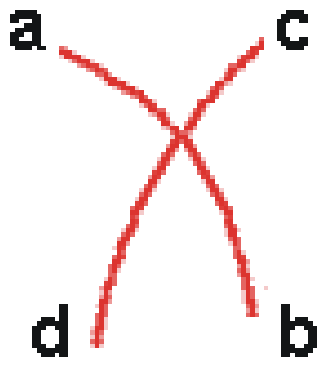
Objects are perceived as symmetrical and forming around a center point

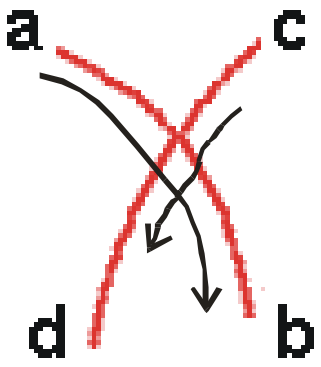
If you fight symmetry, be sure you have a reason

Continuity

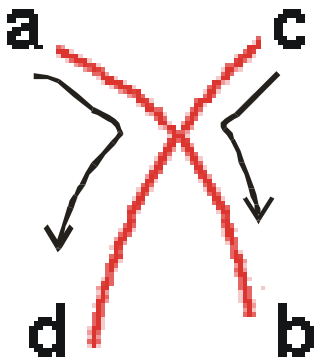
Objects perceived as grouped when they align

- Remain distinct even with overlap
- Preferred over abrupt directional changes





what most people see



not this

Continuity


Met Concept7 realiseert Anderzorg toppositie in klanttevredenheid

Models from Different Perspectives

Some example models of human performance

Visual System	Biological Model
Model Human Processor	Higher-Level Model
Fitts's Law	Model by Analogy
Gestalt Principles	Predict Interpretation

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 08:
Human Performance

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

Project Status

Looking Forward

- 2g: Design Review (1x2) Due Thursday
- 2h: Getting the Right Design Report Due Monday
- 2i: Presentations next Thursday / Friday
- 3a: Paper Prototype due Monday 2/13
  (bring to class on Tuesday 2/14)

Other Assignments

- Reading 3 Posted, Due Friday

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 09:
Paper Prototyping
and Testing

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50

Is My Design Good?

This is not a meaningful question

- It can and will be answered with “Yes”

At least consider asking:

- “What are three good things about this design?”
- “What are three bad things about this design?”

But really the answer is “it depends”

- Remember that designs are used for tasks
- We should ask this in the context of tasks

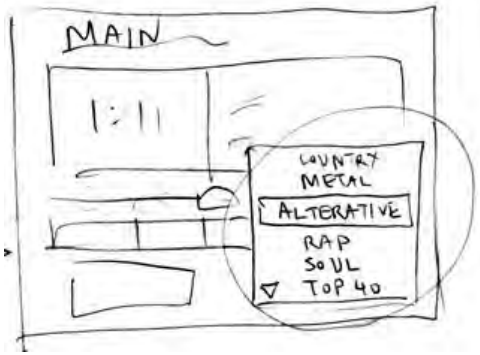
Fidelity in Prototyping

High Fidelity

Prototypes look like the final product

Low Fidelity

Designer sketches with many details missing



We have discussed the value of staying lightweight in sketching, but this also applies to prototyping

High-Fidelity Prototypes Warp

Time and creativity

- Require precision (e.g., must choose a font)
- Specifying details takes time
- Can lose track of the big picture

Perceptions of a person reviewing or testing

- Representation communicates “finished”
- Comments often focus on color, fonts, alignment

