CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 01: Introduction and Personal Informatics

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
What Is This Course?

Time for a Door Quiz:

Say out loud what action you use to open the door

Push
Pull
Door Quiz
Door Quiz
Door Quiz
Door Quiz
Door Quiz
Door Quiz
Door Quiz
Door Quiz
What is so Special about Computers?

Nothing! It is about good designs and bad designs.

We make push/pull decisions many times per day.

We all encounter doors that do this badly.

We all see signs that do not change what we do.
Signs Do Not Help
Signs Do Not Help

Pull.
What is so Special about Computers?

Yet we blame ourselves

Absolutely everything we encounter in the made world was designed
Too often poorly designed

Read this book

Be warned you cannot unread it, you become angry
Iterative Human-Centered Design

This is a course about process

This is not a course about ‘good’ interfaces or rules that you should follow in design

Rapid iteration and exploration is the most important and effective tool for effective design

“Enlightened trial and error succeeds over the planning of the lone genius” – Peter Skillman, IDEO
Project Overview

The core of this course is a group project

Propose and do an intense end-to-end design

Getting the Right Design
Getting the Design Right
Communicating the Design

Not an implementation course
Design Research & Task Analysis

Observe practices and understand needs

Consumester

FoodWatch
Sketching & Storyboarding

- Post
- Trips
  - Past
  - Find
- My Trips
  - Community
    - Friend’s Trips
    - Nearby trips
- RideAlong
Sketching & Storyboarding

RouteMyRun
Low-Fidelity Prototyping & Testing

RideAlong
Digital Mockup

Balance
Video Prototypes

GetOut

PickUp
Learn by Example from Prior Projects

Aqueous:

Learn by Example from Prior Projects

IEP Connect:
https://courses.cs.washington.edu/courses/cse440/14au/projects/iepconnect/
Learn by Example from Prior Projects

Ka-Ching:
Learn by Example from Prior Projects

Soundscape:
Learn by Example from Prior Projects

Balance:
Learn by Example from Prior Projects

Neat:
Learn by Example from Prior Projects

Poliscope:
Learn by Example from Prior Projects

School View:
Studio Time in Section and Lecture

This course is designed around rapid feedback.

Section is primarily studio time with the staff.

Groups will be formed within section.
Your team always brings a milestone to studio.
Participation is a critical component of the course.

Project time on Tuesdays.
Your team always has a milestone due.
Class will often include project time or activity.
Overview

HCI and the Project Sequence
Course Staff Introductions
Administrivia

Assignment 1: Project Proposal
  Assignment 1a: Due for Friday
  Assignment 1b: Due for Tuesday

Some Reflection
Self-Tracking and Relevant Background
Who We Are

James Fogarty

Prefer: James / He / Him

Background

BS, Virginia Tech, 2000
PhD, Carnegie Mellon, 2006
Joined UW CSE, 2006

Brief Industrial Stints

IBM, 2000
IBM Research, 2003
Microsoft Research, 2007
Who We Are

Cross-Campus HCI Efforts

DUB
MHCID

Teaching

CSE 440: Introduction to HCI
CSE 441: Advanced HCI
CSE 510: Advanced Topics in HCI
CSEP 510: Human-Computer Interaction
CSE 332: Data Structures
Who We Are

Computing

You
Who We Are

Eunice Jun

Prefer: Eunice / She / Her

Background:

BS, Cognitive Studies & Computer Science
Vanderbilt, 2016

Research:

Increasing engagement in multicultural online communities, including large-scale online experiments

Interests:

Hiking, learning new languages, ballet, getting lost
Who We Are

David Wang

Prefer: David / He / Him

Background:

BS, Informatics (HCI)
UC Irvine, 2013
MS, HCDE
University of Washington, 2017

Research:

Collapse informatics, ubiquitous computing

Interests:

Outdoors, travel,
making (ask me about the food truck harness)
Who We Are

Elisabeth Chin

Prefer: Elisabeth / She / Her

Background

BS, Informatics: HCI
University of Washington, 2017

Interests

Movies (watched 72 in 2016!), making fresh noodles, cross-cultural studies, all sorts of rock music
Who We Are

Ravi Karkar

Prefer: Ravi / He / Him

Background

BE, Gujarat University, 2011
MS, Georgia Tech, 2012
MS, University of Washington, 2016

Research

Designing and building tools to support people in their diagnostic self-tracking

Interests:

Sleeping, getting 404s, hunting horcruxes
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Staying in Touch

Web:  http://www.cs.washington.edu/440
You are responsible for calendar

Canvas:  I hate Canvas so much but we have to use it for some things

Email Us:  cse440-instr [at] cs.washington.edu

Email:  You are responsible for course email

Office Hours:  Posted on Calendar
Also By Appointment
GitHub Repository

The website, assignments, and other materials are being run from a GitHub repository
https://github.com/uwcse440/web-cse440-wi17

You will contribute when posting your projects

You can and should contribute if you see the opportunity
Grading

We provide a grading scale, but it is subjective
  Design is subjective, and so is this course
  Wow us with your work, not with complaining

Entire project process is designed for feedback
  Milestone grades mean you did the milestone

You still must act on feedback as part of continuing to refine and develop your project

A focus on “doing the work” and “getting feedback” means final grades are more “quality of result”
## Grading

<table>
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<tr>
<th>Component</th>
<th>Weightage</th>
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<tbody>
<tr>
<td>Group Project</td>
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<td>Assignment 1</td>
<td>3%</td>
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<td>Assignment 2: Getting the Right Design</td>
<td>21%</td>
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<td>Final Report</td>
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<td>Milestones</td>
<td>6%</td>
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<tr>
<td>Assignment 3: Getting the Design Right</td>
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<td>Final Report</td>
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<td>Milestones</td>
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<td>Assignment 4: Communicating the Design</td>
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<td>Website</td>
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<td>Video Prototype</td>
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<td>Poster</td>
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<td>Presentations</td>
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<tr>
<td>Getting the Right Design</td>
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<td>Getting the Design Right</td>
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<td>Individual Readings</td>
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Submissions

Many assignments are due “night before class”

Canvas will operationalize this as 12:01am
A bit more slack, but definitely “before I wake up”

We need your submissions as part of our preparation for in-class feedback

“Day of class”, “just before class”, or “in class” are all unacceptable, risking zero credit
“Now” vs “When You Need It” Content

This course has both, we will try to distinguish

Several assigned readings will be posted

- Intentionally minimal but critical
- May be on exam
- Small reading report assignment

Additional resources will be made available

- If you find others you want to share, email us
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Project Proposal Schedule

Project Brainstorm Due for Friday
Brainstorming in Section Friday

Project Proposal Due Monday Night
Sponsored Projects Posted Tuesday

Project Bids Due Wednesday Night
Groups Assigned Thursday
Brainstorming in Section Friday
Assignment 1a: Project Brainstorm

You have an assignment due for Friday:

http://courses.cs.washington.edu/courses/cse440/17wi/assignments/assignment1/

Propose 3 project domains, problems, goals:

These are starting points for brainstorming

Submit online:

This proves that you did your preparation
Submit via email if unable to access Canvas

Bring to section Friday:

You have a lot more brainstorming ahead of you
Assignment 1b: Project Proposal

You have an assignment due for Tuesday:

http://courses.cs.washington.edu/courses/cse440/17wi/assignments/assignment1/

One page of text:

Problem and Motivation
Analyze the problem or idea (e.g., a scenario)

Submit online:
Sponsored Projects will be Posted for Bidding
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Some Reflection
Self-Tracking and Relevant Background
Some Reflection

This will not be an easy course
Students have said this was their most intense course
You have two deadlines per week, every week
But I believe in everything that is included

This course challenges some aspects of what the CSE curriculum has taught you is important
It will be what you make it
“Very good class that every engineer should have to take. Good perspectives and made me think outside my comfort zone.”

“The focus on projects and fieldwork was very well suited to my learning style. I greatly enjoyed this format. The theory and techniques taught in class were directly applicable to the projects we were doing and were usually timed very well. That is, usually the topics presented in lecture were relevant to the current deliverable or the next deliverable.”
“People Really Get It

“I can't believe I'm saying this, but I found the lectures a huge part of what I learned in this course. They were useful and organized, and each one had a clear message and topic. The assignments were an excellent extension of these themes.”

“Fieldwork and iterative assignments really taught me how important the design process is.”
“the project placed groups in a realistic situation and forced us to work together effectively and practice relevant concepts/strategies”

“The group work was distracting because of the lack of unity and sense of purpose. We all had different priorities and purposes for taking the class and this made it really hard to be on the same page for the project which was the biggest part of this class.”
“Have groups do a team charter - outlining what they expect from one another as teammates. I took a project management course and when working in a group with individuals you've never worked with, the team charter may help break the ice easier when everyone can say what their expectations are.”

“... I think that working effectively as a team was the most challenging part of this class ...”
And it is not for Everybody

What aspects of this class detracted from your learning?

Finding strangers in malls & coffee shops was a major hurdle

What suggestions do you have for improving the class?

Don't exclude the two most available sources of people - friends & university students
Adding and Dropping

Attempting to Add

- Say something to me after class
- Will email today, attempt to finalize quickly
- Must enforce a hard enrollment cap

Considering Dropping

- Do so before we assign teams, and tell us

Section switch availability

- We may need help in balancing sections
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Some Reflection

Self-Tracking and Relevant Background
Thousands of Health Monitoring Apps
Activity and Medical Sensing Devices

- Blood glucose meter
- Thermometer
- Blood pressure monitor
- Heart rate monitor
Medical Implants

NeuroPace
Sustainability Tracking

Kill A Watt

Belkin WeMo Water

Automatic
Location and Activity

FitBit

Garmin

FitBark

Moves
Time Tracking

RescueTime
Finances

Mint

You Need a Budget
Background in Personal Informatics

Some Definitions

What is the Point?

What is the Problem?

What is Personal Informatics

“We define personal informatics systems as those that help people collect personally relevant information for the purpose of self-reflection and gaining self-knowledge. There are two core aspects to every personal informatics system: collection and reflection.”

Li I., Dey A., Forlizzi J. CHI 2010.
“A Stage-Based Model of Personal Informatics Systems”
What is Quantified Self

“The Quantified Self is an international collaboration of users and makers of self-tracking tools.”

“Our aim is to help people get meaning out of their personal data.”

“Self knowledge through numbers.”

What is the Point?

Gnothi seauton
“Know thyself”
Leonardo da Vinci

- Odometers on the left
- Pedometer on the right

To track troop activities
Benjamin Franklin

Temperance
Silence
Order
Resolution
Frugality
Industry
Sincerity
Justice
Moderation
Cleanliness
Tranquility
Chastity
Humility
### TEMPERANCE.

**EAT NOT TO DULLNESS.
DRINK NOT TO ELEVATION.**

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万歩計
Five-Stage Model of Personal Informatics

Li I., Dey A., Forlizzi J. CHI 2010. “A Stage-Based Model of Personal Informatics Systems”
Five-Stage Model of Personal Informatics

Alice

20 years old

Has a family history of heart disease

Wants to be more active

Does not know how, because she is busy

Li I., Dey A., Forlizzi J. CHI 2010. “A Stage-Based Model of Personal Informatics Systems”
Preparation

Li I., Dey A., Forlizzi J. CHI 2010. “A Stage-Based Model of Personal Informatics Systems”
Preparation

Li I., Dey A., Forlizzi J. CHI 2010. “A Stage-Based Model of Personal Informatics Systems”
Collection

Li I., Dey A., Forlizzi J. CHI 2010.
“A Stage-Based Model of Personal Informatics Systems”
Integration

Li I., Dey A., Forlizzi J. *CHI 2010.*
“A Stage-Based Model of Personal Informatics Systems”
Reflection

Li I., Dey A., Forlizzi J. CHI 2010.
“A Stage-Based Model of Personal Informatics Systems”
Action

Walk in park instead of watching TV

Li I., Dey A., Forlizzi J. *CHI 2010.*
“A Stage-Based Model of Personal Informatics Systems”
Five-Stage Model of Personal Informatics

PREPARATION | COLLECTION | INTEGRATION | REFLECTION | ACTION

Li I., Dey A., Forlizzi J. CHI 2010.
“A Stage-Based Model of Personal Informatics Systems”
What is the Problem?

Examining serious self-trackers, as they represent the early adopters.
Quantified Self Talk Format

1. What I did
2. How I did it
3. What I learned

Analyzed 52 videos

Analysis

Visualizations

Themes

Profiles

What do they Track?

A Diabetic Experience with Self-Quantification
Analyzing My Cancer Data
Going Vegan in December
Improving Skin Health
Cognitive Performance
15 Weeks of Self-Tracking
Diabetes, Exercise, and QS
Experience Sampling of My Stress
Hacking Your Subconscious Mind

Self-tracking is more than just buying a FitBit

# Motivations for Tracking

<table>
<thead>
<tr>
<th>Motivations</th>
<th>Sub-categories</th>
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<tbody>
<tr>
<td>To improve health</td>
<td>To cure or manage a condition</td>
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<td></td>
<td>To achieve a goal</td>
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<td>To find triggers</td>
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<td>To answer a specific question</td>
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<td>To identify relationships</td>
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<td>To execute a treatment plan</td>
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<td>To make better health decisions</td>
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<td>To find balance</td>
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<td>To improve other aspects of life</td>
<td>To maximize work performance</td>
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<td></td>
<td>To be mindful</td>
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<tr>
<td>To find new life experiences</td>
<td>To satisfy curiosity and have fun</td>
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<td></td>
<td>To explore new things</td>
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<td></td>
<td>To learn something interesting</td>
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# Data Collection and Exploration Tools

## Data Collection Tool

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<th>Data Collection Tool</th>
<th>% (#)</th>
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<tbody>
<tr>
<td>Commercial hardware</td>
<td>56% (29)</td>
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<tr>
<td>Spreadsheet</td>
<td>40% (21)</td>
</tr>
<tr>
<td>Custom software</td>
<td>21% (11)</td>
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<tr>
<td>Pen and paper</td>
<td>21% (11)</td>
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<tr>
<td>Commercial software</td>
<td>19% (10)</td>
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<tr>
<td>Commercial website</td>
<td>10% (5)</td>
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<tr>
<td>Camera</td>
<td>6% (3)</td>
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<tr>
<td>Open-source platform</td>
<td>6% (3)</td>
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<tr>
<td>Custom hardware</td>
<td>4% (2)</td>
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<td>Other</td>
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## Data Exploration Tool

<table>
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<td>Custom software</td>
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<td>Statistical software</td>
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<tr>
<td>Pen and paper</td>
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“Understanding Quantified Selfers’ Practices in Collecting and Exploring Personal Data”
Building Custom Tools

Captures smile via wearable sensing
Provides real-time feedback

Captures snoring via mobile app
Provides data visualization

Custom Visualizations

Why are they Building Custom Tools?

Desirable features are not supported
- Collect and reflect on the data using a single tool
- Perform self-experimentation

Barriers to success
- Tracking too many things
- Not tracking triggers and context
- Lacking scientific rigor

Tracking Too Many Things

“I can honestly say that I’ve made the classic newbie self-tracking mistake which is that I track everything. I didn't know exactly what to track, so I tracked caffeine, dairy, wheat, sugar, nuts, fruit, vegetables, meat, chicken, fish, alcohol supplements…”

People burn out on self-tracking

Not Tracking Triggers and Context

“I was trying to track all these symptoms and I was completely ignoring the cause…”

People lack clues on what to track
Missing information on how to improve outcome

They track the wrong information

“Understanding Quantified Selfers’ Practices in Collecting and Exploring Personal Data”
Lacking Scientific Rigor

Conduct self-experimentations without control or without addressing confounding factors

And they conduct flawed experiments

Barriers and Negative Nudges

“It was too time consuming and tedious. I also did not know what to enter if I ate out, so I often did not enter data and that compounded. I also felt embarrassed to do it in front of friends so I stopped.”

Negative Nudges:
Contrasting difficulty of entry
Judgment and choosing not to journal
Stigma and journaling
Lack or decline in social support

A Model of Lived Informatics

Extends 5-stage model to surface additional opportunities and challenges in lifecycle

Returning to a tool (e.g., short/long lapse)

Changing tools (e.g., due to burden)

Changing goals (e.g., due to discovery)

Your Challenge

People invest tremendous effort for little value

Do better, help people achieve their goals, solve real problems

Go beyond the data fetish

Understand the problems people face
Find the role for interactive technology
Your Challenge

Explore **tracking beyond the self:**
co-located relationships
remote relationships
communities organizing
people seeking help from peers
people seeking help from experts

Any problem where multiple people collect data, or where multiple people engage in gaining value from data, introduces additional opportunities and challenges in designing for effective interaction with personal data
Some Reflection

We have high expectations

We want you to do cool stuff

But we are also enthusiastic and we listen

Email us, point out opportunities, ask questions

If you are not onboard, please drop now

Please email us so that we know a spot opened

cse440-instr [at] cs.washington.edu
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Lecture 02:
Design of Everyday Things

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
Examining a Design Process

By example:

A video from the 90s about a shopping cart with no bottom
ABC News and IDEO’s Deep Dive

http://courses.cs.washington.edu/courses/cse440/videos/design/IDEO-DeepDive.mp4
Design Terminology

Design of Everyday Things reviews a common and useful vocabulary of design.

We will use these in feedback and conversations without even realizing that we are doing it.

You should know these terms and recognize them in practice.
Norman’s Execution-Evaluation Cycle

1. Establish the goal.
2. Form the intention.
3. Specify the action sequence.
4. Execute the action sequence.
5. Perceive the system state.
6. Interpret the system state.
7. Evaluate the system state with respect to the goals and intentions.

Revise Goals
Turning on the Light

1. Establish the goal
   Increase light in the room
2. Form the intention
   To turn on the lamp
3. Specify the action sequence
   Walk to the lamp, reach for the knob, twist the knob
4. Execute the action sequence
   [walk, reach, twist]
5. Perceive the system state
   [hear “click” sound, see light from lamp]
6. Interpret the system state
   The knob rotated. The lamp is emitting light. The lamp seems to work
7. Evaluate the system state with respect to the goals and intentions
   The lamp did indeed increase the light in the room [goal satisfied]
Norman’s Execution-Evaluation Cycle

1. **Goals**
2. **Form Intention**
3. **Develop Action Plan**
4. **Execute Actions**
5. **System Change**
6. **Observe State**
7. **Interpret State**
8. **Evaluate Goals**
9. **Goals**
Norman’s Execution-Evaluation Cycle

Gulf of Execution:
- Goals
  - Form Intention
    - Develop Action Plan
      - Execute Actions
        - System Change
          - Observe State
            - Interpret State
              - Evaluate Goals
                - Goals

Gulf of Evaluation:
Bridging the Gulfs

Gulf of Execution: “How do I do it?”
Commands and mechanisms need to match the goals, thoughts, and expectations of a person.

Gulf of Evaluation: “What does it mean?”
Output needs to present a view of the system that is readily perceived, interpreted, and evaluated.

People build mental models to anticipate and interpret system response to their actions.

What can I do?  How do I do it?
What result will it have?  What is it telling me?
Cooper’s Mental Model Terminology

- **Implementation Model**
  - How it works
  - *(Design Model, Designer’s Conceptual Model)*

- **Manifest Model**
  - How it presents itself
  - *(System Image)*

- **Mental Model**
  - How a person thinks it works
  - *(User Model, User’s Conceptual Model)*
Cooper’s Mental Model Terminology

Implementation Model
How it works
(Design Model, Designer’s Conceptual Model)

Manifest Model
How it presents itself
(System Image)

Mental Model
How a person thinks it works
(User Model, User’s Conceptual Model)

These terms are sloppy and ambiguous out in the world.
Manifest and Mental Models

Designer projects their model into an artifact
Person forms their model based on interaction
People struggle until model matches manifest model
Update mental model in response to breakdowns
Matching the implementation model is not necessary
Mental Models

Problem: freezer too cold, fresh food just right
What if I want to make just the freezer warmer?
A Sensible Mental Model

“The Freezer Control controls the freezer temperature and the Fresh Food Control controls the fresh food temperature”
The Implementation Model
A Problem with Feedback

1. Set both controls
2. Allow 24 hours to stabilize
The Implementation Model

Why is there a problem?

Can you fix the problem?
The Implementation Model

Why is there a problem?

Cost constraints

Can you fix the problem?

Make controls correspond to a person’s mental model

Make controls correspond to the implementation model

“Design depends largely on constraints.”
Charles Eames
Building the Right Model

Having the right model helps people bridge the Gulf of Execution and the Gulf of Evaluation

How can we help people build the right models:

- Affordances
- Visibility
- Constraints
- Consistency
- Metaphors
- Knowledge in the World
- Mapping
- Modes
Affordances

Visual clue to interaction

- knobs afford turning
- levers afford moving
- buttons afford pushing
Affordances

“The affordances of the environment are what it offers animals, what it provides or furnishes, for good or ill.”

Gibson, ecological approach to psychology

“The term ‘affordance’ refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used.”

Norman
What’s the Affordance?
Affordances
Affordances

Technology affordances are often based in affordances from the physical world.
Affordances

What is the affordance here?

Where does it come from?
Affordances

What is the affordance here?

Where does it come from?
Sequential Affordance

Acting on a perceptible affordance leads to information indicating new affordances

Figure 4. Sequential affordances: one affordance leads to another. Visual information indicates grasping (A & B); tactile information indicates turning (B & C).
Sequential Affordance

Acting on a perceptible affordance leads to information indicating new affordances.

Now does the door push or pull?

Figure 4. Sequential affordances: one affordance leads to another. Visual information indicates grasping (A & B); tactile information indicates turning (B & C).
Nested Affordances

Affordances due to spatial relationships revealing what actions can be done

Proximate to, contained in, part of

Copies: 1
In Other Words

An affordance is what a thing communicates about how it can be used, often by its appearance.

“In general, when the apparent affordances of an artifact matches its intended use, the artifact is easy to operate. When apparent affordances suggest different actions than those for which the object is designed, errors are common.”

Gaver

Challenges arise if there is a mismatch between implied use versus intended use.
False Affordances

When there is perceptual information suggesting an implied use that does not exist

(Just an image of a button, not one that responds)
False Affordances
False Affordances
False Affordances
False Affordances
Hidden Affordances

When there is no perceptual information suggesting an actual intended use
Hidden Affordances
Hidden Affordances

Logos linking to home is a convention, but not afforded by the page.
Confusion of the Term

“Note also that affordances are not intrinsic, but depend on the background and culture of users. Most computer-literate user will click on an icon. This is not because they go around pushing pictures in art galleries, but because they have learned that this is an affordance of such objects in a computer domain…”

Dix

I disagree. Icons do not afford “pushability” or “clickability” by their attributes. They do not give an indication of their intended use, except by convention.
Clarification on Convention

“Designers sometimes will say that when they put an icon, cursor, or other target on the screen, they have added an ‘affordance’ to the system. This is a misuse of the concept. … It is wrong to claim that the design of a graphical object on the screen ‘affords clicking.’ … Yes, the object provides a target and it helps the user know where to click and maybe even what to expect in return, but those aren’t affordances, those are conventions, and feedback, and the like. … Don’t confuse affordances with conventions.”

Norman
Metaphors

Suggest an existing mental model

“horseless carriages”, “iron horses”, “wireless”

Desktop metaphor

Not an attempt to simulate a real desktop

Leverages knowledge of files, folders, trash

Explains why some windows seem hidden
Metaphors

Suggest an existing mental model

“horseless carriages”, “iron horses”, “wireless”

Desktop metaphor

Not an attempt to simulate a real desktop

Leverages knowledge of files, folders, trash

Explains why some windows seem hidden
Mail Metaphor

![ACM Multimedia 2004 - Microsoft Outlook](image)

Extra line breaks in the message were removed. To restore, click here.

From: Wein Zhao [wzb@cs.columbia.edu]  To: Manning Schulzmeier; Nevenka Dimitrova; Angela Sasse; Sue Moon; Rainer Lienhart; Yong Rui; Jon Crosscroft;

Subject: Invitation for MM'04 Organizer Lunch  Cc:

Dear MM'04 Organizers,

You are invited to attend the MM'04 organizer lunch on Tuesday, October 12, 2004. The schedule is as follows:

- **Time:** 12:30–14:00
- **Location:** Randolph Room (1st floor) of Faculty House at Columbia University
- **Map:** [http://www.cs.columbia.edu/~wzb/mm04-map.pdf](http://www.cs.columbia.edu/~wzb/mm04-map.pdf)
Calendar Metaphor
Health Metaphor

Inform VirusScan how to respond when a virus is detected.

When a virus is found:

**Clean infected files automatically**

This option instructs VirusScan to clean files automatically.

If the above Action fails:

**Move infected files to a folder**

This option instructs VirusScan to automatically move all infected files to the quarantine folder. The location of the quarantine folder is configured on the "General" tab under "General Settings"
Shallow or Inappropriate Metaphors

Informs a small range of possibilities, or none at all

It is just a menu and a dialog box?

What does the living room add?
Mixed Metaphors

Two or more different metaphors coexist with some supposed relation

The desktop metaphor
Windows into content

Good?  Bad?
Neither?  Both?

Windows are views into larger content regions
No desktop has windows
Broken Metaphors

Are not consistent, do not operate in every circumstance, or do not uphold things consistent with what the metaphor would suggest
Mechanical-Age Metaphors

Operate as their mechanical-age counterparts did, not taking advantage of the digital domain to escape the limitations of the original
Dead Metaphors

Lost the original imagery of their meaning

- Milk
- Butter
- Cheese
- Water
- Beer
- Wine
Metaphors versus Idioms

Idioms

- rely on shared experience or custom
- are learned, often early in life
- are supported or revealed by context
- become conventions
- do not rely on metaphors

Idiomatic widgets (e.g., screen splitter, draggable title bar)

Single click to select, double click to open

Hyperlinks
Idioms

Star Trek IV: Scotty Uses a Mouse
Idioms

Star Trek IV: Scotty Uses a Mouse
Metaphors and Affordances

Affordances “jump start” a model for interaction
Metaphors “jump start” a model of a system

But if designed poorly, both can be damaging

  Lead to an incorrect model, undermine interaction
  Can limit designer creativity
  Can reduce the advantages of software
  Can be “cute” at the expense of functional
Visibility

Phones

How do you

put somebody on hold

change volume
Visibility

Location of Controls

Display

During a conversation, the call duration is displayed.

- The unit is in the programming mode (p. 9, 16, 20).
- The AUTO button was pressed while dialing or storing phone numbers for the Speed Dialer (p. 16, 19).
- The LOWER button was pressed (p. 21, 23).
- The ringer is set to OFF (p. 10).
- The MUTE button was pressed during a conversation (p. 24).
- The dial lock mode is set. To cancel the mode, see page 27.
- The FLASH button was pressed while storing phone numbers.
- The PAUSE button was pressed while dialing or storing phone numbers.
- You pressed  while dialing or storing phone numbers in the TONE mode.
- You pressed  while dialing or storing phone numbers in the TONE mode.
- While storing a phone number in an UPPER memory location for the One-Touch Dialer, “*” will appear when you press a onetouch auto dial button (p. 20).
- While storing a phone number in a LOWER memory location for the One-Touch Dialer, “*” will appear when you press a one-touch auto dial button (p. 21).
- The MUTE button was pressed as a secret button while storing phone numbers (p. 18, 22).
- While programming function items, such as the dialing mode, “*” will flash as a cursor.
Visibility

Changing Ringer Volume

Press “Program”
Press “6”

Set Volume

Low - Press “1”
Medium - Press “2”
High - Press “3”

Press “Program”
Visibility

Controls available on watch with 3 buttons?
  Too many and they are not visible

Compare to controls on simple car radio
  Number of controls ≈ Number of functions
  Controls are labeled and grouped together
Knowledge in the World
Constraints

Prevent some actions while allowing others

Prevent errors before they can happen

Disruptive error messages are a last resort
Constraints
Constraints
Constraints
Mapping

Correspondence between an interface and the corresponding action in ‘the world’

Minimize cognitive steps to transform action into effect, or perception into comprehension (i.e., execution and evaluation)
Very Bad Mapping
Slightly Better Mapping
Good Mapping
Not this Stove
Great Mapping
Mapping

Removing the cover plate, then removing and swapping the switches.

Mapping
Mapping
Mapping
Mapping
Consistency

Interfaces should be meaningfully consistent

Ubiquitous use of same keys for cut/copy/paste

Types of consistency

Internal (i.e., within itself)
- e.g., same terminology and layout throughout

External (i.e., with other applications)
- e.g., common widget appearance
- e.g., design patterns common across applications
Is Consistent Always Better?

Should “new” & “delete” be in the same place?
Is Consistent Always Better?

Should “new” & “delete” be in the same place?

New is common, delete is not
Is Consistent Always Better?

Original focus on consistency, later design for mobile form
Is Consistency Always Better?
Is Consistency Always Better?
Is Consistency Always Better?
Modes

Modes force people to divide their model
Active versus Passive Modes

Active modes require constant action to maintain. When that action has ended, so does the mode. e.g., Shift.

Passive modes require action to set, and a separate action to unset, or to set again. e.g., CAPS LOCK.

Active modes are generally preferred.
Standardization

If all else fails, standardize
Fewer things to memorize
Reduced learning time
Adapt to new situations faster

e.g., keyboard layout not optimal, but standard
Norman’s Seven Principles for Design

Use knowledge in the head and in the world
Simplify the structure of tasks
Making things visible
Get the mappings right
Exploit the power of constraints
Design for error
When all else fails, standardize
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 02:  
Design of Everyday Things

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 03: Contextual Inquiry & Design Research
James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
Project Status and Assignments

Proposals to be “Funded” and Posted for Bidding
  Bidding Tomorrow, Team Formation Thursday

Looking Forward
  Ideation on Friday in Section
  2b: Design Research Plan due Tuesday 1/17
  2c: Design Research Check-In due Friday 1/20
  2d: Design Research Review due Tuesday 1/24

Other Assignments
  Assignment 0 Due Today
  Reading 1 Posted, Due Friday
Amazing Color Changing Card Trick

The colour changing card trick
Why did I show you that?

If we are focusing on the wrong thing, we can completely miss other important things.

Our assumptions and pre-conceptions play a huge role in how we focus our attention.

Today is about this danger when understanding the context for which you design technology.
“You Are Not the Customer”

Seems obvious, but…

- You have different experiences
- You have different terminology
- You have different ways of looking at the world

Easy to think of self as typical

Easy to make mistaken assumptions
Today

Ethnography

Contextual Inquiry

Additional Methods
Ethnography

Emerged in 1920s as a new anthropology method, exploring why groups think and act as they do.

Learn local language, record myths, customs, and ceremonies in much greater detail than prior work.

You will likely never perform an ethnography.
Ethnography

Traditional science attempts to understand a group or individual objectively

  Understand the subject of study from the outside in a way that can be explained to “anyone”

Ethnography attempts to understand a group or individual phenomenologically

  Understand the subject of study as the subject of study understands itself
Four Ethnographic Principles

Natural settings
Holism
Descriptive
Member point-of-view
Four Ethnographic Principles

Natural Settings

Conducted in the setting of the participant

Focus on naturally occurring, everyday action

Cannot use laboratory, experimental settings, or a phone call to gather this type of data

You really do have to go out there and see it
Four Ethnographic Principles

Holism

Behavior can only be understood in its larger social context; that is, holistically.

Particular behaviors understood in relation to how they are embedded in the social and historical fabric of everyday life.

Focus on relationship between the parts
Four Ethnographic Principles

Descriptive

Study how people actually behave, not how they ought to behave.

Defer judgment.
Four Ethnographic Principles

Member
Point-of-View

See through participant eyes in order to grasp how they interpret and act in their world.
Four Ethnographic Principles

Member Point-of-View

See through participant eyes in order to grasp how they interpret and act in their world.
Design Ethnography

Quicker than traditional ethnography
  Days, weeks, or months, not years
Sometimes “concurrent ethnography”
  The ethnography is being done
  at the same time that design is under way
Goal is to generate insights informing design
  Sometimes “ethnographically inspired methods”

Translating from raw field observation
to design ideas can be a difficult process
Today

Ethnography

Contextual Inquiry

Additional Methods
Contextual Inquiry

Applied design ethnography

“The core premise of Contextual Inquiry is very simple: go where the customer works, observe the customer as he or she works, and talk to the customer about the work. Do that, and you can’t help but gain a better understanding of your customer.”

Hugh Beyer and Karen Holtzblatt
User, Subject, or Participant?

Only two groups refer to their customers as users.

In traditional science, "subjects" are "subjected to" experiments as researcher develops understanding.

In ethnographically-oriented design methods, "participants" instead "participate" in helping the researcher develop understanding.

This is not simple correctness, nor only about respect, it is a mindset that matters for being open.
What is your relationship?

In a scientist/subject relationship:

The scientist does stuff

The subject responds in some way

The scientist collects data, goes back to their office, and analyzes the data to gain understanding

This is not very appropriate for gaining phenomenological understanding
What is your relationship?

In an interviewer/interviewee relationship:

- The interviewer asks a question
- The interviewee responds immediately
- At a pause, the interviewer asks the next question from their list
- When all the questions are answered, the interview is complete

This would support gaining phenomenological understanding if you knew what questions to ask

Implying you have phenomenological understanding
What is your relationship?

In a master/apprentice relationship:
- The master is doing stuff
- The master explains what they are doing
- The apprentice asks clarification questions
- The master answers

This relationship is at the heart of contextual inquiry
Master/Apprentice Relationship

Seeing the work reveals structure

Many instances and interviews reveal the picture

Every current activity recalls past instances

A customer describing how she learned a feature told us, “I looked it up in the documentation.” But when we asked her to look it up again, she was able to show us: “I looked the function up in the index and scanned the section. I saw this icon in the margin that I recognized from the screen, so I read just this paragraph next to it. It told me all I needed to know.” The documentation provided the context she needed to recover a detailed story, and the detail revealed aspects that had been overlooked—that the icon was her visual cue to the relevant part of the page.
Unique or One of Many?

“Take the attitude that nothing any person does is done for no reason; if you think it’s for no reason, you don’t yet understand the point of view from which it makes sense. Take the attitude that nothing any person does is unique to them, it always represents an important class of customers whose needs will not be met if you don’t figure out what’s going on.”

(p. 63, Contextual Design)
Not Quite Master/Apprentice

The goal is not to learn to do the task

Instead, the goal is to learn how the participant does the task in order to learn how to support it.

And for the researcher to enlist the participant’s active assistance in understanding the task.
Not Quite Master/Apprentice

In a contextual inquiry relationship:
- The participant is doing stuff
- The participant explains what they are doing
- The researcher offers an interpretation
- The participant agrees or corrects

Partners
- Not really an interview
- Not really an apprentice
Principles of Contextual Inquiry

Context
Must be done in the setting of the participant.

Partnership
Master/apprentice model; investigator is humble.

Interpretation
Observed facts must be regarded for their design implications. Raw facts without interpretation are not very useful.

Focus
Themes that emerge during the inquiry. You cannot pay attention to all facets of someone’s work at all times.
Context

Go to the workplace & see the work as it unfolds
People summarize, but we want details
Keep it concrete when people start to abstract
“Do you have one? May I see it?”
Context

Imagine studying how a student writes a paper
Why not just ask?
Context

Imagine studying how a student writes a paper

Why not just ask?

May not remember details

- Getting roommate to read drafts

May skip critical difficulties

- Trouble locating references on the Web
Context

Avoid summary data by watching work unfold

We once asked a secretary how she started her day. Her answer was, “I guess I just come in and check my messages and get started.” She wasn’t able to go beyond this brief summary overview. It was the first thing in the morning and she had just arrived at the office, so we asked her to go ahead and do as she would any other morning. She unhesitatingly started her morning routine, telling us about it as she went:

“First I hang up my coat, then I start my computer. Actually, even before that I’ll see if my boss has left something on my chair. If he has, that’s first priority. While the computer’s coming up, I check the answering machine for urgent messages. There aren’t any. Then I look to see if there’s a fax that has to be handled right away. Nope, none today. If there were, I’d take it right in and put it on the desk of whoever was responsible. Then I go in the back room and start coffee. Now I’ll check the counters on the copier and postage meter. I’m only doing that because today’s the first of the month. . . .”

Have them think aloud..
Context

“One customer said he would not use a manual’s index to find the solution to a problem: ‘It’s never in the index.’ He could not say what led him to this conclusion, what he had looked up and failed to find. All his bad experiences were rolled up into one simple abstraction: it’s not there. But when we watched him looking things up, we could see that he was using terms from his work domain, but the index listed parts of the system.”
“A customer was unable to describe how she made her monthly report. When asked to create it, she pulled out her last report and started filling in the parts.”
Context

If cannot observe, ground in an instance

Span time by replaying past events in detail

Look for holes

Ask questions to fill them

Use artifacts for context

If story has not yet ended, go back to a story that did

Customer: When I got this problem report I gave it to Word Processing to enter online—

(Why did she decide to give it to Word Processing? Did she do anything first?)

Interviewer: So you just handed it on automatically as soon as you got it?

C: No, it was high priority, so I read it and decided to send a copy to the Claims department.

(How did she decide it was high priority? Is it her decision?)

I: How did you know it was high priority?

C: It has this green sticker on it.

(Someone else made the decision before the report ever got here. Who and when?)

I: Who put on the green sticker?

C: That's put on by the reporting agency. They make the decision about whether it's high priority and mark the report.

(We can better pursue how the reporting agency makes the decision with them; we'll only get secondhand information from this user. Instead of trying to go further backward, look for the next missing step forward: doesn't Claims get a more personal communication than just the report?)

I: Did you just send it on to Claims, or did you write them a note about why they needed to see it?

C: Oh, I always call Claims whenever I send them one of these reports.
Partnership

Traditionally, interviewer has too much power
  You do not know what will turn out to be important
Apprenticeship model tilts power back too far
  You are not there to learn the skill

Interviewer should create a partnership
  Alternate between watching and probing
Partnership

Withdrawal and return

Researcher observes action that indicates something meaningful

The researcher asks about this, and the pair withdraw from the task

Discuss the question

Then return to the task

In one interview with a user of page layout software, the user was positioning text on the page, entering the text and moving it around. Then he created a box around a line of text, moved it down until the top of the box butted the bottom of the line of text, and moved another line of text up until it butted the bottom of the box. Then he deleted the box.

Interviewer: Could I see that again?
Customer: What?
I: What you just did with the box.
C: Oh, I’m just using it to position this text here. The box doesn’t matter.
I: But why are you using a box?
C: See, I want the white space to be exactly the same height as a line of text. So I draw the box to get the height. (He repeats the actions to illustrate, going more slowly.) Then I drag it down, and it shows where the next line of text should go.
I: Why do you want to get the spacing exact?
C: It’s to make the appearance of the page more even. You want all the lines to have some regular relationship to the other things on the page.
Partnership

Do not squash design ideas if they arise
This is design, not dispassionate science

Get instant feedback

If it works, you understand the work practice and have a solution

If it fails, you can improve your understanding of the work

Find the issues behind design ideas
Partnership

Avoiding Other Relationship Models

Interviewer / Interviewee
  You are not there to get a list of questions answered

Expert / Novice
  You are not there to answer questions

Guest / Host
  Move closer, ask questions, be nosy
Interpretation

Chain of Reasoning
- Fact, Hypothesis,
  Implication for Design, Design Idea

Design is built upon interpretation of facts
- Design ideas are end products of a chain of reasoning
- So interpretation had better be right

Share interpretations with users to validate
- Will not bias the data
- Teaches participant to see structure in the work
Interpretation

Instead of asking open ended questions…

“Do you have a strategy to start the day?”
“Not particularly.”

… give participants a starting point

“Do you check urgent messages first, no matter where they are from?
“Actually, things from my boss are important, because they are for me to do. Messages or faxes may be for anybody.”

Participants fine-tune interpretations

Probe contradictions until assumptions fit
Interpretation

Non-verbal cues can confirm or negate

Yes and Nos

“Huh?” – way off

“Umm, could be” – probably no, just being polite

“Yes, but…” or “Yes, and” – depends what follows

Commit to hearing what people actually say

Most have not ever had people actually pay careful attention to what they are doing
Focus

Everybody has a focus, you cannot prevent it

Entering focus
Project focus

Because you will have a focus, be mindful of that focus and use it to your advantage

Brainstorm and define your focus
Focus

Focus defines the point of view
- Clear focus steers the conversation
- Everyone in the team has an entering focus

Focus lets the interviewer see more
- Focus reveals detail

Focus conceals the unexpected
- Focus on one, and lose the other

Start with a focus and then expand
Focus

Opportunities to expand focus:

Surprises, contradictions, idiosyncrasies
   Nothing any person does is for no reason

Nods
   Question assumptions even if they match
   “Do they really do that? Why would they do that?”

What you do not know
   Treat interview as an opportunity to learn new stuff
   Even if the participant is not knowledgeable, extent of their knowledge / misinformation can be useful
The Stages of a Contextual Inquiry

1. Interview / Warm Up
2. Transition
3. Observe Behavior
4. Share Interpretation
5. Refine Interpretation
6. Wrap-up
7. Withdraw / Return
Explain the Rules

Be sure you explain “the rules” of how you’ll be interacting during the contextual inquiry.