Low-Fidelity Prototypes

Traditional methods take too long

- Sketches → Prototype → Evaluate → Iterate

Instead simulate the prototype

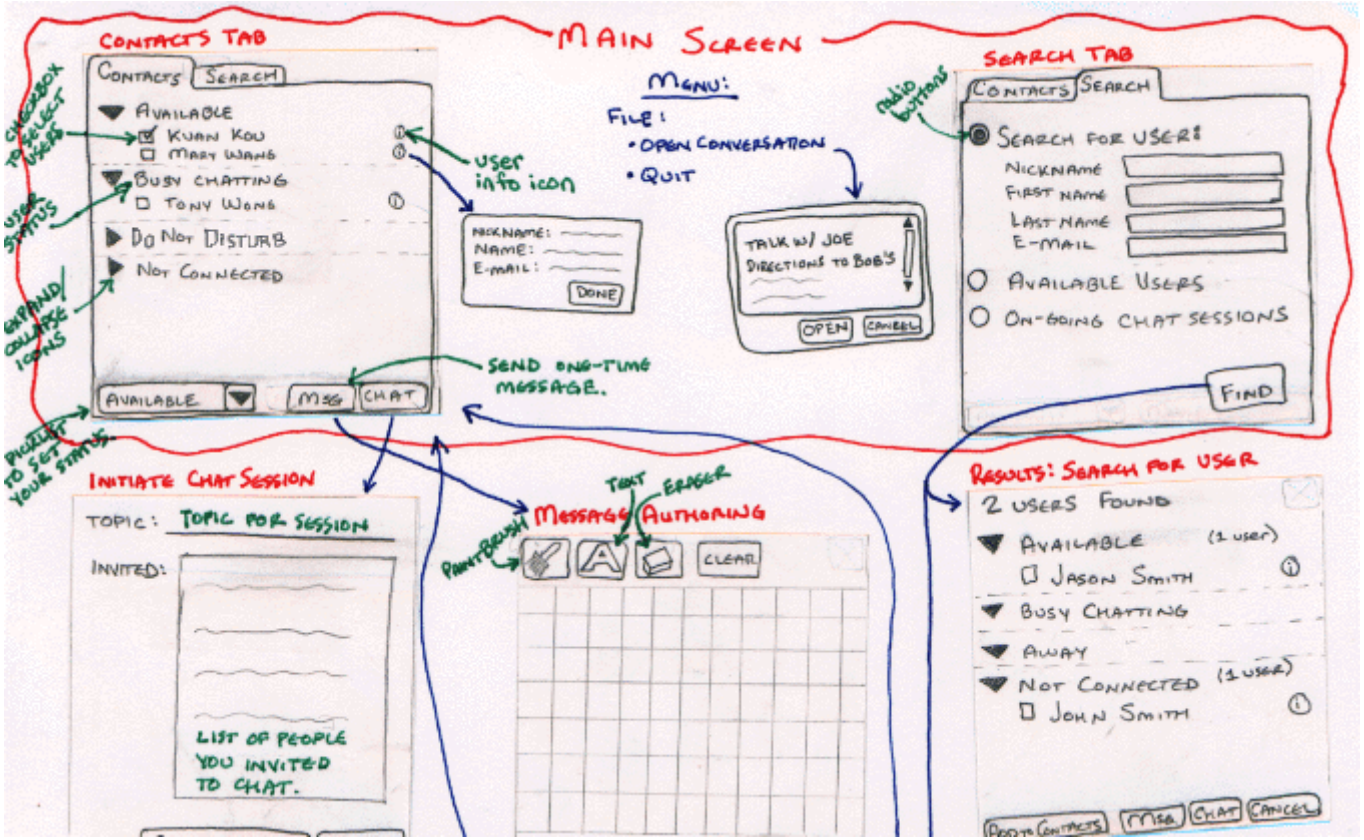
- Sketches → Evaluate → Iterate

Sketches act as prototypes

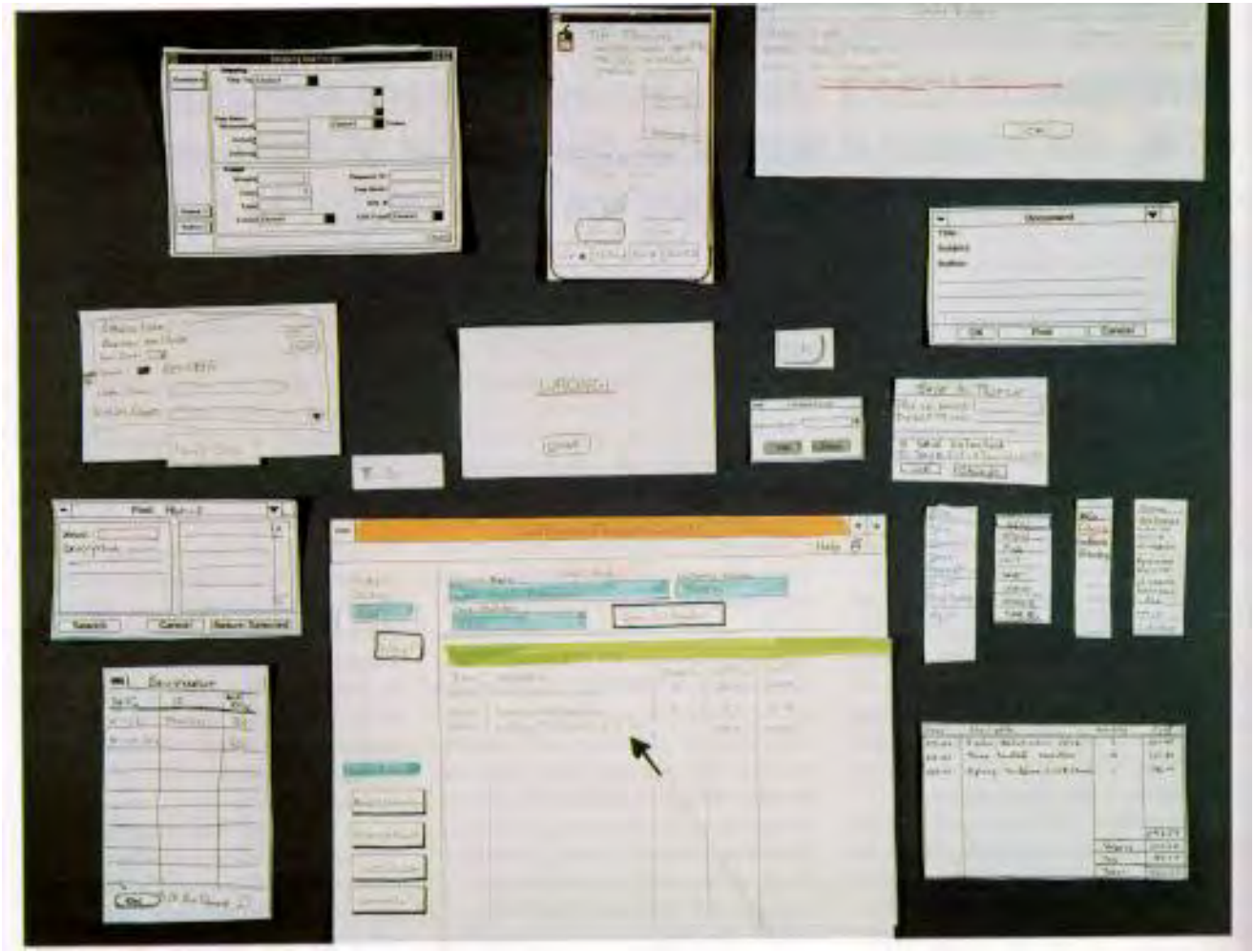
- A designer “plays computer”
- Other design team members observe & record

Kindergarten implementation skills reduce barriers to participation in design and testing