If this isn’t completely clear, the encounter may devolve into a traditional interview (since this relationship is more familiar to people).
How to Screw it Up

Slipping into abstraction
  Keep it concrete, in the work, in the details

Not being inquisitive or nosy enough
  If you have the impulse to ask, do it right away

Being too pushy with interpretation
  If you ignore corrections, participant will shut down
How to Screw it Up

With the wrong person

They need to be willing to partner with you

Turning it into a regular interview

If you could have done it in a coffee shop, then you did not do a contextual inquiry

Multiple people present

Can be good if they talk, surface their thoughts
Bad if they do not talk, are not forthright
How to Screw it Up

Overly disrupting the task

- If you change the task, your data is less useful
- Withdrawal and return, maybe on a schedule
- Retrospective methods might be necessary (e.g., going through artifacts, prior critical incident)

Being stuck in your focus

- Important to have a focus, expectations of what you expect to be important
- But you learn by attending to misconceptions
When All Else Fails

Remember Master/Apprentice

Remember Context

Remember Withdraw & Return
Affinity Diagrams

Generated during group session

Each observation, idea, note to a post-it

Notes are hierarchically organized into themes, based on project focus
Today

Ethnography

Contextual Inquiry

Additional Methods
Many Design Research Methods

Many other design research methods are available, with different strengths.

Often apply multiple methods for complementary perspectives.

Fundamental goal remains to gain design insight through improved understanding of problems.
Interviews

Similar to contextual inquiry, but lacking context of direct observation

Set a focus, record, take notes, have two people

Can be Structured / Semi-Structured

Avoid leading questions

Interpret responses

Repeat and rephrase, probe terms and concepts
“can you give an example”, “tell me more”, “what do you mean”, “why was that important”

Ask when it did not happen as expected

Pair with questionnaires for depth / to humanize
Focus Groups

Moderated conversation among peers

- Moderator helps establish this,
- participants share experiences, wants/needs

Researcher benefits from their conversations

Prompts discussion topics

- Explanations of problems in status quo
- Underlying emotions in a process
- Desires / disagreements for new designs
Diary Study

Participants keep a diary
Possibly as primary data
Possibly to create mindfulness before interview
Diary Study

Participants keep a diary
Possibly as primary data
Possibly to create mindfulness before interview
Diary Study

Participants keep a diary
Possibly as primary data
Possibly to create mindfulness before interview
Experience Sampling

Emerges from “beeper study” method

Can be random, can be context-aware

Can gather self-report, photos, sensor data
Many Design Research Methods

Personal Inventories

“collections of artifacts selected by the participant”

Cultural Probes

“materials designed to inspire people to thoughtfully consider personal context and circumstance”

“maps … asked the elderly to mark zones for meeting others, being alone, dreaming…”

Method 62

Method 24
Many Design Research Methods

Behavior Mapping

“place-centered mapping”
“individual-centered mapping / traces”

Graffiti Wall

“candid feedback on behaviors and perceptions of current spaces”
Shadowing

“observational method that involves tracking somebody in their role”

“not intended to be covert … however subtle instances might be completed in public spaces …”

Useful reminder to be thoughtful and safe
multiple groups have been asked to leave be safe, be mindful of people
Value Sensitive Design

To be useful or usable is not the same as supporting important human values

Examples?
Value Sensitive Design

To be useful or usable is not the same as supporting important human values

Examples?

Independence  Fairness
Privacy       Freedom from Bias
Trust         Human Safety
Accountability Universal Access
Ownership and Property Sustainability
Value Suitabilities

Value Sensitive Design is an interactional theory

Values are not inherent in a given technology
But a technology is not value neutral

Some technologies are more suitable than others for supporting given values

Value Sensitive Design investigates stakeholders, values, and value suitabilities

Direct and indirect stakeholders
Tripartite Method

Conceptual Investigations
Analyses of the values involved in a system

Technical Investigations
Identify or develop technical mechanisms
Investigate suitability to support values

Empirical Investigations
Investigate who the stakeholders are, which values are important to them, and how they prioritize these values
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 03: Contextual Inquiry & Design Research

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 04: HCI History

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
Why do we do HCI in CSE?

Every engineering discipline includes the study of breakdowns and the design of improved solutions that address those breakdowns.
Tacoma Narrows
O-Rings

History of O-Ring Damage in Field Joints (Cont)

O-Ring Temp
(°F)

SRM No.

O-Ring Temp
(°F)

SRM No.

* No Erosion

Morton Thiokol, Inc.

Warren Operations

Information on this page was prepared to support an oral presentation and cannot be considered complete without the oral discussion.
O-Rings

O-ring damage index, each launch

26°-29° range of forecasted temperatures (as of January 27, 1986) for the launch of space shuttle Challenger on January 28

Temperature (°F) of field joints at time of launch
Tractors
Tractors
Tractors

National Agricultural Safety Database Quotes

Older tractors with narrow front ends are easily upset

Tractor upsets cause more fatalities than other farm accidents

Injuries often include a broken or crushed pelvis
Tractors

Tractor upsets used to be dismissed as driver error.

But such accidents are less frequent because modern designs have:

- roll cage
- low center of gravity
- wider wheel bases
Human Factors Tradition

Emerges during and after WWII, as highly trained people are failing to effectively control the machinery they operate

(pilots are crashing planes)

The phrase “human factors” now often has a connotation of studying factory workers, ergonomics, or other physical tasks

(ask me about Grudin article if interested)
1988: Iran Air Flight 655

In 1987, *USS Stark* was struck by two missiles launched by an Iraqi Mirage F-1, killing 37 with no weapons fired in self-defense during the attack.

In 1988, crew of the *USS Vincennes* Combat Information Center confusingly reported the plane as ascending and descending at the same time (there were two "camps").
1988: Iran Air Flight 655

The Airbus’s original track, number 4474, had been replaced by the *USS Sides* track, number 4131, when the computer briefly recognized them as one and the same. Shortly thereafter, track 4474 was re-assigned by the system to an American A-6, several hundred miles away, following a descending course at the time. Apparently not all the crew in the CIC realized the track number had been switched on them.
Why do we do HCI in CSE?

Every engineering discipline includes the study of breakdowns and the design of improved solutions that address those breakdowns.

Understanding how and why human interaction breaks down is fundamental to designing better computing systems.

This study must include computer scientists, as we are the ones creating the technology.
A History Question

Who invented hypertext? When?
Computing in 1945

Harvard Mark I, 55 feet long, 8 feet high, 5 tons
Computing in 1945

Harvard Mark I, 55 feet long, 8 feet high, 5 tons
Computing in 1945

Ballistics calculations
Physical switches (no microprocessor)
Paper tape
Simple arithmetic & fixed calculations (before programs)
3 sec. to multiply
Computing in 1945

First computer bug
(Harvard Mark II)
Adm. Grace Murray Hopper
A Little About Vannevar Bush

Name rhymes with “Beaver”
Faculty member at MIT
Coordinated WWII effort
with 6000 US scientists

Social contract for science

- Federal government funds universities
- Universities do basic research
- Research helps economy and defense
As We May Think

Published in the Atlantic Monthly in 1945

http://www.theatlantic.com/magazine/print/1945/07/as-we-may-think/3881/

Motivated in part by defining a scientific grand challenge as WWII was ending
As We May Think

“There is a growing mountain of research. … The investigator is staggered by the findings and conclusions of thousands of other workers—conclusions which he cannot find time to grasp, much less to remember, as they appear. Yet specialization becomes increasingly necessary for progress, and the effort to bridge between disciplines is correspondingly superficial.”
As We May Think

“The world has arrived at an age of cheap complex devices of great reliability; and something is bound to come of it.”

“Had a Pharaoh been given detailed and explicit designs of an automobile, and had he understood them completely, it would have taxed the resources of his kingdom to have fashioned the thousands of parts for a single car, and that car would have broken down on the first trip to Giza.”
MicroPhotography

Describes a combination of photocells, facsimile transmission, and electron beam technology

Enables capturing a photograph into micro form

“It would be a brave man who would predict that such a process will always remain clumsy, slow, and faulty in detail.”
MicroPhotography

“Assume a linear ratio of 100 for future use. Consider film of the same thickness as paper, although thinner film will certainly be usable. Even under these conditions there would be a total factor of 10,000 between the bulk of the ordinary record on books, and its microfilm replica. The Encyclopedia Britannica could be reduced to the volume of a matchbox. A library of a million volumes could be compressed into one end of a desk.”
Memex
Memex

“If the user wishes to consult a certain book, he taps its code on the keyboard…”

“Frequently-used codes are mnemonic, so that he seldom consults his code book;”

“He can add marginal notes and comments … even … by a stylus scheme”

“All this is conventional…”
Memex

“It affords an immediate step, however, to associative indexing”

“tying two items together is the important thing”

“Before him are the two items to be joined, projected onto adjacent viewing positions. At the bottom of each there are a number of blank code spaces, and a pointer is set to indicate one of these on each item. The user taps a single key, and the items are permanently joined.”
Memex

“Thereafter, at any time, when one of these items is in view, the other can be instantly recalled merely by tapping a button below the corresponding code space. Moreover, when numerous items have been thus joined together to form a trail, they can be reviewed in turn, rapidly or slowly, by deflecting a lever like that used for turning the pages of a book.”
Memex

“Wholly new forms of encyclopedias will appear, ready made with a mesh of associative trails running through them, ready to be dropped into the memex and there amplified.”

Memex is the first proposed hypertext system
A History Question

Who invented desktop computing?  When?
Macintosh in 1984 is well known

On January 24th, Apple Computer will introduce Macintosh. And you’ll see why 1984 won’t be like “1984.”

http://courses.cs.washington.edu/courses/cse440/videos/history/Apple1984.mp4
Alan Kay on Early Interface Work

Narrator is Alan Kay, speaking in 1987

This video is almost 20 years old
It was a historical account when it was filmed

Speaks to four systems

Sketchpad
NLS
GRAIL
Dynabook

http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987.m4v
Ivan Sutherland’s Sketchpad

http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987-Sketchpad.m4v
Ivan Sutherland’s Sketchpad

When do we think this was done?
Ivan Sutherland’s Sketchpad

When do we think this was done?

1962

Windows
Constraints (i.e., non-procedural)
Prototype/Instance Inheritance (i.e., object-oriented)
Doug Engelbart’s NLS (Online System)

http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987-NLS.m4v
Doug Engelbart’s NLS (Online System)

When do we think this was done?
Doug Engelbart’s NLS (Online System)

When do we think this was done? 1968

Invention of the mouse
First working hypertext system
Chording keyboard to reduce hand movement
Remote collaboration

Analog Mouse leads to heavy moding
Reactions include accusations of “faking it” and claims of irrelevance because “terminal can do that”
When do we think this was done?
When do we think this was done? 1968

Window handles
Modeless interaction via direct action
Gesture recognition

Proposed for end-user programming via flow charts
Dynabook

http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987-Dynabook.m4v
Xerox to Apple and Microsoft

XEROX Alto 1973
Xerox Alto
Xerox Alto

Ready:
Select file names with the mouse
Red-Copy, Yel-Copy/Rename, Blue-Delete
Click 'Start' to execute file name commands

Start

Page 0
Files listed: 60
Files selected: 0
Copy/Rename: 0
Delete: 0
Copy: 0

Log:

-- BEGINNING --
1012: AstraReds.Boot.
Anonymous.1.
Battleship.cr
Battleship.RUN.
Beblock.RUN.
BuildKalm.com.
Calculator.com.
Calculator.RUN.
Chess.log.
Chess.run.
Conf.com.
CompileKalm.com.
CRTTest.RUN.
DHT.boot.
EditBuild.run.
empress.run.
Executive.Run.
Fly.run.
galaxn.boot.
Garbage.3.
Geh.run.
GetFont.FL.
Intruders.Run.
junk.
junk.prsp.
Kal.boot.
Kal.com.
Kal.a.com.
Kal.M.com.
Kinetic4.RUN.
LookKalm.com.
MasterMind.RUN.
maze.run.
Maze1.Typescript.
Maze2.run.
NEPHERUS.RUN.
ether.run.
Pathfinder.Copy.run.
POLYGON3.RUN.

No DISK: <SYSDIR> "~"
Xerox to Apple and Microsoft

XEROX Alto 1973

Steve Jobs visits PARC in 1979
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Xerox Star
Xerox Star
Xerox Star

XEROX 8010 Star Information System

Star provides integrated text and graphics. A variety of typesizes and styles may be used.

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peas</td>
<td>$0.39</td>
</tr>
<tr>
<td>Beans</td>
<td>$0.50</td>
</tr>
</tbody>
</table>

NAME

0 Temporary title page
A Copyright and abstract
B Front matter
Chapter 1
Chapter 2
Chapter 3
Chapter 4
Chapter 5
Chapter 6
Chapter 7
References
Styles

SIZE

1 Page   10/30/84 13:29
2 Pages  11/06/84 16:12
4 Pages  10/31/84 22:05
11 Pages 10/30/84 13:56
15 Pages 10/31/84 22:49
21 Pages 11/02/84 15:41
36 Pages 10/31/84 21:47
15 Pages 11/02/84 15:45
7 Pages  10/30/84 18:02
13 Pages 10/31/84 22:10
3 Pages  10/31/84 21:58
5 Pages  10/22/84 11:42
Xerox Star
Xerox Star
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Lisa
Apple Lisa
Apple Lisa
Apple Lisa
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Macintosh 1984
Macintosh
Macintosh
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Macintosh 1984
Windows 1.0 1985
Windows 1.0
Windows 1.0

Floppy drive configuration as it conserves disk space. To use this feature change the "Spooler=yes" in the [windows] section of the WIN.INI file to read "Spooler=no".

Note: Setting Spooler=no will disable printing from Windows Terminal.

RUNNING BATCH (.BAT) FILES FROM WINDOWS
If you run a standard application from a batch file you should create a PIF file for the batch file. The PIF file should have the same PIF options set as the application. The Memory Required and Memory Desired options for the batch PIF file should always be set to 32K. This is independent of the memory requirements for the application.

Batch files should be run from the MS-DOS Executive.

RUNNING WINDOWS WRITE ON A TWO FLOPPY SYSTEM
Several precautions should be observed when using Windows
Windows 1.0
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Macintosh 1984
Windows 1.0 1985
Windows 2.0 1987
Windows 2.0 (1987)
Windows 2.0
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Macintosh 1984
Windows 1.0 1985
Windows 2.0 1987
Windows 3.0 1990
Windows 3.0
Windows 3.0
Windows 3.0
Xerox to Apple and Microsoft

XEROX Alto 1973
Steve Jobs visits PARC in 1979
XEROX STAR 1981
Apple Lisa 1981
Apple Macintosh 1984
Windows 1.0 1985
Windows 2.0 1987
Windows 3.0 1990

Bill Gates: "Hey, Steve, just because you broke into Xerox's house before I did and took the TV doesn't mean I can't go in later and take the stereo"
HCI Turing Awards

Sutherland wins 1988 Turing Award

Engelbart wins 1997 Turing Award

Alan Kay wins 2003 Turing Award

(in part for SmallTalk and OOP, though he says OOP is linked to the GUI)
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 04:
HCI History

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 05: Design Diamond

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
Quantity versus Quality

One class told they will be graded on quality, another on quantity

Bayles and Orland, 2001
Quantity versus Quality

The quantity class produces better pots. Why?
Quantity versus Quality

The quantity class produces better pots. Why?

“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
Sketching User Experiences

“Bill Buxton brings design leadership and creativity to Microsoft. Through his thought-provoking personal examples he is inspiring others to better understand the role of design in their own companies.”

Bill Gates—Chairman, Microsoft Corp.

Sketching User Experiences
getting the design right and the right design

Bill Buxton
Sketching

Theater: Shattuck Cinemas
Phone: (510) 665-1342 Dist: 1-5 mi.
Address: 2122 Shattuck Ave
Berkeley, 94709
Cost: $8.50 normal, $6.00 senior, $4.00 matinee

**Art of War**
(10:00)-(1:00): 4:00 - 7:00 - 10:00

**Bitter Sweet Motel**
(11:00)-(1:30): 4:00 - 6:30 - 9:00

**Gizailla**
(10:30)-(2:00): 5:30 - 9:00

**The Cell**
(1:00)-(1:00): 3:00 - 5:00 - 7:00 - 9:00

---

STORE FOR THE STYLE-CHALLENGED

AS IS...

- t-shirts
- buttons
- sweaters
- pants
- shorts

.../

**As it should be...**

- outfit #1
- outfit #2
- outfit #3

(pre-selected to match so you don’t have to choose.)
Sketching

MAP SHOWING PARKING AVAILABILITY BASED ON INPUTTED DATA, INPUTTED ON MAP

- Different colors
- Highlights availability

43RD
92ND
34TH

Ave

- Full

Sketching
Sketching

UBIGITOUS RICE COOKER

- LCD display shows number of cups & time remaining
- keypad for cups of rice input
- eject button opens drawer

"Just another drawer in your kitchen"

The uncooked rice is stored in a hidden reservoir. Water is acquired through a hose attached to your water source (similar to an espresso machine).
Sketching

A *process* that enables you to think through ideas and convey design ideas to others very early in the design phase.
Quintessential Activity of Design
Design as Choice

Elaboration
palette of choices

Reduction
heuristics to choose
Design as Choice

Two openings for creativity

- Palette of choices
- Heuristics used to choose

Why is your design research so important?

What you learn directly informs both of these, shaping everything you do this entire quarter
The Design Diamond

start

generate

select

intentional!

danger!
Properties of Sketches

Quick
Timely
Inexpensive
Disposable
Plentiful
Clear Vocabulary

Distinct Gesture
Minimal Detail
Appropriate Refinement
Suggest and Explore
Ambiguous
Quick

A sketch is quick to make, or at least gives that impression
Timely

A sketch can be provided when needed
Inexpensive

Cost must not inhibit the ability to explore a concept, especially early in design
Disposable

If you cannot afford to throw it away, then it is not a sketch

Investment is in the process, not the physical sketch

But they are not "worthless"
Plentiful

Sketches do not exist in isolation

Meaning and relevance is in the context of a collection or series
Clear Vocabulary

The way it is rendered makes it distinctive that it is a sketch (e.g., style, form, signals)

Could be how a line extends through endpoints

Physical sketches have their own vocabulary
Distinct Gesture

Fluidity of sketches gives them a sense of openness and freedom.

Opposite of engineering drawing, which is tight and precise.

vs.
Minimal Detail

Include only what is required
to render the intended purpose or concept
Minimal Detail

When we abstract an image through cartooning, we’re not so much eliminating details as we are focusing on specific details.

By stripping down an image to its essential “meaning,” an artist can amplify that meaning in a way that realistic art can’t.
Appropriate Degree of Refinement

Make the sketch as refined as the idea

If you have a solid idea, make the sketch look more defined

If you have a hazy idea, make the sketch look rougher and less defined
Suggest and Explore Rather than Confirm

Sketch should act as a catalyst to the desired and appropriate behaviors, conversations, and interactions.
Ambiguity

Intentionally ambiguous

Value comes from being able to be interpreted in different ways, even by the person who created them

Sketches have holes
Sketching as Conversation

Mind
knowledge, new knowledge

Sketch
representation

Create

Interpret

Requires ambiguity
## Sketch vs. Prototype

<table>
<thead>
<tr>
<th>Sketch</th>
<th>Prototype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invite</td>
<td>Attend</td>
</tr>
<tr>
<td>Suggest</td>
<td>Describe</td>
</tr>
<tr>
<td>Explore</td>
<td>Refine</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
</tr>
<tr>
<td>Propose</td>
<td>Test</td>
</tr>
<tr>
<td>Provoke</td>
<td>Resolve</td>
</tr>
<tr>
<td>Tentative, non committal</td>
<td>Specific Depiction</td>
</tr>
</tbody>
</table>

The primary differences are in the intent.
ABC News and IDEO’s Deep Dive
Sketching the Mouse

Making the Macintosh:
http://www-sul.stanford.edu/mac/index.html
Sketching the Mouse

Making the Macintosh:
http://www-sul.stanford.edu/mac/index.html
Physical Sketching
Physical Sketching
Physical Sketching

traditional workflow:
- 3D model
- hi-fi fabricated

low-fi fabrication:
- 3D model
- low-fi fabricated
- low-fi fabricated
- hi-fi fabricated

Mueller, WirePrint, UIST 2014
WirePrint (2014)

WirePrint
Fast 3D Printed Previews

Stefanie Mueller
Sangha Im
Serafima Gurevich
Alexander Teibrich
Lisa Pfisterer
François Guimbretière
Patrick Baudisch
WirePrint (2014)

WirePrint
Fast 3D Printed Previews

Stefanie Mueller
Sangha Im
Serafima Gurevich
Alexander Teibrich
Lisa Pfisterer
François Guimbretière
Patrick Baudisch
Physical Sketching
faBrickation (2014)

Stefanie Mueller, Tobias Mohr, Kerstin Guenther, Johannes Frohnhofen, Patrick Baudisch
faBrickation (2014)

Stefanie Mueller, Tobias Mohr, Kerstin Guenther, Johannes Frohnhofen, Patrick Baudisch
Physical Sketching

Mueller, Constructable, CHI 2012
Constructable (2012)
Constructable (2012)
The Design Diamond

start \rightarrow generate \rightarrow select

danger! \rightarrow intentional! \rightarrow danger!
Idea Oscillation

- start
- generate
- intentional!
- select
- dangerous!

Flow diagram showing the process of idea oscillation with various stages and annotations indicating potential dangers or cautions.
Critiquing Sketches is Important

Ideas are both good and bad

Both are useful in design
By making clear what is a bad design, we can avoid actually implementing it
Bad ideas help you justify your good ideas

Feedback can turn a good idea into a great idea

Sketching generates too many ideas to implement
Idea Oscillation
Iteration Toward a Design
Exploration of Alternatives
Exploration of Alternatives

... a designer that pitched 3 ideas would probably be fired. I'd say 5 is an entry point for an early formal review (distilled from 100's). ... if you are pushing one you will be found out, and also fired. ... it is about open mindedness, humility, discovery, and learning. If you aren't authentically dedicated to that approach you are just doing it wrong!

Alistair Hamilton
VP Design
Symbol Technologies
The Converging Path
Is this a sketch? Why or why not?
Is this a sketch? Why or why not?
Is this a sketch? Why or why not?
Is this a sketch? Why or why not?
Is this a sketch? Why or why not?
Is this a sketch? Why or why not?
Is this a sketch? Why or why not?
Is this a sketch? Why or why not?
Some Evidence

Task:
Create a web banner ad for Ambidextrous magazine.
Feedback in Parallel or Serial

Parallel condition

Serial condition

Dow et al. TOCHI 2010.
Procedure

serial prototyping condition

parallel prototyping condition

Dow et al. TOCHI 2010.
Parallel: more diverse, better, more clicks

Dow et al. TOCHI 2010.
Share one or share your best?

- Share multiple condition
- Share best condition
- Make one condition

Dow et al. TOCHI 2010.
Share Multiple: better, more clicks

Dow et al. TOCHI 2010.
Some Evidence

Greater divergence in designs
  Prevents sticking with the first idea
  Allows mashing ideas together

Alternatives facilitate feedback
  Enable comparison
  Can improve tone of critique
Sketching and the Design Diamond

The design diamond is fundamental to understanding what you are doing here.

Much of your education, including in CSE, has taught you to focus on having the right answer.

Here it matters what you do long before the end.

Most ideas get thrown out, including yours.

Better ideas are great criticism, and frequently would never have come about otherwise.
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 05: Design Diamond

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 06:
Critique and Task Analysis

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
Learning to Give and Receive Critique

You will learn to both give and receive critique
  Each is important
  Each is a skill developed through practice

Many activities will consist of group critiques
  Each group will present an artifact
  Other class members and staff will offer critique

Starting tomorrow with critique of
Assignment 2c: Design Research Check-In
Why Critique?

Critique helps evaluate early, often, and cheaply
  Applicable to artifacts of many types
  Compare to other expert inspection methods

You are not your own worst critic
  We collectively know more than any one of us
  It is hard to see past your own decisions
  Design requires getting past our own infatuation

A design can feel like our love, our baby...
Why Critique?

Critique is not just for design

It applies to many artifacts and domains

Examples?
Why Critique?

Critique is not just for design

   It applies to many artifacts and domains

Examples?

   visual art, writing, design, code (i.e. code review)

Over time, you should gather people who can give you high-quality critique in everything you do

   You may meet some of those people in this class
Critique is About Improvement

http://alistapart.com/article/design-criticism-creative-process
What is Critique?

Critique is a method for feedback

It is not just a list of complaints

1. Presenters sit down with critics
2. Quickly explain their artifacts (e.g., less than 2 minutes)
3. Critics give feedback, ask questions
4. Presenters respond, take notes on what is discussed
Critique is Neither Criticism nor Design

Seriously, not just a list of complaints

Critics offer honest feedback

Both positive and negative

Presenters should be able to learn what works well and what is problematic about their artifact

It is then presenter’s responsibility to sort through feedback, decide what is important, how to act

You must take notes for later review
Tips for Presenters

Critique can be hard, especially at first

Try to avoid being defensive

  You are not your work, separate yourself

Remember the expertise you bring

  Even if “the room” knows more about design, you know more about your problem / artifact and your rationale for the current design
Tips for Presenters

Taking advice is not giving up authorship

You still make the final decisions
A half-baked suggestion does not contain all the details of a finished solution

Design your critique

What you show invites different forms of feedback
Verbally indicate what kind of feedback you want, but also provide an artifact of appropriate form
This course will guide you in a variety of forms
Tips for Presenters

Keep an eye out for design rationale

You probably made some decisions without thinking through good reasons at the time
Critique can help give a rationalization for past decisions as you explain the artifact to others

Exploit failure

A “failed” artifact should teach you about the design space, what won’t work, and why
The goal is to improve, this requires failure
Tips for Critics

There are many strategies for giving critique

Hamburger method
I like, I wish, what if

Socratic method

These provide ways to give critique that can help the conversation go smoothly

Can give you a question to ask when you do not have one, provide a way to ask that is productive and less likely to create defensive reaction
Tips for Critics: Hamburger Method

“Bun, meat, bun”

Bun:
Something fluffy and nice

Meat:
Criticism on how to improve

Bun:
Something fluffy and nice

Not a “shit sandwich”
Positives need to be genuine, enable learning from both positive and negative aspects of the artifact
Tips for Critics: I Like, I Wish, What If

I Like:
   Lead with something nice

I Wish:
   Some criticism, often leading from what you like

What If:
   An idea to spark further conversation, better than: “I think you should have…” or “Why didn’t you …”
   Gives the presenter benefit of the doubt if they did already think of your idea, can present rationale
Tips for Critics: Socratic Method

Identify an aspect of the design and ask “Why?”

- Can be good if unsure what else to say
- Forces presenter to give, or develop, explanations for design decisions, which can help build up the design rationale
- Not fundamentally negative, hard to get defensive
Tips for Critics

Limit your use of personal pronouns (e.g., “you”)  
Critique is about the artifact, not the designer

A designer deserves honest feedback  
Both positive and negative  
Including clarity and rationale

Help with actionable suggestions  
But it is not your design  
Perhaps several possible ways of thinking
Summary

Fall out of love with the things you build
  Let others help you see past the infatuation
Get feedback early, often, and cheaply
Focus on improvement
  In brainstorming, we were not criticizing
  In critique, we are not defending
You will learn to both give and receive critique
  If you are having difficulty, please come talk to us
Design Research Reminders

You are not doing science

You seek design insight, not knowledge or truth

Do the best design work you can

May find that self-tracking is not the opportunity

We designed the project sequence, but be flexible

Capture and keep your raw work products

Dedicate a note keeper, record if possible

Our collection is minimal, but you will want them
Structure of Section and Critique

Focus on peer feedback and learning

Bring paper, keep the laptops put away
Bring your artifacts, be ready to present them

Critique progression

Reminder of your project
What you have done
What you have learned
  about your project, about your method
Your plan going forward
Time for critique
Questions you have for the group
Developing Insight Is Hard

Design research yields a lot of data

*Does not reduce to a statistical test*

Need to get from data to design insight

But this is fundamentally difficult
Affinity Diagrams

Generated during group session

Each observation, idea, note to a post-it

Notes are hierarchically organized into themes, based on project focus
Developing Models

Distilling models that summarize data
- Highlights gaps in understanding
- Identify breakdowns and workarounds

Many types of models
- e.g., Flow, Sequence, Artifact, Cultural, Physical
- None is perfect, they highlight different things
Flow Model: Secretarial Hub

**President**
- Run the business
- Keep abreast of what's going on
  - Sign checks
  - Go on trips

**Worker**
- Do the work of the business
  - Meet with management

**Vendor**
- Invoice for services

**Sales manager**
- Run the sales department
  - Travel to sales offices

**Marketing manager**
- Run the marketing department
  - Produce proposal

**U1 (Secretary)**
- Keep office organized
  - Ensure bills paid on time
  - Do final proof, print, and distribution of documents
  - Manage and coordinate schedules
  - Handle logistics of trips

**Proposal to proof and mail**
- Requires lots of iterations

**Announcement**

**Request to book trip**

**Request to schedule meeting with president**

**Checks to sign**

**Department's reports**

**Checks**

**Invoices**

**Discussion of travel plans**

**Bulletin board**
- Announce events of general interest
- Hold documents that manage shared projects
Sequence Model: Doing Email

Intent: Handle emergencies

- Trigger: Return to the office
- Scan message list for important message—Use sender, subject
- Choose urgent message
- Read message about unhappy user
- Decide more info needed
- Make phone call
- Had to put off issue of unhappy user
- Leave phone message

Intent: Get back to people easily

- File in phone folder
- See list of messages
- Choose message 9: subject indicates university news relevant to department
- Read message
- Delete message
- See message 10 automatically
- Read message 10
Sequence Model: Equipment Audit

Assigned to do equipment audit

- Retrieve required form from database
  - Print form
  - Collect data at site
    - Record data on paper form
      - Type data into form on computer
      - Print form
  - Print completed form
  - Leave hardcopy of form with customer
  - Send electronic form to supervisor
    - Store electronic form on form database
Cultural Model: Developer

Marketing
- Our new features are top priority.
- If I say do X, you figure out what that means.

Competitors
- We have 50 new features; catch up.

Base technology group
- You aren't our primary user; we'll fix bugs for you in our own time.
- Our technology is standard; use it even if it doesn't work.

Customer support
- Our bug reports are top priority.

U9 (Developer)
Artifact Model: Calendar

- Past (seldom accessed)
- Future (quick access)

- Scheduled events
- Unscheduled but associated with the day
- Reminders (storage with quick access)

- Business cards (storage for later)
- Rubber band

- Meetings
- Appointments
- Reminders
- Strike out a day
- Notes
- Never used
Physical Model: Work Site

Approximately a 5 minute walk. If doing an audit at a site under construction, then safe path frequently changes and may need to wait for construction equipment to pass.

Work Site

- Maybe outside
- Large area (up to square mile)
- Tight spaces
- Climbing
- Awkward positions

Company Trailer

Computer
Tasks Matter

System will fail if:

- It is inappropriate for the person
- It does not meet a person’s needs

Your contextual inquiries will emphasize getting to know people and their needs

Can you then just make ‘good’ interfaces?
Why Task Analysis?

‘Good’ has to be interpreted in the context of use
  Might be acceptable in office, but not for play
  Infinite variety of tasks and customers

Guidelines are too vague to be generative
  e.g., “give adequate feedback”
  Can be used to critique, but not to generate

Design is often about tradeoffs
Why Task Analysis?

Task analysis is a lens on the information you obtain through design research methods.

Use what you learned in your research to answer the questions in the task analysis.

Your assignments order the two, but in practice you should iteratively decide how to best draw upon all relevant methods throughout a process.
11 Task Analysis Questions

Who is going to use the system?
What tasks do they now perform?
What tasks are desired?
How are the tasks learned?
Where are the tasks performed?
What is the relationship between people & data?
What other tools do people have?
How do people communicate with each other?
How often are the tasks performed?
What are the time constraints on the tasks?
What happens when things go wrong?
Question 1

Who is going to use the system?

Identity
In-house or specific customer is more defined
Broad products need several typical consumers

Background

Skills

Work habits and preferences

Physical characteristics and abilities
Seattle Parking Meter

Who is going to use the system?

Identity?
People who park in Seattle
Business people, students, elderly, tourists

Background?
Have used parking meters before
May have an ATM or credit card
Have used other fare machines before
Seattle Parking Meter

Who is going to use the system?

Skills?
May know how to put cards into ATM

Work habits and preferences?
Park several times a week, a month, a year

Physical characteristics and abilities?
Varying heights, do not make it too high or too low

Anything else?
PARK, PAY & DISPLAY
Parking Pay Station Instructions

1. Insert card and push BLUE button to buy time OR Insert coins to buy time
2. Push GREEN button to print receipt
3. Remove card quickly wait for receipt and display properly
4. Display one receipt only to park in any meter or pay station space until your time expires

Use the removable backing to tape receipt to INSIDE of a front-seat side window

PARALLEL curbside

Questions? Call 684-ROAD (7623)
paystations@seattle.gov

SDOT
Seattle Department of Transportation

Questions? Call 684-ROAD (7623)
paystations@seattle.gov

SDOT
Seattle Department of Transportation
Question 2 and Question 3

What tasks do they now perform?
What tasks are desired?

Important for both automation and new functionality
Relative importance of tasks?
Observe people, see it from their perspective

Automated Billing Example
small dentists office had billing automated
assistants were unhappy with new system
old forms contained hand-written margin notes
e.g., patient’s insurance takes longer than most
POPOVERS

2 cupfuls flour
1/2 teaspoonful salt
2 teaspoonfuls melted fat
2 eggs
2 cupfuls milk

Beat eggs slightly. Sift flour and salt, and add alternately with milk to eggs. Add melted fat. Beat with egg beater until smooth and full of bubbles. Fill hot greased cast aluminum or iron pans or glass or earthenware custard cups, 1/4 full of popover batter. Place immediately in a hot oven of 450°F. and bake for 30 min. Then lower temperature to 350°F. and bake for 15 min. longer. Makes 9 popovers.

CORNBREAD

2 cupfuls cornmeal
1 teaspoonful soda
1 1/2 teaspoonfuls salt
2 cupfuls sour milk
2 eggs, beaten
3 tablespoonfuls melted fat
3 tablespoonfuls sugar

Sift dry ingredients together. Mix milk with beaten eggs and add to dry ingredients. Stir well together and add melted fat. Pour into a hot greased baking pan or muffin tins and bake in hot oven of 400°F. for 20-25 min. Makes 24 pieces.
Question 4

How are the tasks learned?

What does a person need to know?

Do they need training?

academic

general knowledge / skills

special instruction / training
Question 5

Where are the tasks performed?
Office, laboratory, point of sale?
Effects of environment on customers?
Are people under stress?
Confidentiality required?
Do they have wet, dirty, or slippery hands?
Soft drinks?
Lighting?
Noise?
Question 6

What is the relationship between people & data?

**Personal data**
- Always accessed at same machine?
- Do people move between machines?

**Common data**
- Used concurrently?
- Passed sequentially between customers?
- Remote access required?
- Access to data restricted?
- Does this relationship change over time?
Question 7

What other tools does a person have?

More than just compatibility

How customer works with collection of tools

Automating lab data collection example:
how is data collected now?
by what instruments and manual procedures?
how is the information analyzed?
are the results transcribed for records or publication?
what media/forms are used and how are they handled?
Question 8

How do people communicate with each other?
Who communicates with whom?
About what?
Follow lines of the organization? Against it?
Question 9

How often are the tasks performed?
Frequent use likely remember more details
Infrequent use may need more help
Even for simple operations
Make these tasks possible to accomplish

Which function is performed
Most frequently?
By which people?

Optimizing for these will improve perception of performance
Careful about initial use scenario
Question 10

What are the time constraints on the tasks?

What functions will people be in a hurry for?

Which can wait?

Is there a timing relationship between tasks?

e.g., pregnancy in web search
Question 11

What happens when things go wrong?
How do people deal with task-related errors?
practical difficulties?
catastrophes?
Is there a backup strategy?
What are the consequences?
Plantr Task Analysis

1. Who is going to use the system?

Anyone who owns indoor plants is a potential user of Plantr. All of the plant owners that we interviewed forgot to water their plants at some point regardless of age, experience, and background. Even Lucy, who spent most of her time at home because she worked from home, struggled with timely watering.
Plantr Task Analysis

2. What are the currently possible tasks?

When people purchase a plant, they often look up information about the proper lighting and temperature conditions for their plants. Additionally, people must find out how much and how frequently to water and fertilize their plants.
Plantr Task Analysis

3. What are currently unavailable, desired tasks?

People want a way to remember to water and care for their plants. Forgetting to water plants was the most cited reason for plant death, and the only task that participants in our inquiries mentioned completing on a regular basis.
4. How are tasks learned?

Most people learned how to take care of their plants through trial and error. Some consulted the Internet, nursery staff, or friends for more information on plant care.
Plantr Task Analysis

5. Where are the tasks performed?

Tasks like watering and fertilizing are performed at the plant's location. People keep plants in their workplace, like Jack, or at home, like Lucy and Caroline. Getting information about plant care was performed in a variety of places. People who consult the Internet could be anywhere with a platform that supports web browsing. Those who go to the nursery to talk to plant experts are required to go to a specific location to talk to someone in person.
Plantr Task Analysis

6. What is the relationship between a person and data?

We identified three different types of data: a plant’s current state, information about plants, and data that reflects the person’s plant care history.

A plant's current state is data on the moisture level of its soil and the general appearance of the plant (e.g., color, stiffness/limpness of leaves). People use this information to determine the plant's needs. Caroline and Lucy watered their plants when the soil felt dry or the leaves began to droop.
Plantr Task Analysis

6. What is the relationship between a person and data?

People consulted various plant care information databases when they wanted to know how to care for their plants.

People used their personal history of plant care to determine how to take care of plants. Caroline said that she used to underwater plants, but she learned from her mistake and now tries to water them more often. People also base their buying decisions based upon their plant care history. Caroline noted that she tries to buy plants that require minimal water.
Plantr Task Analysis

7. What other tools do people have?

Caroline, Lucy, Jack, and Kacy all have phones and computers. People also have a water source, pots, and soil for their plants. Most people probably have access to a nursery or library.
8. How do people communicate with each other?

Plant owners communicate on online forums and message boards. People who happen to be in the nursery at the same time might talk to each other about plant care. Likewise, people who have friends with indoor plants may share plant care tips.
Plantr Task Analysis

9. How often are the tasks performed?

Watering is performed with a frequency between twice a week (Jack) and twice a month (Caroline). Fertilizing is performed less frequently, between once every two weeks to once every three months. Plants do not become sick often enough to make a good estimate about how often people try to get help.
10. What are time constraints on the tasks?

Plants must be watered with some regularity, so if people do not water their plants for long enough, the plants will start to die. Likewise, if plants are in need of attention for other reasons - pH imbalance, environment too dry - and they do not receive attention within some amount of time, they will die. Watering, caring, and learning how to care for a plant takes time. People who are very busy might not have the time or attention required for plant care.
Plantr Task Analysis

11. What happens when things go wrong?

When plants became "sick", people take action, seek help, or ignore the problem until the plant dies. When people forget to water plants, they usually notice that the plant needs water and give it water. Sometimes people may not realize that a plant needs water until it is too late.
Selecting Tasks

Real tasks people have faced or requested
- collect any necessary materials

Should provide reasonable coverage
- compare check list of functions to tasks

Mixture of simple and complex tasks
- easy tasks (common or introductory)
- moderate tasks
- difficult tasks (infrequent or for power use)
What Should Tasks Look Like?