Sketches


CONTACTS TAB
MAIN SCREEN
SEARCH TAB
CONTACTS
SEARCH
AVAILABLE
KUAN KOU
MARY WANG
BUSY CHATTING
TONY WONG
DO NOT DISTURB
NOT CONNECTED
MENU:
FILE:
• OPEN CONVERSATION
• QUIT
USER INFO ICON
NICKNAME:
NAME:
E-MAIL:
DONE
TALK W/ JOE
DIRECTIONS TO BOB'S
OPEN
CANCEL
SEARCH FOR USER:
NICKNAME
FIRST NAME
LAST NAME
E-MAIL
AVAILABLE USERS
ON-GOING CHAT SESSIONS
FIND
AVAILABLE
MSG
CHAT
SEND ONE-TIME MESSAGE.
INITIATE CHAT SESSION
TOPIC: TOPIC FOR SESSION
INVITED:
LIST OF PEOPLE YOU INVITED TO CHAT.
MESSAGE AUTHORING
TEXT
ERASER
CLEAR
RESULTS: SEARCH FOR USER
2 USERS FOUND
AVAILABLE (1 USER)
JASON SMITH
BUSY CHATTING
AWAY
NOT CONNECTED (1 USER)
JOHN SMITH
ADD TO CONTACTS
MSG
CHAT
CANCEL