Say what person wants to do, but not how
  allows comparing different design alternatives

Be specific, stories based in concrete facts
  say who person is (e.g., using personas or profiles)
  design can really differ depending on who
  give ‘names’ (allows referring back with more info later)
  characteristics of person (e.g., job, expertise)
  story forces us to fill in description with details

Sometimes describe a complete “accomplishment”
  forces us to consider how features work together
Task: Park in a New Neighborhood

Peter is going to brunch on a Sunday with his roommates. He is trying a new place he found on Yelp. He has the address for the place and he is using his phone’s GPS for directions. He leaves the apartment with his roommates at 8:30am and he wants to beat the crowd so they won’t have to wait in line. He is driving a Toyota Corolla that he has owned for five years. It is a rainy day and he doesn’t have an umbrella.
Hierarchical Task Analysis

Steps of the task execution (detailed in a hierarchy)

park in new neighborhood

- determine destination
- drive to destination
- locate parking spot
- secure parking spot
- park

- enter address in GPS
- follow directions
- arrive at destination

...
Hierarchical Task Analysis

Steps of the task execution (detailed in a hierarchy)

park in new neighborhood

- determine destination
- drive to destination
- locate parking spot
- secure parking spot
- park

- enter address in GPS
- follow directions
- arrive at destination

...
Using Tasks in Design

Write up a description of tasks formally or informally run by people and rest of the design team get more information where needed

Manny is in the city at a restaurant and would like to call his friend Sherry to see when she will be arriving. She called from a friend’s house while he was in the bus tunnel, so he missed her call. He would like to check his missed calls and find the number to call her back.
Using Tasks in Design

Rough out an interface design
discard features that do not support your tasks
or add a real task that exercises that feature
major elements and functions, not too detailed
hand sketched

Produce scenarios for each task
what person does and what they see
step-by-step performance of task
illustrate using storyboards
Scenarios

Scenarios are design specific, tasks are not

Scenarios force us to
show how things work together
settle arguments with examples
but these are only examples,
and may need to look beyond flaws

Show people storyboards
topic for Tuesday
Tasks, Personas, and Scenarios

**Task**: a design-agnostic objective

**Persona**: a fictional person with a backstory

**Scenario**: narrative that demonstrates a persona completing a task using a particular design

**Use Case**: in software engineering, describes requirements using one or more scenarios
Tasks in Your Projects

Say what is accomplished, not how

Real tasks that people currently encounter, or new tasks your design will enable

Reasonable coverage of the interesting aspects of your problem and your design space

Range of difficulty and complexity

Park at the zoo
Park Friday night in Ballard
Park at the airport
Combine with Other Methods

Personas
Concept Mapping
Competitive Analysis

“If you want to create a product that satisfies a broad audience …, logic will tell you to make it as broad in its functionality as possible to accommodate the most people. Logic is Wrong.”
Combine with Other Methods

Personas
Concept Mapping
Competitive Analysis

Example Personae:
Parent concerned about safety
Carpenter transporting tools
Executive wants a sporty car

More specific is effective
Give the person detail
Give them a name
Make it believable

Careful of stereotyping
Web littered with examples
Combine with Other Methods

Personas
Concept Mapping
Competitive Analysis

Method 16
Combine with Other Methods

Personas
Concept Mapping
Competitive Analysis

Method 16
Combine with Other Methods

Personas
Concept Mapping
Competitive Analysis

Method 15
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 07:
Storyboarding and Video Prototyping

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
Tasks in Sketching and Design

Tasks guide your exploration of a design

Creating scenarios for each task illustrates

what a person does
what they see
step-by-step performance of task with a design
Sketching

Theater: Shattuck Cinemas
Phone: (510) 665-1342 Dist: 1.5 mi
Address: 2122 Shattuck Ave
Berkeley, CA 94709
Cost: $8.50 regular, $6.00 senior, $4.00 matinee

Movies

Art of War ★★★
(10:00) - (12:00) 4:00 - 4:00
Bittersweet Motel ★★★★
(11:00) - (12:30) 4:00 - 6:30 - 9:00
Godzilla ★★
(10:30) - (11:45) 5:30 - 9:00
The Cell ★★★★
(11:00) - (1:00) 3:00 - 5:00 - 7:00 - 9:00

Store for the Style-Challenged

As it is...

... [drawings of clothes]

As it should be...

[drawings of different outfits]

(Pre-selected to match so you don't have to choose.)
Sketching

MAP SHOWING PARKING AVAILABILITY BASED ON INPUTTED DATA, INPUTTED ON MAP

- Different colors
- High lights availability

PACIFIC
43RD
92ND
34TH
### Sketching and Tasks

<table>
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<tr>
<th>Attendance List</th>
<th>Sort By: Last Name</th>
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<th>Section</th>
<th>Major</th>
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- **Lee, Benjamin**
  - Enrollment: 12345678
  - Level: Senior

- **Santos, Allen**
  - Enrollment: 23456789
  - Level: Senior

- **Schwartz, Jonah**
  - Enrollment: 34567890
  - Level: Senior

**Go to Attendance View**

**Back to main menu**

- 38 Present, 2 Absent

**Done**

**Look Up:**

- Refresh w/new info
- Take Attendance
- From students’ PDA
- Highlights student
Sketching and Tasks

SCENARIO 1: "I want to listen to alternative music"
Sketching and Tasks
Sketching and Tasks
Sketching and Tasks
Illustrating Time

Storyboards come from film and animation

Give a “script” of important events
leave out the details
concentrate on the important interactions
Storyboards

Can be used to explore

Much faster and less expensive to produce

Can therefore explore more potential approaches

Notes help fill in missing pieces of the proposal

Relative to film, these function as sketches
Storyboards

Can be used to convey

Effective storyboards can quickly convey information that would be difficult to understand in text

Imagine explaining this in text, for various audiences
Storyboards

Can illustrate key requirements and leave open less important details of design.
Basic Storyboard
Storytelling

Stories have an audience

Other designers, clients, potential end-users, stakeholders, managers, funding agencies

Stories need to match audience and purpose
Potential Purpose of a Story

Purpose allows choosing effective details

Stories have a purpose

Share information about people, tasks, goals
Giving insight into people who are not like us, convey details that might be lost in generalities
Put a human face on analytic data
Spark design concepts and encourage innovation
Share ideas and persuade on potential value
Stories Provide Context

Characters
  Who is involved

Setting
  Environment

Sequence
  What task is illustrated
  What leads a person to use a design
  What steps are involved

Satisfaction
  What is the motivation
  What is the end result
  What need is satisfied

Details of interface features and components are not necessarily surfaced, they can often be developed and conveyed more effectively with other methods.

Can help surface details that might otherwise be ignored.

Grocery store application:
- use with one hand while pushing a shopping cart
- privacy of speech input
- split attention
Amal’s Guide to Storyboarding

- Cities → S.F. → S.J. → Halifax

No!

Don’t use this to illustrate all the UI features & components.

***This is what paper prototyping is for!

Red & Sean were bored after going to the bluegrass festival, so decided to find out what else they could do...

Dude, what do we do?!

Let me use yours AT&T!

Instead, show why & when features would be used.

Amal Dar Aziz
Amal’s Guide to Storyboarding

Let's try out Burmese Superstar. Amal rated it, & it sounds cool!

Sure!

& show satisfactions

Finally, be creative! You don’t need to be an artist. To get a point across.
Amal’s Guide to Storyboarding

Let's try out Burkinese Superstar. Amal rated it, cool!

Show satisfactions

Sure.

Kid

& finally, be creative! You don't need to be an artist to get a point across.
Storytelling

Good stories
- Understand audience
- Provide context of use
- Are well-motivated
- Memorable
- Evokes a reaction
- Evokes empathy
- Illustrate experience
- Convey emotions
- Short and to-the-point

Bad stories
- Do not account for audience
- Boring or un-engaging
- Fantastical or unrealistic
- Wrong story for purpose
- Too long to hold attention

tl;dr
Elements of a Storyboard

Visual storytelling

5 visual elements

- Level of detail
- Inclusion of text
- Inclusion of people and emotions
- Number of frames
- Portrayal of time

To better characterize design intuitions:
gather and analyze artifacts
semi-structured interviews
survey focused on identified elements

Truong et al, 2006
1. How Much Detail?

Guideline: too much detail can lose universality

Scott McCloud
1. How Much Detail?

Sketching People

Star people by Bill Verplank

(c) 2009 SACHA CHUA

Keith Haring
1. How Much Detail?
1. How Much Detail?

Unnecessary details distract from the story
2. Use of Text

Guideline: It is often necessary, but keep it short
2. Use of Text

Guideline: It is often necessary, but keep it short

1. At home, Mary checks her blood pressure.
2. After a few simple key presses, her blood pressure readings get sent to a clinic.
3. The information is made available to her doctor.

Short text is more effective, less likely to over-explain.
Watch for cases where text induces weird biases.
3. Include People and Emotions

Guideline: Include people experiencing the design and their reactions to it (good or bad)

Remember, the point of storyboards is to convey the experience of using the system
4. How Many Frames?

Guideline: 4-6 frames is ideal for end-users

- Less work to illustrate
- Must be able to succinctly tell story
- Potentially longer for design clients

More is not always better

- May lose focus of story
- May lose attention
4. How many frames?
4. How many frames?

People found the extra panels were not needed
5. Passage of Time

Guideline: Only use if necessary to understand
5. Passage of Time

Guideline: Only use if necessary to understand

Inclusion of the clock distracts
Storyboards for Comparing Ideas

**Authoritative**

Hey! You need to exercise at least 20 days a month.

Oh! Um... Okay.

Cell phone is used to keep track of one's fitness goal.

**Supportive**

Hay! I will keep a record of days you exercise.

Okay! Let's do it.

Good job! You've exercised more than 20 days a month!

Cell phone is used to keep track of one's fitness goal.
Storyboards for Comparing Ideas

Cooperative

Let's use our cell phones to keep a record of the number of days that we exercise!

Okay! Let's work together to meet a goal of exercising for at least 2 weeks.

Competitive

Let's compete to see who exercises more.

Okay, let's do it!

1st Week

2nd Week

1st Week

2nd Week

Yeah! We are almost there. Good job!

Yeah! I win this week! Let's see who wins next week.
Storyboards for Comparing Ideas

Negative Reinforcement

Week 1

I'm going to use my phone to keep track of my fitness goals.

Week 2

Oh no! My virtual garden on my phone is ugly. I need to exercise to keep the flowers alive!

Now I have lots of flowers in my garden!

Positive Reinforcement

Week 1

I'm going to use my phone to keep track of my fitness goals.

Week 2

Each time I exercise, I will get another item added to my garden.

Now I have a full garden!
Examples and Tricks in Storyboarding

This is also the focus of Reading 2

Due Friday night
(not needed for Friday section)

Will go over these quickly, especially the videos

You then view them outside of class
Drawing is Hard

**IT IS SO DARK JAN CAN HARDLY READ HER BOOK**

**SHE GESTURES IN FRONT OF HER SPECIAL PENDANT TO TURN ON THE LIGHTS**

**THE LIGHTS TURN ON!**

**FINALLY, SHE CAN READ HAPPILY.**

Will a picture work instead?
Existing Images from Other Sources

http://designcomics.org/

http://www.pdclipart.org/
Blur Out Distracting Details

Using image editing software to simplify photos into sketches.
Tracing Photos

Baudisch and Chu, 2009
Mapping the Space of Interaction
Comic Presentation

After a long workday, Jen decides to check traffic before heading home...

Hi Jen, we're going to Linda's tavern for drinks around 7 tonight, you interested?

Sounds good, what's the best way to drive there from my place?

Not sure... just google it.

Will do. CYA later.

A month goes by...

According to AltVerto, I've saved a lot of money by taking the bus. It's a shame that there aren't convenient bus routes for my commute.

aren't you always telling me about your weekend bike rides?

why not bike?

Maybe... I'd have to get some advice and figure out a good route first.

Later that same year...

More bike lanes downtown would make my commute a lot safer. I should do the critical mass ride.

Field trial participants not only reported changing their behavior - reducing single occupant trips by around 10% - but they also told us about encouraging their peers and colleagues to do the same during and after the field trial.

Gukeisen et al., 2007
Selective Use of Color

An F?! But I studied for hours yesterday!!

5 PM

12 PM

5 PM

Oh my gosh!

YESTERDAY

10 AM

Productive

20%

Distracted

80%

YESTERDAY

3:30 PM

Facebook

Recommendation

Use Facebook blocker
Route Maps

The Family Circus

- Will you go gather some firewood, Billy?
- Okay, Mommy!
- Tack's car in a hurry!
- Picks some blackberries for Mommy.
- Is this enough firewood, Mommy?
- Suddenly remembers march of the muskrat!
- Sees cipples remains left by Indians!
- Spots turtle on rock but can't reach it.
- Hurriedly grabbing a few sticks.
- Grabs play stone across water.
- Escapes across old log.
- Exits quickly!
Route Maps

You're in Central Park. 2 hours until dinner with Simon.
What to do?

You enable geocaching mode on your phone and spend the next two hours exploring.

Dinner!
Route Maps
Route Maps

The movie is over and you are hungry, but you don't know the area...

Eventually settling on a diner and getting directions through your phone.

You check your phone for a list of places people often go from here...

And discuss the food options with your friends...
Value of Animation or Video

Can illustrate critical timing

Can be more engaging than written or storyboard

Can help convey emotion (e.g., voice, music)

Can show interactive elements more clearly

Can be self-explanatory

If done well, can be an effective pitch

But you need to keep it quick and effective
Most Important Trick: Stop Motion

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Mackay-StopAction.mp4
Most Important Trick: Stop Motion

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Mackay-StopActionResult.mp4
Video Prototypes

May build upon paper prototypes, existing software, and images of real settings

Narration optional

- Narrator explains, actors move or illustrate interaction

- Actors perform movements and viewer expected to understand without voice-over
Steps to Create a Video Prototype

Review field data

Review ideas from brainstorm

Create text for usage scenarios

Develop storyboard, with each scene on a card, illustrating each action/event with annotations explaining what is happening
Steps to Create a Video Prototype
Steps to Create a Video Prototype

Shoot a video clip for each storyboard card

Avoid editing in the camera, just shoot scenes

Use titles to separate clips

Like a silent movie

Digital changes these tradeoffs, but respect the spirit of doing this quickly to get point across

If you make an error, just reshoot it
Prototyping Microsoft Surface

Prototyping Microsoft Surface

Lessons from Prior Video Prototypes

Narration, Pace, and Flair

Three versions of “Don’t Forget”

Using Projectors and Simple Props

“Buddy Map”

Watch for Pace and Scene Relevance

“Consumemester”
Narration, Pace, and Flair

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Don't-Forget-1.mp4
Narration, Pace, and Flair

Don't Forget!

Video Prototype

1 February 2007

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Don't-Forget-2.mp4
Narration, Pace, and Flair

"Don't Forget" Video Prototype
Chris Govella - Peter Woodman

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Don't-Forget-3.mp4
Using Projectors and Simple Props

Team Buddy Map

Backcountry Savior

Craig Panthen : Philip Kuo : Heidi Tanamulia : Christopher White
CSE 440F : Professor Landay

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Buddy-Map-Backcountry.mp4
Watch for Pace and Scene Relevance

Consumester
Video Prototype

http://courses.cs.washington.edu/courses/cse440/videos/vidoprototyping/Consumester.mp4
Lessons from Prior Video Prototypes

Split Presentation, Simple Effects
  “PickUp”

Still-Frame, More Effects
  “Graffiti Karma”
Split Presentation, Simple Effects

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Pickup.mp4
Still-Frame, More Effects

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Graffiti.mp4
Lessons from Prior Video Prototypes

Scenario with a Contrast

“ParkSmart” (note that screens are static images)

Playful while Keeping Pace

“Plantr”
Scenario with a Contrast

But watch for pace and scene relevance

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Parksmart.mp4
Playful while Keeping Pace

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Plantr.mp4
Reminder on Fidelity

http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Mug-Sketch.mp4
http://courses.cs.washington.edu/courses/cse440/videos/videoprototyping/Mug-HiFi.mp4
Fidelity Takes Time: Stay Low Fidelity

If you need a video, do you really need footage?

If you need an animation, do you really need Flash?

If you need a photo, do you really need to shoot?

 Completely made-up bar length

But it is probably at least this bad
Range of Purposes

Illustrating Low-Level Techniques

Microsoft Surface examples convey timing

Illustrate Designs

Focus in this course

High-Level Visions

StarFire

Knowledge Navigator

A Day Made of Glass
Sun’s “Starfire” (1994)

http://courses.cs.washington.edu/courses/cse440/videos/vidoprototyping/Vision-Sun-Starfire.mp4
Apple’s “Knowledge Navigator” (1987)

Corning’s “A Day Made of Glass” (2011)

Summary

Think about your audience
Think about your time constraints
Think about the purpose of your story

Think about options for effective presentation
These are Examples of What?

Popsicle-stick bridge

\[ x = x_0 + v_0 t + \frac{1}{2} at^2 \]

ACT-R

Goffman’s Negotiated Approach

Norman’s Execution-Evaluation Cycle
Models

We have said models describe phenomena, isolating components and allowing a closer look

Today is a closer look at modeling humans

Capture essential pieces

Model should have what it needs but no more
Thus avoid underfitting or overfitting model

Allow us to measure

Collect data, put in model, compare model terms

Allow us to predict

The better the model, the better the predictions
Definition of Interaction?

Two-Way

one-way is a reaction

Communicative

information is sent

Receptive

information is received

Effective

the parties are changed as a result
Definition of Interaction?

Knocking over a chair
Clicking a Submit button on a web page
Two televisions, turned on, facing each other
A computer sending data to another via a network
Typing on a computer that is turned off
Picking up a telephone and putting it to your ear
Typing ESC on a screen that does not allow it
Models of Interaction

Models of interaction allow a closer look

Define and describe an interaction
Isolate areas where problems occur
Design new interaction

Two examples at different scales

Norman’s Execution-Evaluation Cycle
Buxton’s 3-State Model
Models of Interaction

Models of interaction allow a closer look

Define and describe an interaction
Isolate areas where problems occur
Design new interaction

Two examples at different scales

Norman’s Execution-Evaluation Cycle
Buxton’s 3-State Model

“All models are wrong, but some are useful”
George Box
Norman’s Execution-Evaluation Cycle

Gulf of Execution

Goals

Form Intention

Develop Action Plan

Execute Actions

System Change

Observe State

Interpret State

Gulf of Evaluation

Evaluate Goals
Buxton’s 3-State Model

Mouse

Stylus

Touchpad

Touch Screen
Buxton’s 3-State Model

Mouse

- State 1: Button up, Tracking
- State 2: Button Down, Dragging

Touchpad

- State 0: Release, Out of Range
- State 1: Touch, Tracking

Stylus

- State 0: Stylus Lift, Out of Range
- State 1: Stylus On, Tracking
- State 2: Tip Switch Close, Dragging

Touch Screen

- State 0: Release Contact, Passive Tracking
- State 1: Contact, Selection

Which can support tooltip previews?
Creating a Model

How would you go about creating a model?
Creating a Model

How would you go about creating a model?

One approach:

Observe, Collect Data, Find Patterns,
Draw Analogies, Devise Model,
Test Fit to Data, Test Predictions, Revise

Fundamentally an inductive process

From specific observations
to broader generalization
Today

Some example models of human performance

<table>
<thead>
<tr>
<th>Visual System</th>
<th>Biological Model</th>
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<tbody>
<tr>
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</table>
Human Visual System

Light passes through lens, focused on retina

Blind Spot?
Blind Spot

- Use right eye, look at letters
Blind Spot

Use left eye, look at cross
Visible Spectrum
Retina

Covered with light-sensitive receptors

Rods (120 million)
- Sensitive to broad spectrum of light
- Sensitive to small amounts of light
- Cannot discriminate between colors
- Sense intensity or shades of gray
- Primarily for night vision & perceiving movement

Cones (6 million)
- Used to sense color
Retina

Center of retina has most of the …
Retina

Center of retina has most of the cones

Allows for high acuity of objects focused at center
Retina

Center of retina has most of the cones

  Allows for high acuity of objects focused at center

Edge of retina is dominated by …
Retina

Center of retina has most of the cones
   Allows for high acuity of objects focused at center

Edge of retina is dominated by rods
   Allows detecting motion of threats in periphery
Retina

Center of retina has most of the cones
  Allows for high acuity of objects focused at center

Edge of retina is dominated by rods
  Allows detecting motion of threats in periphery

What does that mean for you?
Retina

Center of retina has most of the cones
  Allows for high acuity of objects focused at center

Edge of retina is dominated by rods
  Allows detecting motion of threats in periphery

What does that mean for you?
  Peripheral movement is easily distracting
Retina

Center of retina has most of the cones
  Allows for high acuity of objects focused at center

Edge of retina is dominated by rods
  Allows detecting motion of threats in periphery

What does that mean for you?
  Peripheral movement is easily distracting
Color Perception via Cones

Photopigments used to sense color

3 types: blue, green, “red” (actually yellow)

Each sensitive to different band of spectrum

Ratio of neural activity stimulation for the three types of gives us a continuous perception of color
Color Sensitivity

[Diagram showing relative absorbance curves for blue cone (437 nm), rod (498 nm), green cone (533 nm), and red cone (564 nm) across different wavelengths (400-700 nm). Credit: Dowling, 1987]
Distribution of Photopigments

Not distributed evenly

Mainly reds (64%), Very few blues (4%)
Insensitivity to short wavelengths (i.e., blue)

No blue cones in retina center

Fixation on small blue object yields “disappearance”

Lens yellows with age, absorbs short wavelengths
Sensitivity to blue is reduced even further
Color Sensitivity & Image Detection

Most sensitive to center of spectrum

To be perceived as the same, blues and reds must be brighter than greens and yellows

Brightness determined mainly by red and green

\[ Y = 0.3 \text{Red} + 0.59 \text{Green} + 0.11 \text{Blue} \]

Shapes detected by finding edges

We use brightness and color difference

Implication

Blue edges and shapes are hard
Color Sensitivity & Image Detection

Most sensitive to center of spectrum

To be perceived as the same, blues and reds must be brighter than greens and yellows

Brightness determined mainly by red and green
\[ Y = 0.3 \text{ Red} + 0.59 \text{ Green} + 0.11 \text{ Blue} \]

Shapes detected by finding edges

We use brightness and color difference

Implication
Blue edges and shapes are hard
Focus

Different wavelengths of light focused at different distances behind eye’s lens

Constant refocusing causes fatigue

Saturated colors (i.e., pure colors) require more focusing than desaturated (i.e., pastels)
Focus

Different wavelengths of light focused at different distances behind eye’s lens

Constant refocusing causes fatigue

Saturated colors (i.e., pure colors) require more focusing than desaturated (i.e., pastels)
Color Deficiency

Trouble discriminating colors

Affects about 9% of population

Two main types

Different photopigment response most common

- Reduces capability to discern small color differences

Red-Green deficiency is best known

- Lack of either green or red photopigment, cannot discriminate colors dependent on red and green

Also known as color blindness
Red-Green Deficiency Test
Dual / Redundant Encoding

http://danielsolisblog.blogspot.com/2011_03_01_archive.html
## Dual / Redundant Encoding

### Add/Update Shipping Information

We found an error while verifying your shipping address. We've marked the problem in red for you.