Paper Prototype



Basic Materials

Heavy, white paper

Index cards

Post-its

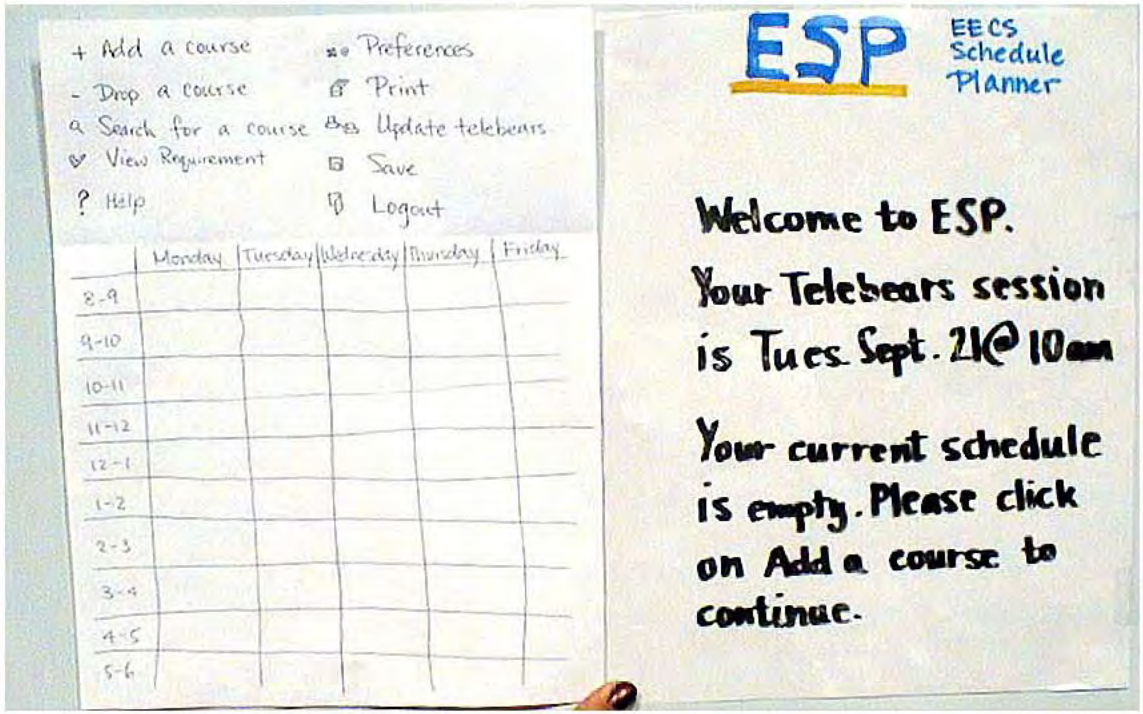
Tape, stick glue, correction tape

Pens and markers in many colors and sizes

Overhead transparencies

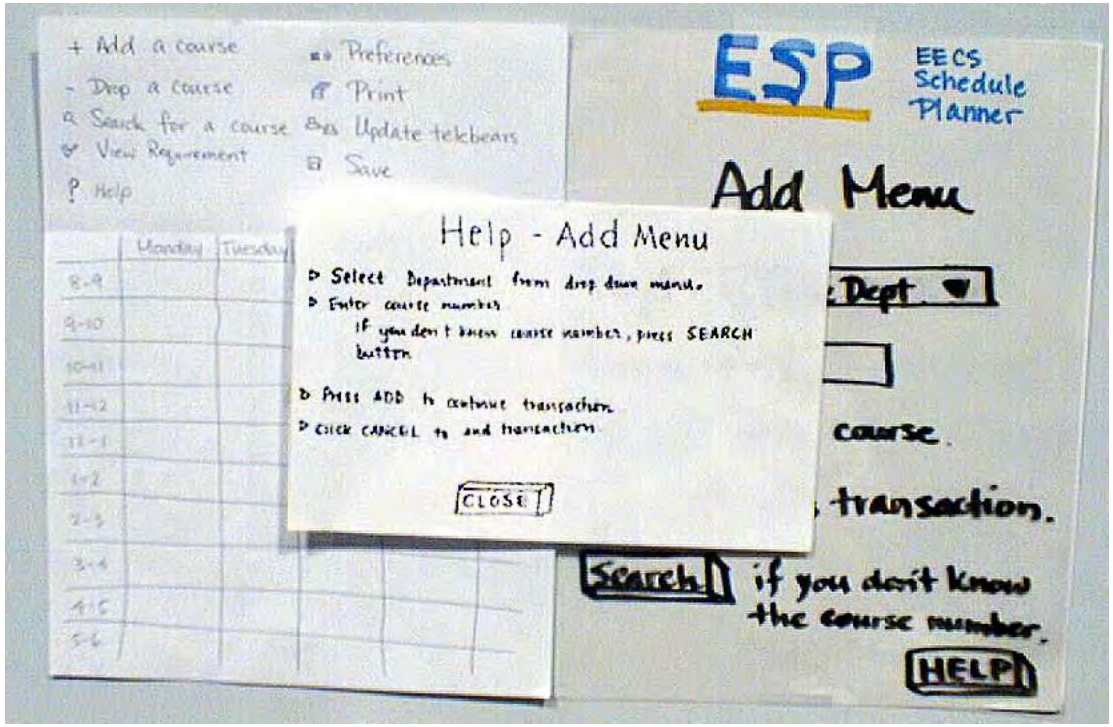
Scissors, X-Acto knife

Paper Prototype



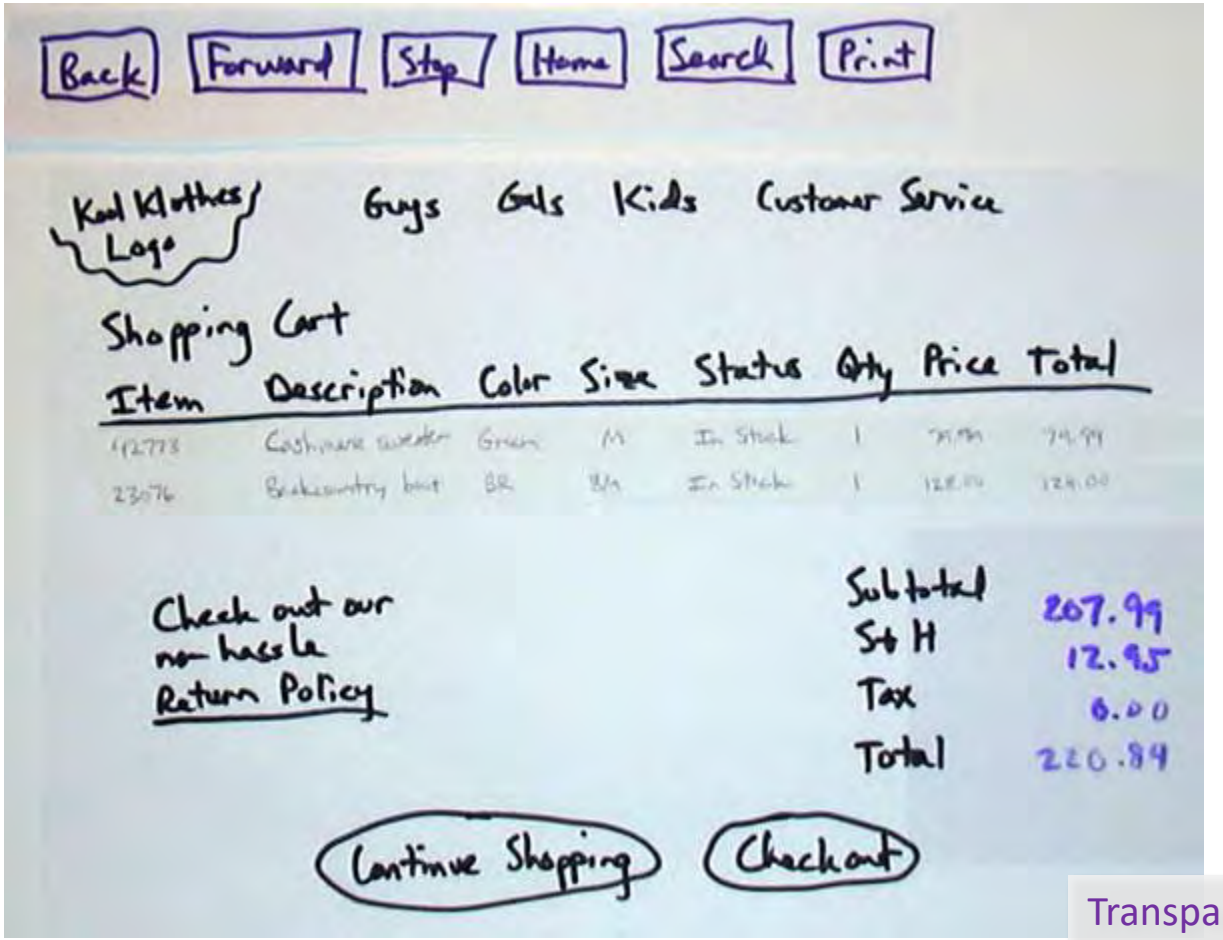
"Screen" faked with pre-constructed pieces

Paper Prototype



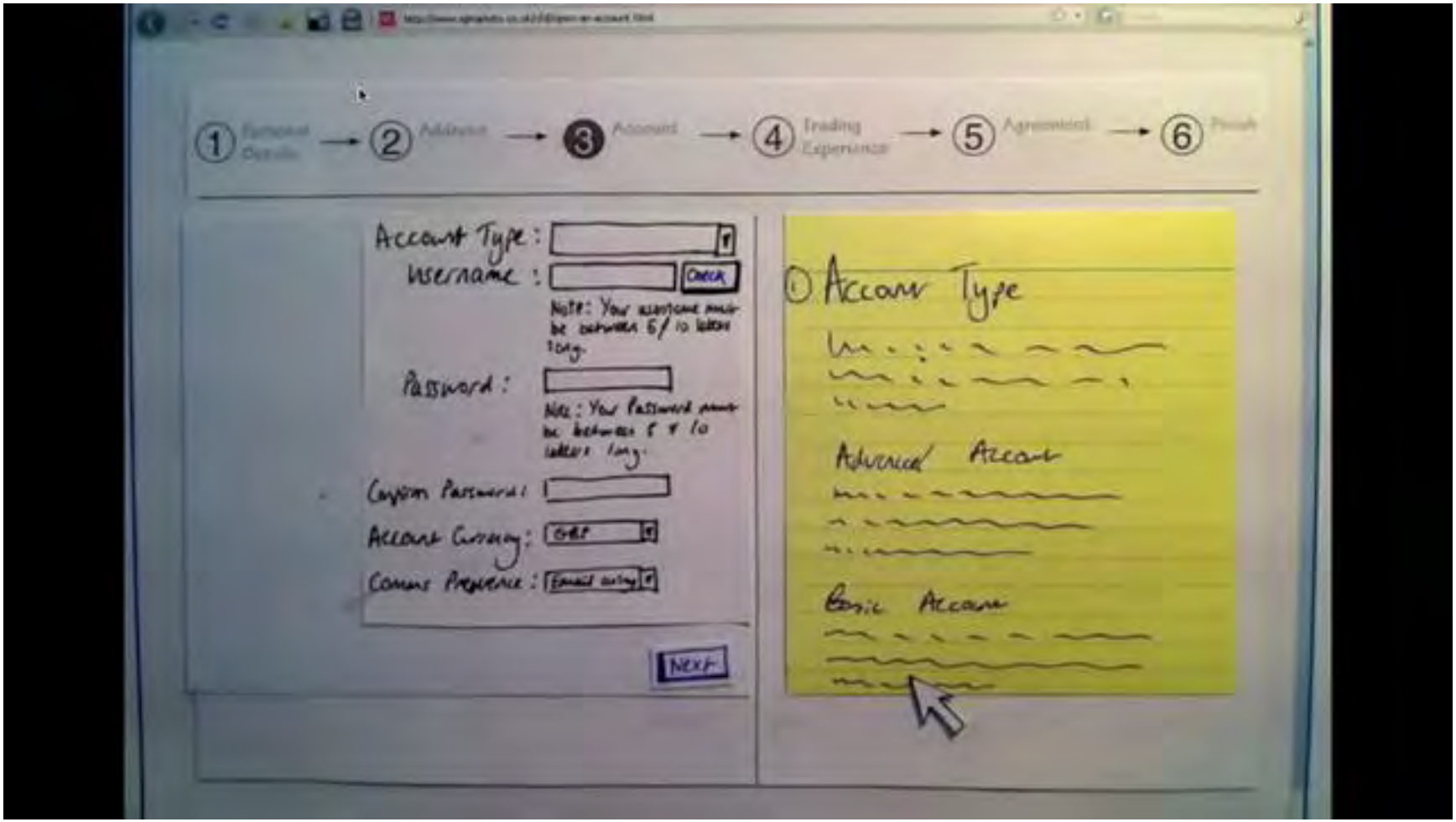
New pieces added in response to interaction