<table>
<thead>
<tr>
<th>update the address book of</th>
<th></th>
</tr>
</thead>
</table>

Required information is marked in **GREEN CAPS**. **HELP** for questions about shipping.

- **NICKNAME:** MYSELF
- **FIRST NAME:** DOUGLAS
- **LAST NAME:**
- **ADDRESS:**
  - 245 SAN JOSE RD
  - (International use only)
- **CITY:** LOS GATOS
- **STATE/PROVINCE:** California
- **ZIP/POSTAL CODE:** 95333
- **COUNTRY:** Select a country
- **SHIPPING METHOD:**
  - In the U.S.: **HELP**
    - Standard UPS (2 business days plus)
  - International: **HELP**
    - Canada Canada Post (4-10 business days)
Today

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The Model Human Processor

Developed by Card, Moran, & Newell (1983)

Based on empirical data
Summarizing human behavior in a manner easy to consume and act upon

Same book that named human computer interaction
The Model Human Processor

- Long-term Memory
- Working Memory
  - Visual Image Store
  - Auditory Image Store
- Sensory Buffers
  - Eyes
  - Ears
- Perceptual Processor
- Motor Processor
- Cognitive Processor
- Fingers, etc.
Basics of Model Human Processor

Sometimes serial, sometimes parallel

Serial in action and parallel in recognition
  Pressing key in response to light
  Driving, reading signs, hearing all simultaneously

Parameters

Processors have cycle time, about 100-200ms
Memories have capacity, decay time, and type
A Working Memory Experiment
BMCIACSEI
IBM CIA CSE
Memory

Working memory (also known as short-term)

Small capacity \((7 \pm 2 \text{ “chunks”})\)
- 6174591765 vs. (617) 459-1765
- IBMCIACSE vs. IBM CIA CSE

Rapid access (~ 70ms) and decay (~200 ms)
- Pass to LTM after a few seconds of continued storage

Long-term memory

Huge (if not “unlimited”)
- Slower access time (~100 ms) with little decay
Activation Experiment

Volunteer
Activation Experiment

Volunteer

Start saying colors you see in list of words
  When slide comes up, as fast as you can
  There will be three columns of words

Say “done” when finished
  Everyone else time how long it takes
# Activation Experiment

<table>
<thead>
<tr>
<th>word</th>
<th>word</th>
<th>word</th>
</tr>
</thead>
<tbody>
<tr>
<td>word</td>
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<td>word</td>
</tr>
</tbody>
</table>
Activation Experiment

Volunteer
Activation Experiment

Do it again

Say “done” when finished
Activation Experiment

Do it again

Say “done” when finished
<table>
<thead>
<tr>
<th>red</th>
<th>red</th>
<th>green</th>
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</thead>
<tbody>
<tr>
<td>blue</td>
<td>yellow</td>
<td>red</td>
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<tr>
<td>green</td>
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</table>
Model Human Processor Operation

Recognize-Act Cycle of the Cognitive Processor
On each cycle, contents in working memory initiate actions associatively linked in long-term memory
Actions modify the contents of working memory

Discrimination Principle
Retrieval is determined by candidates that exist in memory relative to retrieval cues
Interference created by strongly activated chunks

See also Freudian slips
Perceptual Causality

How soon must the red ball move after cue ball collides with it?
Perceptual Causality

Stimuli that occur within one cycle of the perceptual processor fuse into a single concept

Requirement

If you want to create the perception of causality, then you need to be sufficiently responsive

Caution

Two stimuli intended to be distinct can fuse if the first event appears to cause the other
Today

Some example models of human performance

Visual System
Model Human Processor
Fitts’s Law
Gestalt Principles

Biological Model
Higher-Level Model
Model by Analogy
Predict Interpretation
Fitts’s Law (1954)

Models time to acquire targets in aimed movement

- Reaching for a control in a cockpit
- Moving across a dashboard
- Pulling defective items from a conveyor belt
- Clicking on icons using a mouse

Very powerful, widely used

- Holds for many circumstances (e.g., under water)
- Allows for comparison among different experiments
- Used both to measure and to predict
Fitts’s Law (1954)

Models time to acquire targets in aimed movement

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James’s use of ’s is correct, but most people say Fitts’ Law
Fitts’s Law (1954)

Models time to acquire targets in aimed movement

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https://en.wikipedia.org/wiki/Fitts's_law
Reciprocal Point-Select Task

- Width
- Amplitude
Closed Loop versus Open Loop

What is closed loop motion?

What is open loop motion?
Closed Loop versus Open Loop

What is closed loop motion?
- Rapid aimed movements with feedback correction
- Fitts’s law models this

What is open loop motion?
- Ballistic movements without feedback correction
- Example: Throwing a dart
- See Schmidt’s Law (1979)
Model by Analogy

Analogy to Information Transmission
Shannon and Weaver, 1959
Model by Analogy

Analogy to Information Transmission
Shannon and Weaver, 1959
Fitts’s Law

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

What kind of equation does this remind you of?
Fitts’s Law

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

What kind of equation does this remind you of?

\( y = mx + b \)

MT = a + bx, where \( x = \log_2(A / W + 1) \)

\( x \) is called the Index of Difficulty (ID)
As “A” goes up, ID goes up
As “W” goes up, ID goes down
Index of Difficulty (ID)

log2(A / W + 1)

Fitts’s Law claims that the time to acquire a target increases linearly with the log of the ratio of the movement distance (A) to target width (W)

Why is it significant that it is a ratio?
Index of Difficulty (ID)

\[ \log_2 \left( \frac{A}{W} + 1 \right) \]

Fitts’s Law claims that the time to acquire a target increases linearly with the log of the ratio of the movement distance \( A \) to target width \( W \).

Why is it significant that it is a ratio?

Units of \( A \) and \( W \) don’t matter

Allows comparison across experiments
Index of Difficulty (ID)

\[ \log_2\left( \frac{A}{W} + 1 \right) \]

Fitts’s Law claims that the time to acquire a target increases linearly with the log of the ratio of the movement distance (A) to target width (W)

ID units typically in “bits”

Because of association with information capacity and somewhat arbitrary use of base-2 logarithm
Index of Performance (IP)

\[ MT = a + b \log_2(\frac{A}{W} + 1) \]

- \( b \) is slope
- \( \frac{1}{b} \) is called Index of Performance (IP)

If \( MT \) is in seconds, \( IP \) is in bits/second

Also called “throughput” or “bandwidth”

Consistent with analogy of the interaction as an information channel from human to target
A Fitts’s Law Experiment
Experimental Design and Analysis

Factorial Design

- Experiment with more than one manipulation

Within vs. Between Participant Design

- Statistical power versus potential confounds

Carryover Effects and Counterbalanced Designs

Latin Square Design

https://depts.washington.edu/aimgroup/proj/ps4hci/
“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 Examples

Which will be faster on average?

### Pop-up Linear Menu

- Today
- Sunday
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday

### Pop-up Pie Menu

- Today
- Sunday
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
Pie Menus in Use

The Sims

Rainbow 6

Maya
Fitts’s Law Examples

Which will be faster on average?

Pop-up Linear Menu

Today  Sunday  Monday  Tuesday  Wednesday  Thursday  Friday  Saturday

Pop-up Pie Menu

What about adaptive menus?
Fitts’s Law in Windowing

Windows 95: Missed by a pixel
Windows XP: Good to the last drop

Macintosh Menu
Fitts’s Law in MS Office 2007

Larger, labeled controls can be clicked more quickly

Mini toolbar is close to the cursor

Magic Corner:
Office Button in the upper-left corner
Bubble Cursor

Grossman and Balakrishnan, 2005
Bubble Cursor

Grossman and Balakrishnan, 2005
Bubble Cursor with Prefab

Dixon et al, 2012
Fitts’s Law and Keyboard Layout

Zhai et. al (2002) pose stylus keyboard layout as an optimization of all key pairs, weighted by language frequency.

\[ MT = a + b \log_2 \left( \frac{D_{ij}}{W_j} + 1 \right), \]

\[ t = \sum_{i=1}^{27} \sum_{j=1}^{27} \frac{P_{ij}}{IP} \left[ \log_2 \left( \frac{D_{ij}}{W_j} + 1 \right) \right], \]
Hooke’s Keyboard

Optimizes a system of springs
Metropolis Keyboard

Random walk minimizing scoring function
Considering Multiple Space Keys

FITALY Keyboard

**Textware Solutions**

<table>
<thead>
<tr>
<th>Z</th>
<th>V</th>
<th>C</th>
<th>H</th>
<th>W</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>I</td>
<td>T</td>
<td>A</td>
<td>L</td>
<td>Y</td>
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<td></td>
<td>N</td>
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<td>D</td>
<td>O</td>
<td>R</td>
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<td>J</td>
<td>U</td>
<td>M</td>
<td>P</td>
<td>X</td>
</tr>
</tbody>
</table>

OPTI Keyboard

**MacKenzie and Zhang 1999**
Considering Multiple Space Keys

FITALY Keyboard

Textware Solutions

OPTI Keyboard

MacKenzie and Zhang 1999

Correct choice of space key becomes important
Requires planning head to be optimal
ATOMIK Keyboard

Optimized keyboard, adjusted for early letters in upper left and later letters in lower right
Using Motor Ability in Design

Pointing

Dragging

List Selection

Gajos et al 2007
Interface Generation As Optimization

\[
\$ \left( \right) \right) = \text{Estimated task completion time}
\]
### Manufacturer Interface

#### Font Formatting

<table>
<thead>
<tr>
<th>Font</th>
<th>Style</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arial</td>
<td>Regular</td>
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</tr>
<tr>
<td>Arial Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comic Sans MS</td>
<td>Italic</td>
<td>9</td>
</tr>
<tr>
<td>Courier New</td>
<td>Bold</td>
<td>10</td>
</tr>
<tr>
<td>Franklin Gothic Medium</td>
<td>Bold Italic</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

- **Underline style**: (none)
- **Effects**
  - Strikethrough
  - Double Strikethrough
  - Superscript
  - Subscript
  - Shadow
  - Outline
  - Emboss
  - Engrave
  - Small Caps
  - All Caps
  - Hidden

#### Preview

Times New Roman
Person with Cerebral Palsy
Person with Muscular Dystrophy
Interface Generation As Optimization

In a study with 11 participants with diverse motor impairments:

- Consistently faster with generated interfaces (26%)
- Fewer errors with generated interfaces (73% fewer)
- Strongly preferred generated interfaces
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

<table>
<thead>
<tr>
<th>Visual System</th>
<th>Biological Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Human Processor</td>
<td>Higher-Level Model</td>
</tr>
<tr>
<td>Fitts’s Law</td>
<td>Model by Analogy</td>
</tr>
<tr>
<td>Gestalt Principles</td>
<td>Predict Interpretation</td>
</tr>
</tbody>
</table>
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 Seyes 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
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
   - 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
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

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
Models from Different Perspectives

Some example models of human performance

- Visual System
- Model Human Processor
- Fitts’s Law
- Gestalt Principles

- Biological Model
- Higher-Level Model
- Model by Analogy
- 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
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
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-Acoto knife
Paper Prototype

Welcome to ESP.
Your Telebears session is Tues. Sept. 21st 10am
Your current schedule is empty. Please click on Add a course to continue.

“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
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

1. Take a photo of your wireframe sketch
2. Add clickable areas and transitions between screens
3. “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:

<table>
<thead>
<tr>
<th>Factory workers</th>
<th>Businessmen</th>
<th>Construction workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>City employees</td>
<td>Clerks</td>
<td>Salespeople</td>
</tr>
<tr>
<td>Laborers</td>
<td>Professional people</td>
<td>White-collar workers</td>
</tr>
<tr>
<td>Barbers</td>
<td>Telephone workers</td>
<td>Others</td>
</tr>
</tbody>
</table>

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 10: Interface Implementation

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
Tools and Interfaces

Why Interface Tools?
Case Study of Model-View-Controller
Case Study of Animation
Sapir-Whorf Hypothesis
Thoughtfulness in Tools
Case Study in Self-Tracking
Sequential Programs

Program takes control, prompts for input

Person waits on the program

Program says when it is ready for more input, which the person then provides
Sequential Programs

while true {
    print “Prompt for Input”
    input = read_line_of_text()
    output = do_work()
    print output
}

Person is literally modeled as a file
Event-Driven Programming

A program waits for a person to provide input

All communication done via events
  “mouse down”, “item drag”, “key up”

All events go to a queue

Ensures events handled in order
Hides specifics from applications

How many of these queues? How can you tell?
Basic Interactive Software Loop

do {
    e = read_event();
    dispatch_event(e);
    if (damage_exists())
        update_display();
} while (e.type != WM_QUIT);

All interactive software has this somewhere
Basic Interactive Software Loop

Have you ever written this loop?
Basic Interactive Software Loop

Have you ever written this loop?

Contrast with:

“One of the most complex aspects of Xlib programming is designing the event loop, which must take into account all of the possible events that can occur in a window.”

Understanding Tools

We use tools because they

- Identify common or important practices
- Package those practices in a framework
- Make it easy to follow those practices
- Make it easier to focus on our application

What are the benefits of this?
Understanding Tools

We use tools because they

- Identify common or important practices
- Package those practices in a framework
- Make it easy to follow those practices
- Make it easier to focus on our application

What are the benefits of this?

- Being faster allows more iterative design
- Implementation is generally better in the tool
- Consistency across applications using same tool
Understanding Tools

Why is designing tools difficult?

Need to understand the core practices and problems
Those are often evolving with technology and design

Example: Responsiveness in event-driven interface

Event-driven interaction is asynchronous

How to maintain responsiveness in the interface while executing some large computation?
Understanding Tools

Why is designing tools difficult?

Need to understand the core practices and problems
Those are often evolving with technology and design

Example: Responsiveness in event-driven interface

Cursor:
WaitCursor vs. CWaitCursor vs. In Framework

Progress Bar:
Data Races vs. Idle vs. Loop vs. Worker Objects
Fundamental Tools Terminology

Threshold vs. Ceiling

Threshold: How hard to get started
Ceiling: How much can be achieved
These depend on what is being implemented

Path of Least Resistance

Tools influence what interfaces are created

Moving Targets

Changing needs make tools incomplete or obsolete

Myers et al, 2000
http://dx.doi.org/10.1145/344949.344959
Tools and Interfaces

Why Interface Tools?
Case Study of Model-View-Controller
Case Study of Animation
Sapir-Whorf Hypothesis
Thoughtfulness in Tools
Case Study in Self-Tracking
Model-View-Controller

How to organize the code of an interface?

This is a surprisingly complicated question, with unstated assumptions requiring significant background to understand and resolve.
Seeheim Model

Results from 1985 workshop on user interface management systems, driven by goals of portability and modifiability, based in separating the interface from application functionality

Buxton, 1983
http://dx.doi.org/10.1145/988584.988586
Seeheim Model

Lexical - Presentation
External presentation of interface
Generates the display, receive input

Syntactic - Dialog Control
Parsing of tokens into syntax
Maintain state

Semantic - Application Interface Model
Defines interaction between interface and rest of software

- e.g., "add" vs. "append" vs. "^a" vs. "^x"
- e.g., how to make a "menu" or "button"
- e.g., three-state model, interface modes
- e.g., drag-and-drop target highlighting
Seeheim Model

```
USER → Presentation ← Dialogue Control → Semantic Interface Model → APPLICATION
```

Lexical

Syntactic

Semantic
Seeheim Model

USER → Presentation → Dialogue Control → Application Interface Model → APPLICATION

Lexical

Syntactic

Semantic

Huh?
Seeheim Model

Rapid Semantic Feedback

In practice, all of the code goes in here
Model-View-Controller

Introduced by Smalltalk developers at PARC
Partitions application to be scalable, maintainable
View / Controller Relationship

In theory:

Pattern of behavior in response to input events (i.e., concerns of the controller) are independent of visual geometry (i.e., concerns of the view)

Controller contacts view to interpret what input events mean in context of a view (e.g., selection)
View / Controller Relationship

In practice:

View and controller often tightly intertwined, almost always occur in matched pairs

Many architectures combine into a single class
Model-View-Controller

MVC separates concerns and scales better than global variables or putting everything together

Separation eases maintenance
- Can add new fields to model, new views can leverage, old views will still work
- Can replace model without changing views

Separation of “business logic” can require care
- May help to think of model as the client model
Model-View-Collection on the Web

Core ideas manifest differently according to needs

For example, backbone.js implements client views of models, with REST API calls to web server.

Web tools often implement views as templates.
Model View-View Model

Design to support data-binding by minimizing functionality in view

Also allows greater separation of expertise
Tools and Interfaces

Why Interface Tools?
Case Study of Model-View-Controller
Case Study of Animation
Sapir-Whorf Hypothesis
Thoughtfulness in Tools
Case Study in Self-Tracking
Luxor Jr.
Animation Case Study

Principles of Traditional Animation Applied to 3D Computer Animation

Lasseter, 1987

http://dx.doi.org/10.1145/37402.37407
Squash and Stretch
Squash and Stretch
Squash and Stretch

FIGURE 4a. In slow action, an object’s position overlaps from frame to frame which gives the action a smooth appearance to the eye.

FIGURE 4b. Strobing occurs in a faster action when the object’s positions do not overlap and the eye perceives separate images.

FIGURE 4c. Stretching the object so that its positions overlap again will relieve the strobing effect.
Timing

Just two drawings of a head, the first showing it leaning toward the right shoulder and the second with it over on the left and its chin slightly raised, can be made to communicate a multitude of ideas, depending entirely on the Timing used. Each inbetween drawing added between these two "extremes" gives a new meaning to the action.

NO inbetweens......... The Character has been hit by a tremendous force. His head is nearly snapped off.

ONE inbetweens......... The Character has been hit by a brick, rolling pin, frying pan.

TWO inbetweens........ The Character has a nervous tic, a muscle spasm, an uncontrollable twitch.

THREE inbetweens..... The Character is dodging a brick, rolling pin, frying pan.
Timing

FOUR inbetweens.......... The Character is giving a crisp order, "Get going!" "Move it!"

FIVE inbetweens.......... The Character is more friendly, "Over here." "Come on-hurry!"

SIX inbetweens.......... The Character sees a good looking girl, or the sports car he has always wanted.

SEVEN inbetweens.......... The Character tries to get a better look at something.
Timing

EIGHT inbetweens........... The Character searches for the peanut butter on the kitchen shelf.

NINE inbetweens........... The Character appraises, considering thoughtfully.

TEN inbetweens........... The Character stretches a sore muscle.
Anticipation
FIGURE 6. Andre’s scratch was staged to the side (in “silhouette”) for clarity and because that is where his itch was.
FIGURES 7-8. In *Luzo Jr.*, all action was staged to the side for clarity.
Follow Through, Overlap, Secondary
Objects with mass must accelerate and decelerate. Interesting frames are typically at ends, tweaks perception to emphasize these poses.
Arcs
Luxor Jr.
Animation: From Cartoons to the User Interface

Chang and Ungar, 1993

You must learn to respect that golden atom, that single frame of action, that 1/24th of a second, because the difference between lightning and the lightning bug may hinge on that single frame.

— Chuck Jones [10]

**ABSTRACT**

User interfaces are often based on static presentations, a model ill suited for conveying change. Consequently, events on the screen frequently startle and confuse users. Cartoons, in contrast, are exceedingly successful at Mangling the audience; even the most bizarre events are easily comprehended. The self-user interface has served as a model for the application of cartoon animation techniques as a means of making the interface easier to understand and more pleasant to use. Animation is done tactfully, subtle; allows self objects to move solidly. Use of cartoon-style motion blur allows self objects to move smoothly and still maintain their comprehensibility. Self objects animate and disappear smoothly, without sudden materializations and disappearances, and they rise to the front of overlapping objects only when the user moves the mouse. Anticipating action with a small, short motion and pacing the buildup of transitions faster than the user performs results in smoother and cleaner movements. Despite the differences between user interfaces and cartoons—cartoons are frivolous, passive entertainment and user interfaces are active, interactive tools—cartoon animation has much to teach to user interfaces to make both effective and engaging.