Paper Prototype



Transparencies allow flexible use of text

Paper Prototype as Communication

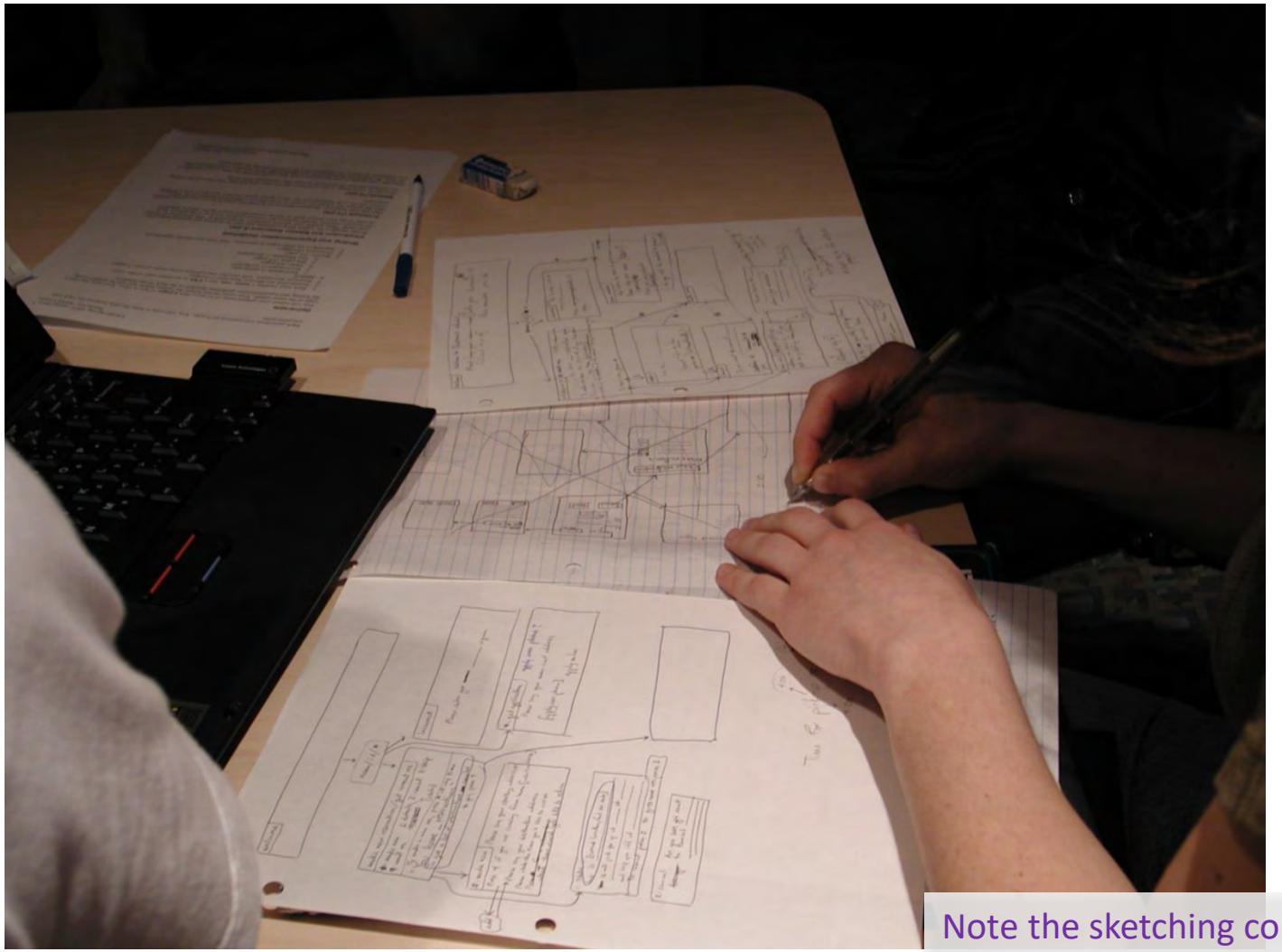


Paper Prototype as Evaluation

Constructing the Prototype

- Set a deadline
  - Do not think too long
  - Instead build it, then learn and iterate as you go
- Put different screen regions on cards
  - Anything that moves, changes, appears/disappears
- Ready responses for actions
  - Have those pull-down menus already made
  - Planned tasks can guide this
- Use photocopier to make many versions

Constructing the Prototype



Note the sketching continues

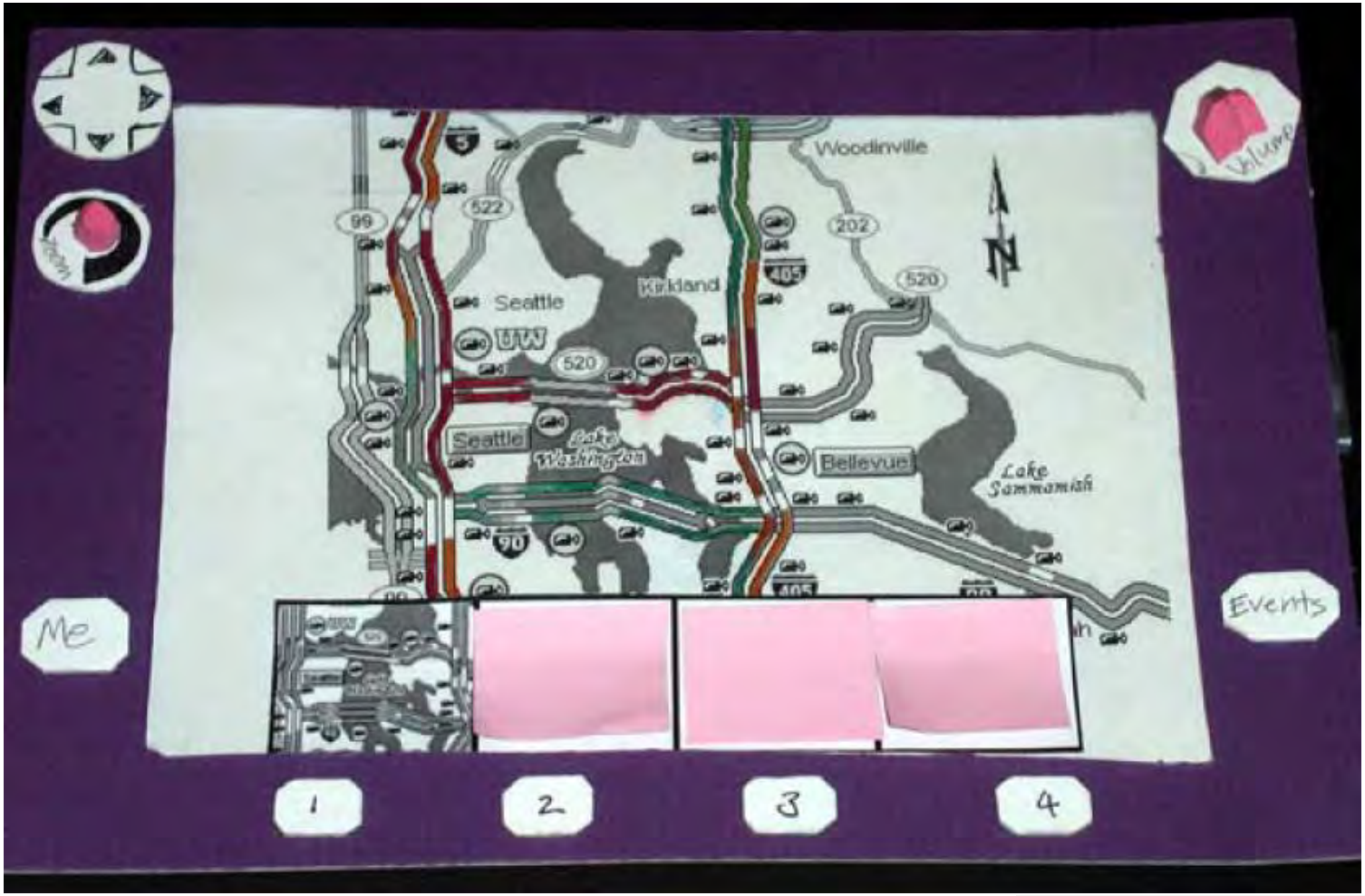
Constructing the Prototype

Planning what is needed given tasks

Constructing the Prototype

Prototyping physical form

Constructing the Prototype



Prototyping physical form

Constructing the Prototype

Remember your target platform constraints

Constructing the Prototype

Remember your target platform constraints

Why Usability Test?

Find and fix problems in a design

- Removes the expert blind spot
- Obtain data to unify team around changes
- Uncover unexpected behaviors

Results drive changes, sometimes innovations

In the long run, this is a win-win

- Both improves design and saves money

Deciding What Data to Collect

- Process data
  - Observations of what people do and think
  - Focused on improving this process
- Summary, statistical, or bottom-line data
  - Summary of what happened (time, errors, success)
  - Focused on measurement

Deciding What Data to Collect

- Process data
  - Observations of what people do and think
  - Focused on improving this process
- Summary, statistical, or bottom-line data
  - Summary of what happened (time, errors, success)
  - Focused on measurement
- Focus on process data
  - Gives overview of where the problems are
  - More useful than “too slow” or “too many errors”

Not a Scientific Experiment

- Focus is on improving the design
  - Experimental control is not as necessary
  - Data measurement is not as precise
  - Number of participants is fairly small
- Changes can be made
  - Fix the obviously broken design
  - Quickly explore alternatives
  - Modify the focus of testing between participants

Task-Based Usability

Set up an overall context

> “We are interested in improving people’s ability to save, update, and use contacts in their phones.”