**KEYWORDS**: animation, user interfaces, cartoons, motion blur, self

1 **INTRODUCTION**

User interfaces are often based on static presentations—a series of displays which show a new state of the system. Typically, these displays have no dynamic animation. For example, when the user chooses an item from a menu, the menu closes and the selected item is highlighted, then a dialog box or window appears. This is quite unlike how we see in cartoons or video games. In these latter cases, the user makes a selection and a new scene is displayed, the selection is immediately highlighted, and the user is free to continue to choose further actions.

When the user cannot visually track the changes occurring in the interface, the causal connection between the old state of the screen and the new state of the interface is not immediately clear. How are the objects now on the screen related to the ones which were there a moment ago? Are they the same objects, or have they been replaced by different objects? What changes are directly related to the user’s actions, and which are incidental? To be able to efficiently and reliably interact with what happens when the screen changes state, the user must be prepared with an expectation of what the screen will look like after the action. In the case of most transactions in entertainment, these expectations can only come by experience; little in the interface or the action gives the user a clue about what will happen, what is happening, or what just happened.

For example, the Microsoft Windows interface [11] expands an icon by depressing the button and shrinking the icon by releasing the button. This is not the way people think of expanding or shrinking an object. The Microsoft approach—cartoons are frivolous, passive entertainment and user interfaces are active, interactive tools—cartoon animation has much to teach user interfaces to make both effective and engaging.

**REFERENCES**


November 3-6, 1993 UST’93
Frames Three Principles

Solidity
Desktop objects should appear to be solid objects

Exaggeration
Exaggerate physical actions to enhance perception

Reinforcement
Use effects to drive home feeling of reality
Solidity: Motion Blur

No Motion Blur

Motion Blur
Solidity: Arrival and Departure
Solidity: Arrival and Departure
Exaggeration: Anticipation

Figure 7. Objects anticipate major actions with a quick contrary motion that draws the user eye to the object in preparation for the main motion to come.
Figure 8. Objects ease out of their beginning poses and ease into their final poses. Although these motions are slower than that during the main portion of the movement, they are still quite fast.
Reinforcement: Arcs

Figure 9. When objects travel under their own power (non-interactively), they move in arcs rather than straight lines.
Reinforcement: Follow Through

Figure 10. When objects come to a stop after moving on their own, they exhibit follow through in the form of wiggling back and forth quickly. This is just suggested by the “wiggle lines” in the figure—in actuality, the object moves back and forth, with motion blur.
Animation Support in a User Interface Toolkit: Flexible, Robust, and Reusable Abstractions

Hudson and Stasko, 1993

http://dx.doi.org/10.1145/168642.168648

ABSTRACT

Animation can be a very effective mechanism to convey information in visualization and user interface settings. However, integrating animated presentations into user interfaces has typically been a difficult task since, so far, there has been little or no explicit support for animation in window systems or user interface toolkits. This paper describes how the Artkit user interface toolkit has been extended with new animation support abstractions designed to overcome this problem. These abstractions provide a powerful but convenient base for building a range of animations, supporting techniques such as simple motion-blur, "squash and stretch", use of easing, trajectory, anticipation and follow-through, and "slow-in / slow-out" transitions. Because these abstractions are provided by the toolkit, they are reusable and may be freely mixed with more conventional user interface techniques. In addition, the Artkit implementation of these abstractions is robust in the face of systems (such as the X Window System and Unix) which can be ill-behaved with respect to timing considerations.

1 INTRODUCTION

Human perceptual capabilities provide a substantial ability to understand form and interpret models of the world from moving images. As a result, in a well-designed display, information can often be much more easily comprehended in a moving scene than in a single static image or even a sequence of static images. For example, the "cone tree" display described in [Rob93] provides a clear illustration that the use of continuous motion can allow much more information to be presented and understood more easily.

However, even though the potential benefits of animation in user interfaces have been recognized for some time ([Bach90]) for example, surveys a number of uses for animation in the interface and cites their benefits and [Stasko93] reviews principles for using animation in interfaces and describes a number of systems that make extensive use of animation in an interface, explicit support for animation in rarely, if ever, found in user interface support environments. The work described in this paper is designed to overcome this problem by showing how flexible, robust, and reusable support for animation can be incorporated into a full scale object-oriented user interface toolkit.

The abstraction mechanisms provided by the Artkit system are designed to be powerful and flexible — providing basic support that can be built on to support a range of sophisticated techniques such as:

- Simple motion-blur, "squash and stretch", use of easing
- Trajectories, anticipation and follow-through
- "Slow-in / slow-out" transitions
- Linear and custom easing functions

November 3-5, 1993
UIST'93
57
Events and Animation

Figure 5. Animation Event Translation and Dispatch
Not Just an Implementation

Provides tool abstractions for implementing previously presented styles of animation

Overcomes a fundamental clash of approaches

Event loop receives input, processes, repaints

Animations expect careful control of frames, but the event loop has variable timing
Events and Animation

Figure 5. Animation Event Translation and Dispatch
Transition Object

Figure 3. Parts of a Transition Object
Pacing Function

Figure 4. Two Example Pacing Functions
Computing a Frame

Figure 8. Translation from Time to Space
Animation Case Study

Based on increased understanding of how animation should be done in the interface, increasingly mature tools develop

Now built into major commercial toolkits (e.g., Microsoft’s WPF, JavaFX, jQuery)

Once mature, begins to be used as a building block in even more complex behaviors
Animation Case Study

The Kinetic Typography Engine: An Extensible System for Animating Expressive Text

Lee et al, 2002

http://dx.doi.org/10.1145/571985.571997
Kinetic Typography Engine

Kinetic Typography

Johnny Lee, Jodi Forlizzi, Scott Hudson
Carnegie Mellon University
Human-Computer Interaction Institute
2002
Kinetic Typography Engine

Kinetic Typography

Johnny Lee, Jodi Forlizzi, Scott Hudson
Carnegie Mellon University
Human-Computer Interaction Institute
2002
Kinetic Typography Engine

Goals of Kinetic Type

- Emotional content
- Creation of characters
- Direction of attention

Animation Composition

*Figure 6. Waveform addition by chaining*

*Figure 7. Waveform scaling by functional composition with amplitude*
Tools and Interfaces

Why Interface Tools?
Case Study of Model-View-Controller
Case Study of Animation
Sapir-Whorf Hypothesis
Thoughtfulness in Tools
Case Study in Self-Tracking
Sapir-Whorf Hypothesis

Roughly, some thoughts in one language cannot be stated or understood in another language

Language is not simply a way of voicing ideas, but is the very thing which shapes those ideas

Our tools define the language of interaction

Beyond the simple matter of code
Frame how we think about possibilities

You must be aware of this when choosing tools, designing applications, and creating new tools
Animation Case Study

Phosphor: Explaining Transitions in the User Interface Using Afterglow Effects

Baudisch et al, 2006

http://dx.doi.org/10.1145/1166253.1166280
Phosphor

Animation can help people follow interface transitions

But the right speed is crucial
  Too fast increases error rate
  Too slow increases task time

The right speed depends on familiarity, distraction, etc.
  It cannot be determined
Phosphor

Phosphor shows the outcome immediately, then explains change in retrospect using a diagrammatic depiction.
Phosphor

phosphor
Challenging Assumptions of Tools

Phosphor breaks from the assumptions that have evolved into current transition tools.
Tools and Interfaces

Tools embody expertise and assumptions

Tools evolve based on emerging understanding of how to address categories of problems

Be conscious of your tool decisions

Try to think about designs before tying to a tool
Choose good and appropriate tools
Understand what you are getting in a tool
Push yourself to think outside the tool
Prefab

Prefab uses pixel analysis to modify existing applications from the outside, using only pixels.

Prefab is informed by how toolkits work, but not linked to any particular toolkit implementation.

Allows trying and fielding new ideas that are not supported by existing applications or toolkits.
Prefab
Mobile Phones as Pagers

Our notion of technology design for journals / ESM / EMA has been anchored by papers journals and pager-based reminders.

Froehlich, Chen, Consolvo, Harrison, Landay. MyExperience ... MobiSys 2007.
Unlock Journaling for Self-Report

Zhang, Pina, Fogarty. Examining Unlock Journaling with Diaries and Reminders ... CHI 2016.
Unlock Journaling for Self-Report

Unlock Journaling for Self-Report

Pleasure and Accomplishment (e.g., self-monitoring depressive symptoms)

Lejuez, Hopko, Acierno, Daughters, Pagoto. ... Behavioral Activation Treatment for Depression ... Behav Modif 2011.
Unlock Journaling for Self-Report

Russell’s Affect Grid

Unlock Journaling vs. Notifications

Unlock journaling is:
- rated less intrusive (1.77 vs. 2.22 on a 5-point scale)
- yields greater frequency (15.0 vs. 9.8 per 12-hour day)
- comparable timeliness (8.6 vs. 9.3 minutes)

Instead of reminders to journal, unlock journaling makes the opportunity visible, easy, and optional.

It should not have taken 10 years to get here.
Mobile Food Journals

Origins in daily recall

Self-monitoring of food can support many goals
- Weight Loss
- Diabetes Management
- Trigger Identification

High burdens detract from potential benefit, data is often wrong

Mobile Food Journals

Mobile devices provide real-time feedback

Search for each food in a large database, often breaking into components

Typically provide calorie-based feedback

High burdens detract from potential benefit, data is often wrong

Perceptions of Healthy Eating

“What does healthy eating look like to you?”

Food types:
“vegetables”
“fruits”
“protein”

Food qualities:
“low processed”
“organic”
“fresh”

Diet qualities:
“balanced”
“variety”
“portion”

Cordeiro, Bales, Cherry, Fogarty. Rethinking the Mobile Food Journal … CHI 2015.
Difficulty as a Negative Nudge

“I just avoided eating things that were hard to log” – SP132

“Prepackaged meals were the easiest because of bar codes but those aren’t healthy” – SP123

“I could make life easier by eating the same things regularly” – SP97

“It discourages you from eating out or at a friend’s, even if it is healthy” – SP42
Deploying a Photo-Based Journal

Mobile capture and review

Web review and annotation

Cordeiro, Bales, Cherry, Fogarty. Rethinking the Mobile Food Journal … CHI 2015.
Leveling the Difficulty of Journaling

With prior techniques:

60% report not journaling because it was too difficult
65% report not journaling because they did not know

With photo-based capture:

22% report not journaling because it was too difficult
None report not journaling due to food knowledge

“For some meals, it’s just really easy to take a picture … than sit there and type in every ingredient” – FP20
Journaling without Judgment

With prior journals, participants report choosing not to journal because they would exceed a calorie budget or because a food was unhealthy

- 13% of survey participants
- 45% of field participants

Photos enable mindfulness while avoiding judgment

“[it was] easier because there were no calorie counts, no judgments, but still makes you aware” – FP14

“Do I really want to eat this? I’m capturing this” – FP17
Triggers and Trends

“I eat too much pizza” – FP10

“I’m surprised at how many times I’m seeing things that I consider an exception to my diet!” – FP4

“I don’t branch out as much as I thought I did, even when I go somewhere new, I kind of get what I always get somewhere else” – FP10
“it should be noted that much of the use of food journaling is in a more clinical setting with the purpose being sharing and evaluating the journal with nutritionists and care providers …

it’s not relevant if photos are more or less easily understood by the user if a nutritionist is the eventual consumer of the data”

– Actual Anonymous Grumpy R3
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 10: Interface Implementation

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
Lecture 11: Tasks in Testing

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
In-Class Design, Prototype, Test

Design and prototype a touchscreen alarm clock to be deployed in a very high-end hotel brand. Your alarm clock should be immediately usable for tired, busy, or just-don’t-want-to-be-bothered travelers who will spend zero time learning your interface.

In addition to displaying the current time, your design should include basic functionality for:

- turning the alarm on/off
- setting the wake-up time
- anything else you think is appropriate

Guests will interact with the alarm via a touch panel.
Task Design is Important

The goal of a test is to figure out how a person interacts with an interface in the wild...

There are two possible explanations for why a test does not find significant problems:

- The interface does not have significant problems
- The test itself has significant problems
Task Design is Important

Testing is not entirely in the wild

As a part of focusing the test, you often need to give a person a somewhat artificial task

The artificiality of the task may influence how people interact with an interface...

...and thus may influence the outcomes and insights gained through user testing
Bad: Artificial Subgoals

People using the design “in the wild” may not necessarily form these same subgoals.

The task should give one top-level goal, a people should form their subgoals while pursuing this.

Now you want to choose the type of paper you want to print your document on. Lets imagine that Bin “B” has the paper you want to print your paper on, please complete this task.

Now set the darkness of your copies to about 50% dark. After setting the darkness, you decide you want to print 2 sides of copies on two sides of paper. Please complete this task.
Bad: Artificial Ordering

Without an artificial ordering of information or subgoals, people might not proceed in this order.

The ordering might also be biased towards the layout of the interface, which would conceal any problems with finding the appropriate control.

- Enter in 10 copies, with lightness set to 10%.
- Choose 1 sided to 2 sided, use paper source bin A.
- Cover sheet needed, using paper bin B for cover sheet.
- Set stapling feature on and collating on.
- Start printing.
Bad: Changing the Task

The task is to make copies, and this happens to involve entering information in the copier interface.

But this task description is an data entry task, “Here is some information. Put it in the interface.”

- Make 23 copies
- With collate
- Cover sheets
- Default darkness
- 1 Sided-> 1 Sided
Bad: Giving the Answers

Tells the person what terminology the interface uses, which they might not otherwise know

lighten = contrast, sorted = collated?

You are a teacher and are trying to make 40 copies of a one-sided magazine article that is 10 pages long for your class tomorrow. Due to the large number of copies, you print the article double-sided, in other words 10 page article would be printed on 5 sheets of paper. Due to the high contrast of the article, you must lighten the copy, in other words change the contrast. You then want the copies to be collated and stapled.
Good: Giving Context

Giving realistic context through scenarios can reduce the artificiality of the task

It’s your first day in the office, starting a new job. You would like to make some copies of several documents that your boss gave you to browse through. Your colleague in the next cubicle tells you that you need an access code to make copies. The code is 5150. You walk over to the copy machine at the end of the hall and realize that it is not the Xerox copier that you are accustomed too... Make 2 copies of the “Company Annual Report”.
Consider: Under-Specified Tasks

Many realistic goals are under-specified, as people have only a general idea what they want.

By under-specifying the task, you can elicit realistic confusion and decision-making.

You just finished fixing up the old hot rod in the garage and now it's time to sell her. Make a couple copies of the pictures you took to send into the used car sales magazines. It's ok that they’re in black and white but maybe you should lighten them up a bit. Your account billing code is 5150.
Task Design Summary

Task design is difficult and important

Poorly designed tasks mask interface failures

Have others help you “debug” them before testing.
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 11:
Tasks in Testing

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
Today

Project Status

Exam Discussion

Inspection-Based Methods

Time for Heuristic Evaluation of Paper Prototypes
Exam

In-Class
Next Tuesday 2/21

Mostly short answer, some long answer

Content drawn from lecture and readings

Will post a compilation of the lecture slides

Schedule a time for Q&A?
Inspection-Based Methods

We have cut prototyping to its minimum
- Sketches, storyboards, paper prototypes
- Rapid exploration of potential ideas

But we need evaluation to guide improvement
- Can become relatively slow and expensive
- Study participants can be scarce
- Can waste participants on obvious problems
Inspection-Based Methods

Simulate study participants

Instead of actual participants, use inspection to quickly and cheaply identify likely problems

Inspection methods are rational, not empirical

Today we cover two complementary methods

Heuristic Evaluation

Cognitive Walkthrough
Heuristic Evaluation

Developed by Jakob Nielsen

Helps find usability problems in a design
Not a method for “coming up with” a design

Small set of evaluators examine interface

Three to five evaluators
Independently check compliance with principles
Different evaluators will find different problems
Evaluators only communicate afterwards

Can perform on working interfaces or sketches
Nielsen’s 10 Heuristics

Too few unhelpful, too many overwhelming

“Be Good” versus thousands of detailed rules

Nielsen seeks to create a small set

Collects 249 usability problems
Collects 101 usability heuristics
Rates how well heuristics explain problems
Factor analysis to identify key heuristics

Nielsen, 1994
Nielsen’s 10 Heuristics

Visibility of system status
Match between system and the real world
User control and freedom
Consistency and standards
Error prevention
Recognition rather than recall
Flexibility and efficiency of use
Aesthetic and minimalist design
Help recognize, diagnose, and recover from errors
Help and documentation

Nielsen, 1994
1. Visibility

Visibility of system status

The system should always keep people informed about what is going on, through appropriate feedback within reasonable time.
1. Visibility

Visibility of system status

The system should always keep people informed about what is going on, through appropriate feedback within reasonable time.

Refers to both visibility of system status and providing appropriate feedback

Anytime a person is wondering what state the system is in, or the result of some action, this is a visibility violation.
2. Real World Match

Match between system and the real world

The system should speak a person’s language, with words, phrases and concepts familiar to the person, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
2. Real World Match

Match between system and the real world

The system should speak a person’s language, with words, phrases and concepts familiar to the person, rather than system-oriented terms.

Follow real-world conventions, making information appear in a natural and logical order.

Refers to word and language choice, mental model, metaphor, mapping, and sequencing.
3. Control and Freedom

User control and freedom

People often choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted state without having to go through an extended dialogue.

Support undo and redo.
3. User in Control

User control and freedom

People often choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted state without having to go through an extended dialogue.

Support undo and redo.

Not just for navigation exits, but for getting out of any situation or state.
4. Consistency

Consistency and standards

People should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
4. Consistency

Consistency and standards

People should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

Internal consistency is consistency throughout the same product. External consistency is consistency with other products in its class.
5. Error Prevention

Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present people with a confirmation option before they commit to the action.
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Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present people with a confirmation option before they commit to the action.

Try to commit errors and see how they are handled. Could they have been prevented?
6. Recognition not Recall

Recognition rather than recall

Minimize a person’s memory load by making objects, actions, and options visible. A person should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
6. Recognition not Recall

Recognition rather than recall

Minimize a person’s memory load by making objects, actions, and options visible. A person should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

People should never carry a memory load
6. Recognition not Recall

Addresses visibility of features and information
  where to find things

Visibility addresses system status and feedback
  what is going on

Problems with affordances may go here
  hidden affordance: remember where to act
  false affordance: remember it is a fake
7. Flexibility and Efficiency

Flexibility and efficiency of use

Accelerators, while unseen by novices, may often speed up the interaction for experts such that the system can cater to both inexperienced and experienced use. Allow people to tailor frequent actions.
7. Flexibility and Efficiency

Flexibility and efficiency of use

Accelerators, while unseen by novices, may often *speed up the interaction* for experts such that the system can cater to both inexperienced and experienced use. Allow people to tailor frequent actions.

Concerns anywhere users have repetitive actions that must be done manually. Also concerns allowing multiple ways to do things.
8. Aesthetic Design

Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
8. Aesthetic Design

Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

Not just about “ugliness”. About clutter, overload of visual field, visual noise, distracting animations.
9. Error Recovery

Help users recognize, diagnose, and recover from errors

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.
9. Error Recovery

Help users recognize, diagnose, and recover from errors

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

Error prevention is about preventing errors before they occur. This is about after they occur.
10. Help

Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on a person’s task, list concrete steps to be carried out, and not be too large.
10. Help

Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on a person’s task, list concrete steps to be carried out, and not be too large.

This does not mean that a person must be able to ask for help on every single item.
Heuristic Evaluation Process

Evaluators go through interface several times
  Inspect various dialogue elements
  Compare with list of usability principles

Usability principles
  Nielsen’s “heuristics”
  Supplementary list of category-specific heuristics (competitive analysis or testing existing products)

Use violations to redesign/fix problems
Examples

Can’t copy info from one window to another
  violates “Minimize memory load” (H6)
  fix: allow copying

Typography uses different fonts in 3 dialog boxes
  violates “Consistency and standards” (H4)
  slows users down
  probably wouldn’t be found by usability testing
  fix: pick a single format for entire interface
Heuristics
Heuristics

Time Left: 00:00:19

46%
Heuristics

Time Left: 00:00:19
Searching database for matches

46%
Heuristics

Visibility of system status

pay attention to response time

0.1 sec: no special indicators needed \(\text{why?}\)

1.0 sec: user tends to lose track of data

10 sec: maximum duration if user to stay focused on action

longer delays require percent-done progress bars
Heuristics
Heuristics

Mac desktop

Dragging disk to trash should delete, not eject it

Match system to real world

Speak the person’s language

Follow conventions
Heuristics
Heuristics

“Mailto”, “protocol”?

Match system to real world

Speak the person’s language
Heuristics
Heuristics

Flexibility and Efficiency of Use accelerators for experts (e.g., keyboard shortcuts) allow tailoring of frequent actions (e.g., macros)
Heuristics

Error

You have not specified a Web Browser, or Web Browser specified is incorrect!