Then prescribe tasks

1. Try to find the contacts list in the phone
2. View the contact information for John Smith
3. Change John Smith’s number to 555-555-5555

Tasks can be chained to naturally lead to next

Stages of a Usability Test

Preparation

Introducing the Test

Conducting the Test

Debriefing

Analyzing the Data

Creating the Report

Preparing for a Test

Select your participants

Friends and family are not your design targets

Understand background, consider recruiting questionnaire

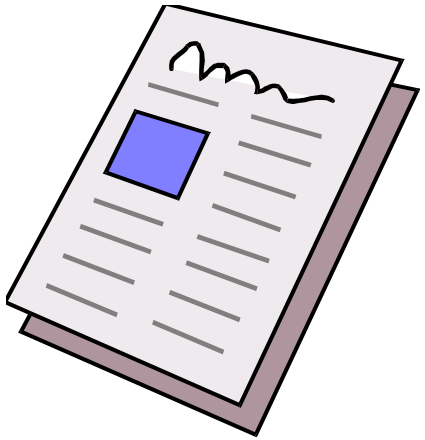
Prepare tasks and paper prototype

Practice to avoid “bugs” in your prototype

Usability Test Proposal

A report that contains

Objective, Description of System, Environment and Materials, Participants, Methodology, Tasks, Test Measures



Work through it with colleagues to debug test

Reuse when presenting report of testing results

Introducing the Test

Address Feelings of Judgment

"Today we are interested in learning about X.
That's where you come in!"

"I did not develop X.
I just want to know what the problems are with X."

"It is X being tested here, not you."

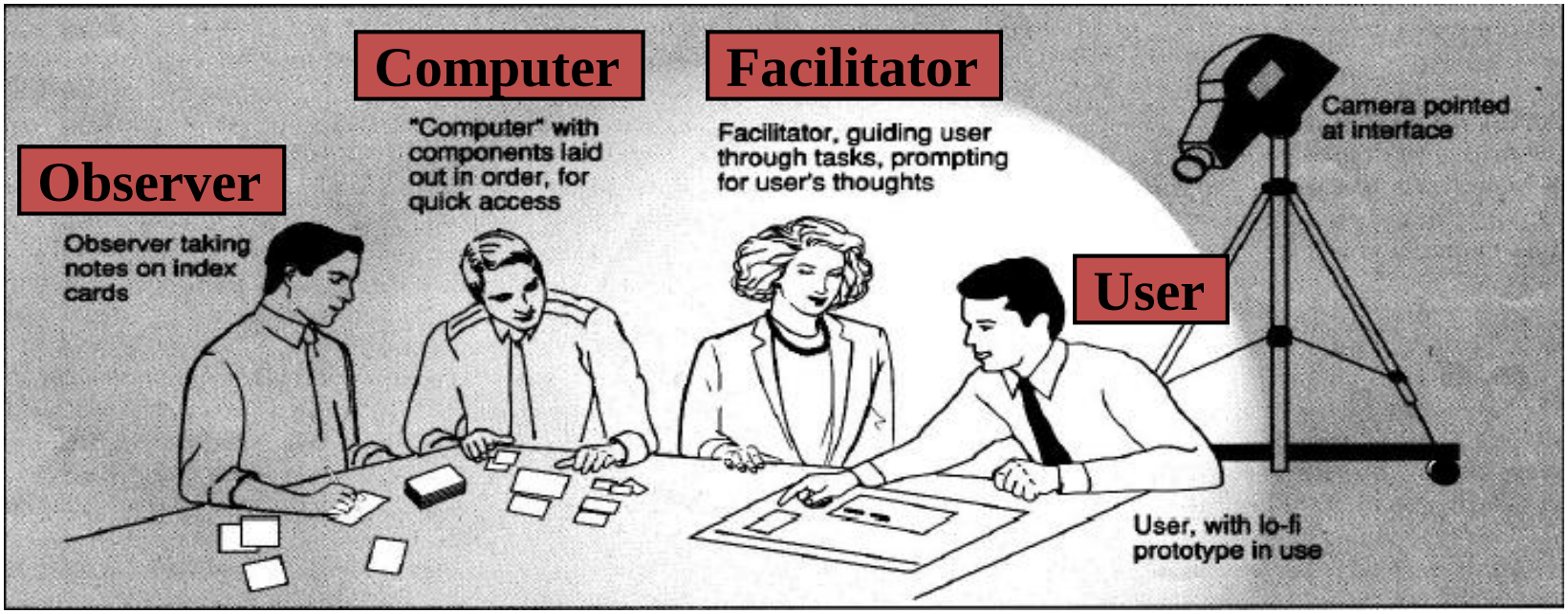
Introducing the Test

Set Expectations for Process

“It is essential you think out loud while working with X. Tell me constantly what you are thinking, looking for, wondering, confused about, surprised, and so on. If you stop talking, I will prompt you to talk.”

“I will not be able to answer your questions when you start using X. Do you have any questions now?”

Conducting a Test



See the Gommol reading tips on a test session

Rettig, 1994

Talk-Aloud Prompts

“Tell me what you are trying to do.”

“Please keep talking.”

“Tell me what you are thinking.”

“Are you looking for something? What?”

“What did you expect to happen just now?”

“What do you mean by that?”

“Talk-aloud” is similar but distinct from “think-aloud”

Most do not know or care about the difference,
so you may see the terms used interchangeably

Insight Problems

When people are trying to figure something out, talking aloud can prevent needed “insight”

If your participant is really baffled, it might not be the best time to prompt them to keep talking

- Wait for a natural break, and then ask “What were you thinking just there?”

Retrospective talk-aloud

- Record session,
  talk through immediately afterward

Answering Questions

Remember the purpose of this test

- You would not be there “in real life”
- You want to see if they can figure it out
- You want to see how hard it is
- You want to see how catastrophic the outcome is

But you do not want to punish the person or completely undermine the rest of the session

- Note any help you provide as a major failure
- Do not allow observing engineers to help

Debriefing

Give them more details about what you were interested in discovering, with their help

Answer any questions they have

- Now you can show them how to accomplish the tasks, talk about what you learned from the test

Thank them for their time

- Appropriate to give some compensation

Analyzing and Reporting the Results

Tests yield many forms of data

Quantitative counts

- time, success/failure
- confusions, errors, workarounds

Observations

- notes about when, where, why, how above occur

Participant comments and feedback

- during session of via a questionnaire

Analyzing and Reporting the Results

Summarize the data

Make a list of critical incidents

- can be positive and negative
- include references back to original data
- try to judge why each difficulty occurred

Sort and prioritize findings

- what does data tell you
- what are the important results
- anything missing from test

Careful Certain Temptations

Take a photo of your wireframe sketch

Add clickable areas and transitions between screens

"Use" the prototype on your own device

Ethical Considerations

Testing is stressful, can be distressing

- people can leave in tears

You have a responsibility to alleviate

- make voluntary with informed consent
- avoid pressure to participate
- let them know they can stop at any time
- stress that you are testing the system, not them
- make collected data as anonymous as possible

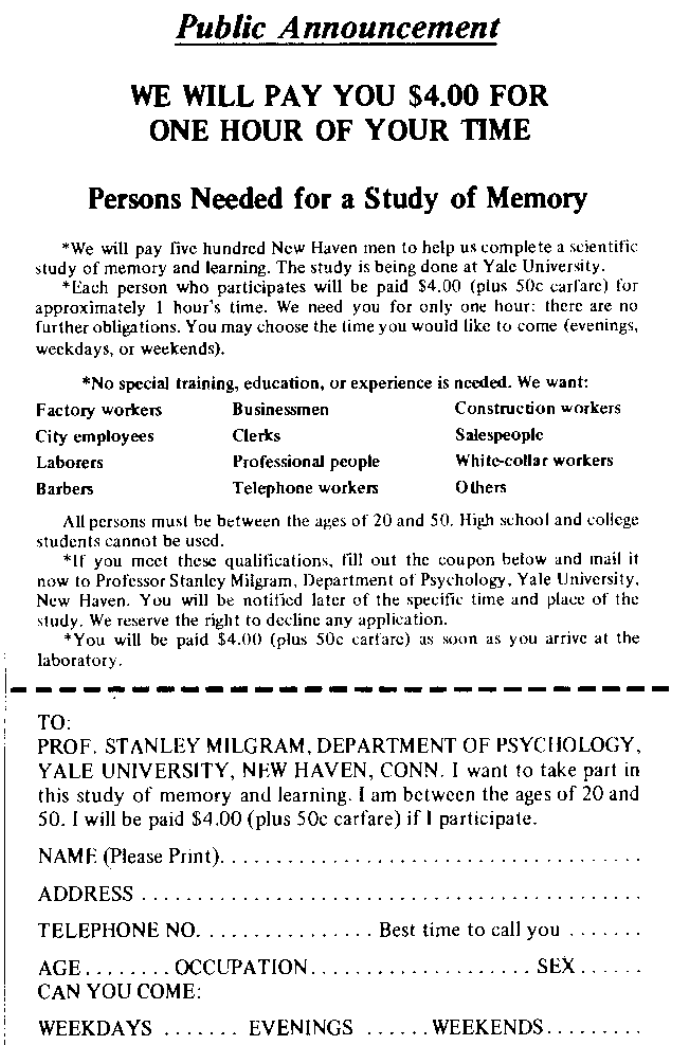
Human Subjects Approvals

Research requires human subjects review of process

This does not formally apply to your design work

But understand why we do this and check yourself

Companies are judged in the eye of the public



Public Announcement

WE WILL PAY YOU $4.00 FOR ONE HOUR OF YOUR TIME

Persons Needed for a Study of Memory

*We will pay five hundred New Haven men to help us complete a scientific study of memory and learning. The study is being done at Yale University.

*Each person who participates will be paid $4.00 (plus 50c carfare) for approximately 1 hour's time. We need you for only one hour: there are no further obligations. You may choose the time you would like to come (evenings, weekdays, or weekends).

*No special training, education, or experience is needed. We want:

Factory workers	Businessmen	Construction workers
City employees	Clerks	Salespeople
Laborers	Professional people	White-collar workers
Barbers	Telephone workers	Others

All persons must be between the ages of 20 and 50. High school and college students cannot be used.

*If you meet these qualifications, fill out the coupon below and mail it now to Professor Stanley Milgram, Department of Psychology, Yale University, New Haven. You will be notified later of the specific time and place of the study. We reserve the right to decline any application.

*You will be paid $4.00 (plus 50c carfare) as soon as you arrive at the laboratory.

TO:
PROF. STANLEY MILGRAM, DEPARTMENT OF PSYCHOLOGY, YALE UNIVERSITY, NEW HAVEN, CONN. I want to take part in this study of memory and learning. I am between the ages of 20 and 50. I will be paid $4.00 (plus 50c carfare) if I participate.

NAME (Please Print). . . . . .

ADDRESS . . . . . .

TELEPHONE NO. . . . . Best time to call you . . . . . .

AGE . . . . . OCCUPATION . . . . . SEX . . . . . .
CAN YOU COME:

WEEKDAYS . . . . . EVENINGS . . . . . WEEKENDS . . . . . .

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 09:
Paper Prototyping
and Testing

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50