Yes
Heuristics

Help recognize, diagnose, & recover from errors
error messages in plain language
precisely indicate the problem
constructively suggest a solution
Heuristics

Adobe Illustrator

You are saving this document in Adobe Illustrator 9.0 format. Saving this document in an older format may disable some editing features when the document is read back in.

Yes  No
Heuristics

User Control and Freedom
Prevent Errors
## Heuristics

### The Radiation Dosimetry Program

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Please Enter Desired Dose (in Rems)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Enter Substance</td>
<td>Polonium</td>
</tr>
<tr>
<td>Isotope Number</td>
<td>211</td>
</tr>
</tbody>
</table>
### Heuristics

#### The Radiation Dosimetry Program

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please Enter Desired Dose (in Rems)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Enter Substance</td>
<td>Polonium</td>
</tr>
<tr>
<td>Isotope Number</td>
<td>211</td>
</tr>
</tbody>
</table>

**Prevent Errors**
Heuristics

Caution: Changing your RAID configuration will erase all its data in the drive (J:), are you sure?

If you wish to continue, enter the confirmation number "029732" below and click Yes.

Confirmation Number: 029732
Heuristics

Prevent Errors
Heuristics
Heuristics

User control & freedom
- provide “exits” for mistaken choices, undo, redo
- don’t force down fixed paths

Wizards
- must respond to question before going to next
- good for beginners, infrequent tasks
- not for common tasks
- consider having 2 versions (WinZip)
Heuristics
Heuristics

Consistency & Standards
Heuristics

% rm cse440*
%

![Confirm Multiple File Delete dialog box](image)
Heuristics

% rm cse440*
%

Error prevention
Recognition rather than recall
Visibility
Heuristics
Heuristics

Aesthetic & Minimalist design

no irrelevant information in dialogues
Heuristics

Select an award style using the scroll bar. When you've found a style that suits you, press OKAY to create that award and open the editor.
Heuristics
Heuristics
Phases of Heuristic Evaluation

1) Pre-evaluation training
   give expert evaluators needed domain knowledge & information on the scenario

2) Evaluation
   individuals evaluate interface and make lists of problems

3) Severity rating
   determine how severe each problem is

4) Aggregation
   group meets and aggregates problems (w/ ratings)

5) Debriefing
   discuss the outcome with design team
How to Perform Evaluation

At least two passes for each evaluator
  first to get feel for flow and scope of system
  second to focus on specific elements
If system is walk-up-and-use or evaluators are domain experts, no assistance needed
  otherwise might supply evaluators with scenarios
Each evaluator produces list of problems
  explain why with reference to heuristic
  be specific & list each problem separately
Example Heuristic Violation

1. [H4 Consistency]

The interface used the string "Save" on the first screen for saving the person’s file, but used the string "Write file" on the second screen. People may be confused by this different terminology for the same function.
How to Perform Heuristic Evaluation

Why separate listings for each violation?
- risk of repeating problematic aspect
- may not be possible to fix all problems

Where problems may be found
- single location in interface
- two or more locations that need to be compared
- problem with overall structure of interface
- something that is missing
- common problem with paper prototypes
(sometimes features are implied by design documents and just haven’t been “implemented” – relax on those)
Severity Rating

Used to allocate resources to fix problems
Estimates of need for more usability efforts
Combination of
  frequency
  impact
  persistence (one time or repeating)
Should be calculated after all evaluations are in
Should be done independently by all judges
Severity Rating

0 - Do not agree this is a problem.

1 - Usability blemish.
   Mild annoyance or cosmetic problem. Easily avoidable.

2 - Minor usability problem.
   Annoying, misleading, unclear, confusing.
   Can be avoided or easily learned. May occur only once.

3 - Major usability problem.
   Prevents people from completing tasks. Highly confusing or unclear. Difficult to avoid. Likely to occur more than once.

4 - Critical usability problem.
   People will not be able to accomplish their goals.
   People may quit using system all together.
Example Heuristic Violation

1. [H4 Consistency] [Severity 3]

The interface used the string "Save" on the first screen for saving the person’s file, but used the string "Write file" on the second screen. People may be confused by this different terminology for the same function.
Why Multiple Evaluators?

Every evaluator does not find every problem

Good evaluators find both easy & hard ones
Debriefing

Conduct with evaluators, observers, and development team members
Discuss general characteristics of interface
Suggest potential improvements to address major usability problems
Development team rates how hard to fix
Make it a brainstorming session
Fixability Scores

1 - Nearly impossible to fix. Requires massive re-engineering or use of new technology. Solution not known or understood at all.

2 - Difficult to fix. Redesign and re-engineering required. Significant code changes. Solution identifiable but details not fully understood.

3 - Easy to fix. Minimal redesign and straightforward code changes. Solution known and understood.

4 - Trivial to fix. Textual changes and cosmetic changes. Minor code tweaking.
Example Heuristic Violation

1. [H4 Consistency] [Severity 3] [Fix 4]

The interface used the string "Save" on the first screen for saving the person’s file, but used the string "Write file" on the second screen. People may be confused by this different terminology for the same function.

Fix: Change second screen to "Save".
Results of Using HE

Discount: benefit-cost ratio of 48

- cost was $10,500 for benefit of $500,000
- how might we calculate this value?

- in-house → productivity; open market → sales

Single evaluator achieves poor results

- only finds 35% of usability problems
- 5 evaluators find ~ 75% of usability problems
- why not more evaluators?

Nielsen, 1994
Decreasing Returns

problems found

benefits / cost

Nielsen, 1994
Alternative Inspection-Based Methods

Cognitive Walkthrough

Surfaces different types of usability problems
Consider as a complement to heuristic evaluation

Action Analysis

Low-level modeling of expert performance
Be aware of GOMS, but may never encounter it
Cognitive Walkthrough

Evaluation method based on:

A person works through an interface in an exploratory manner

A person has goals

The person is applying means-ends reasoning to work out how to accomplish these goals

Evaluation by an expert, who goes through a task while simulating this cognitive process
Preparation: Need Four Things

1) Person description, including level of experience and any assumptions made by the designer
2) System description (e.g., paper prototype)
3) Task description, specifying the task the expert has to carry out, from a person’s point of view
4) Action sequence describing the system display and the actions needed to complete the task. One system display and one action together are one step.
Cognitive Walkthrough Process

Designer/Developer prepares the required documents described on previous slide

Gives these documents to the usability expert

Expert reads the descriptions, and carries out the task by following the action list

At each step in action list, asks four questions

Record problems similar to heuristic evaluation
Believability

1) Will the person be trying to produce whatever effect the action has?
2) Will the person be able to notice that the correct action is available?
3) Once the person finds the correct action at the interface, will they know that it is the right one for the effect they are trying to produce?
4) After the action is taken, will the person understand the feedback given?
GOMS: Goals, Operators, Methods, Selection
Developed by Card, Moran and Newell

Walk through sequence of steps
Assign each an approximate time duration
Sum to estimate overall performance time

1. Select sentence
   Reach for mouse H 0.40
   Point to first word P 1.10
   Click button down K 0.60
   Drag to last word P 1.20
   Release K 0.60
   3.90 secs
Inspection vs. Usability Testing

Inspection is
- Is much faster
- Does not require interpreting participant actions
- May miss problems or find false positives

Usability testing is
- More accurate, by definition
- Account for actual people and tasks

One approach is to alternate between them
- Find different problems, conserve participants
CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 14:
Testing and Patterns

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
Project Status

Looking Forward

3c: Usability Testing Check-In due Today
- Changes from Inspection
- Changes from First Usability Test
3d: Usability Testing Review due Thursday 2/23

Other Assignments

Reading 4 Posted, Due Friday 2/24
(you should engage before that if you can)
Exam

In-Class
Next Tuesday 2/21

Mostly short answer, some long answer

Content drawn from lecture and readings

Compilation of the lecture slides is posted

Q&A scheduled Monday at 1:30 in CSE 403
Testing and Patterns

Wizard of Oz and Low Fidelity Testing

Remote Usability Testing

Controlled A/B Experiments

Patterns
Informal Interaction
SILK (1996)

Migrate to Prototype, Storyboard-Based Programming
DENIM (2000)

Early Stage, Multiple Levels of Details, Sketching, Pen Interaction
SUEDE (2000)

Low-Fidelity Is Not Just About Ink
Topiary (2004)

Location Awareness, Wizard of Oz
Activity Designer (2008)

ActivityDesigner
Activity-Based Prototyping of Ubicomp Applications

Yang Li & James Landay

Computer Science & Engineering
University of Washington

Intel Research Seattle

January 2008

Long-Lived Activities
FrameWire (2010)

Tangible Interaction
Testing and Patterns

Wizard of Oz and Low Fidelity Testing

Remote Usability Testing

Controlled A/B Experiments

Patterns
Remote Usability Testing

Conferencing-based testing
   Use tools like video conferencing, instant messaging, and screencasting to test with a remote participant

Semi-automated remote testing
   Automatic logging and some analysis of usage

Controlled online A/B experiments
   Carefully measure results of showing different versions to different sets of live customers
Semi-Automated Remote Usability

Now available through a variety of services

- Loop11
- TryMyUI
- Userlytics
- Usertesting.com
- UserZoom
- Validately
- WhatUsersDo
- YouEye

Unlikely you need to bake your own

Some include mobile testing
Crowds for automated testing in build processes

http://www.nngroup.com/articles/unmoderated-user-testing-tools/
Semi-Automated Remote Usability

Move usability testing online
- Participants access the “lab” via web
- Answer questions & complete tasks in “survey”
- Records actions or screens for playback
- Can test many people completing many tasks

Analyze data individually or in aggregate
- Playback individual sessions
- Find general problem areas
- If needed, look closely with traditional methods
Semi-Automated Remote Usability
Semi-Automated Remote Usability

1. Find a flat panel monitor that costs less than $1200. Please try to accomplish this task without using the search function.

<table>
<thead>
<tr>
<th>Task</th>
<th>Response(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was able to complete the task</td>
<td>90%</td>
</tr>
<tr>
<td>I was not able to complete the task</td>
<td>10%</td>
</tr>
<tr>
<td>I think that I was able to complete the task, but I'm not sure</td>
<td>0%</td>
</tr>
</tbody>
</table>

Response Times
Fastest: 00:00:28
Median: 00:00:41
Average: 00:00:48.4
Slowest: 00:01:14

2. What is the price of the monitor you just found?

Short Freeform
$1129
Semi-Automated Remote Usability
WebQuilt: Visual Analysis

Goals

- link page elements to actions
- identify behavior/navigation patterns
- highlight potential problems areas

Interactive graph based on web content

- designers can indicate expected paths
- color code common usability interests
- filtering to show only target participants
- use zooming for analyzing at varying granularity
WebQuilt: Visual Analysis
WebQuilt: Visual Analysis
WebQuilt: Visual Analysis

http://pda.edmunds.com

Where Smart Car Buyers Start

Edmunds2Go!

- Vehicle Prices & Reviews
- Dealer Locator
- Auto Tools

About Us | Help

Testing and Patterns

Wizard of Oz and Low Fidelity Testing

Remote Usability Testing

Controlled A/B Experiments

Patterns
Controlled A/B Experiments

Many names for it

A/B tests or Control/Treatment

Randomized Experimental Design

Controlled experiments

Split testing

Parallel flights

(this section mostly due Ronny Kohavi)
Controlled A/B Experiments

Example: Amazon Shopping Cart Recommendations

Add an item to your shopping cart
Most sites show the cart

At Amazon, Greg Linden had idea to show recommendations based on cart items

Controlled A/B Experiments

Evaluation

Pro: cross-sell more items
Con: distract people from checking out

Highest Paid Person’s Opinion:
Stop the project

Simple experiment run:
Wildly successful

Marketplace: Solitaire vs Poker

Experiment run in Windows Marketplace / Game Downloads
Which image has the higher clickthrough? By how much?

A: Solitaire game

B: Poker game
Marketplace: Solitaire vs Poker

Experiment run in Windows Marketplace / Game Downloads

Which image has the higher clickthrough? By how much?

A: Solitaire game

A is 61% better

B: Poker game
Never Underestimate Solitaire

OUR COMPUTERS ARE DOWN, SO WE HAVE TO DO EVERYTHING MANUALLY...
Never Underestimate Solitaire

Activision Acquires Candy Crush Maker King Digital For $5.9 Billion

by Motline login
November 3, 2015, 12:04 AM EST

Activision’s purchase price for the game maker is a premium to its current price but a discount to its recent IPO price.

King Digital Entertainment, the company behind popular Facebook games such as Candy Crush, seems to have decided that being a publicly-traded entity isn’t all it’s cracked up to be. King announced late Monday that it is being acquired by Activision Blizzard, the maker of popular console and PC games such as Call of Duty, for $5.9 billion.

The purchase price of $18 a share amounts to a premium of about 16% over the recent closing price for King’s stock (KING – 18.32%)—but it’s about 20% lower than the price at which the company went public in March. At that
Checkout Page

*Conversion rate* is percentage of visits that include purchase

Which version has a higher conversion rate?

Example from Bryan Eisenberg’s article on clickz.com
Checkout Page

Conversion rate is percentage of visits that include purchase

Which version has a higher conversion rate?

Example from Bryan Eisenberg’s article on clickz.com
Checkout Page

*Conversion rate* is percentage of visits that include purchase

Coupon Code decreases by factor of 10
Office Online Feedback

Feedback A puts everything together, whereas feedback B is two-stage: question follows rating.

Feedback A just has 5 stars, whereas B annotates the stars with “Not helpful” to “Very helpful” and makes them brighter.

Which one has a higher response rate? By how much?
Feedback A puts everything together, whereas feedback B is two-stage: question follows rating.

Feedback A just has 5 stars, whereas B annotates the stars with “Not helpful” to “Very helpful” and makes them brighter.

Which one has a higher response rate? By how much?

B gets more than double response rate.
Another Feedback Variant

Call this variant C. Like B, also two-stage. Which one has a higher response rate, B or C?
Another Feedback Variant

Call this variant C. Like B, also two-stage.
Which one has a higher response rate, B or C?

C outperforms B by a factor of 3.5
Office Online

Clicks on revenue generating links (red links)
Office Online

Clicks on revenue generating links (red links)

A gets many more clicks
Office Online

Clicks on revenue generating links (red below)

B gets more revenue
Examples Where Data Is Wrong

If something is “amazing,” find the flaw!

If you have a mandatory birth date field, and people think it’s unnecessary, you will find lots of 11/11/11 or 01/01/01

If you have an optional drop down, do not default to the first alphabetical entry, or you will have lots of: jobs = Astronaut

Traffic to doubled between 1-2am Nov 6, 2011 for many web sites, relative to same hour week prior
MSN US Home Page
Proposal: New Offers module below Shopping

Control

Treatment
Experiment Results

Ran A/B test for 12 days on 5% of MSN US visitors
Experiment Results

Ran A/B test for 12 days on 5% of MSN US visitors

Clickthrough:

Page views per person-day:
Experiment Results

Ran A/B test for 12 days on 5% of MSN US visitors

Clickthrough: decreased 0.49%

Page views per person-day: decreased 0.35%
Experiment Results

Ran A/B test for 12 days on 5% of MSN US visitors

Clickthrough: decreased 0.49%

Page views per person-day: decreased 0.35%

Value of click from home page: $X$ cents

Net = Expected Revenue – 
Value Per Click * Direct lost clicks – 
Value Per Click * Lost Due to Decreased Views
Experiment Results

Ran A/B test for 12 days on 5% of MSN US visitors

Clickthrough: **decreased 0.49%**

Page views per person-day: **decreased 0.35%**

Value of click from home page: X cents

Net = Expected Revenue –
Value Per Click * Direct lost clicks –
Value Per Click * Lost Due to Decreased Views

Net was negative (in millions of dollars), offers module did not launch
ONLINE PLATFORMS
AS THE FUTURE OF RESEARCH

JEFFREY "LYTE" LIN
jlin@riotgames.com | @RiotLyte
Did You Know:

Sunglasses are an important accessory for reducing damage from the Sun.
“Nautilus’ joke makes him swim through air. He’s weird like that.”
CATEGORY 2: POSITIVE BEHAVIOR

“Players perform better if you give them constructive feedback after a mistake.”
CATEGORY 3: NEGATIVE BEHAVIOR
“Players who verbally abuse their teammates lose 16% more games.”
CATEGORY 4: SELF-REFLECTION

“Who will be the most sportsmanlike player in this game?”
OPTIMUS PRIME

EXPERIMENTAL DESIGN
C1  C2  C3
C4  C5

CATEGORY 5: GAMEPLAY TIPS
“Hold down the ALT key while casting an ability to cast it on yourself.”
OPTIMUS PRIME

EXPERIMENTAL DESIGN

C1 C2 C3
C4 C5

FONT COLORS

Font Color 1 | Red
Font Color 2 | Blue
Font Color 3 | White (Control)
EXPERIMENTAL DESIGN

LOCATIONS

LOCATION 1: Loading Screen
LOCATION 2: In-Game
LOCATION 3: Both
LOCATION 4: None (Control)
OPTIMUS PRIME

EXPERIMENTAL DESIGN

COMPLETE EXPERIMENTAL DESIGN:

- 24 TIPS ACROSS 5 CATEGORIES
- 3 FONT COLORS
- 3 LOCATIONS + 1 OVERALL CONTROL

= 217 UNIQUE CONDITIONS
EVERY GAME OF LEAGUE OF LEGENDS GOT A RANDOM TIP, LOCATION & FONT COLOR
(10% OF GAMES GOT NOTHING TO ACT AS CONTROLS)
OPTIMUS PRIME RESULTS

TIP: “X% of players punished by the Tribunal improve their behavior and are never punished again”

FONT: White
LOCATION: Loading Screen

INCREASE
COMPARED TO CONTROL GAMES
DECREASE

Verbal Abuse: 6.35%
Offensive Language: 5.89%
Reports/Game: 4.11%

*Optimus data from 11/2012
HOW DO **FONT COLORS** INTERACT WITH TIP CATEGORIES?
OPTIMUS PRIME RESULTS

TIP: “Teammates perform worse if you harass them after a mistake.”

FONT: Red

LOCATION: Loading Screen

INCREASE

COMPARED TO CONTROL GAMES

DECREASE

8.34% 6.22% 11.00%

Negative Attitude Verbal Abuse Offensive Language

*Optimus data from 11/2012
OPTIMUS PRIME RESULTS

TIP: “Teammates perform worse if you harass them after a mistake.”

FONT: White

LOCATION: Loading Screen

INCREASE

COMPAARED TO CONTROL GAMES

DECREASE

0.55%
8.34%
2.48%
6.22%
1.28%
11.00%

*Optimus data from 11/2012
OPTIMUS PRIME RESULTS

TIP: “Players who cooperate with their teammates win X% more games.”

FONT: Blue
LOCATION: Loading Screen

INCREASE

COMPARED TO CONTROL GAMES

DECREASE

Negative Attitude: 5.13%
Verbal Abuse: 3.64%
Offensive Language: 6.22%

*Optimus data from 11/2012
OPTIMUS PRIME RESULTS

TIP: “Players who cooperate with their teammates win X% more games.”

FONT: Red

LOCATION: Loading Screen

INCREASE

COMPAARED TO CONTROL GAMES

DECREASE

<table>
<thead>
<tr>
<th></th>
<th>Negative Attitude</th>
<th>Verbal Abuse</th>
<th>Offensive Language</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.39%</td>
<td>1.02%</td>
<td>0.45%</td>
</tr>
<tr>
<td></td>
<td>5.13%</td>
<td>3.64%</td>
<td>6.22%</td>
</tr>
</tbody>
</table>

*Optimus data from 11/2012
ONLINE PLATFORMS
AS THE FUTURE OF RESEARCH

JEFFREY “LYTE” LIN
jlin@riotgames.com | @RiotLyte
Data Driven Methods Not Just Online

1999
Made from cardboard, the first Netflix mailer weighs more than an ounce. But with only 100,000 customers, reducing material and shipping costs is not yet a priority for the company.

2000
Thick paper replaces cardboard. DVDs are inserted and removed from the top rather than the side.

2000
Full-color printing is introduced. Top-loading is abandoned in favor of side-loading, which is judged more convenient.
Data Driven Methods Not Just Online

2000
Customers are asked to peel off a sticker to reveal Netflix's return address. The design is eventually deemed too complex.

2000
Made from plastic instead of paper, this mailer is cheaper, but it sometimes inflates when transported on airplanes.

2001
An airhole (the black dot on the left side of the mailer) is added to prevent the package from inflating.

2001
Netflix returns to paper because it's easier to recycle. Foam padding is added to reduce breakage.
Data Driven Methods Not Just Online

2001
Foam padding is dropped because the benefits don’t justify the cost. The company gives top-loading another try.

2001
Marking a return to side-loading, this mailer is a direct ancestor of the one the company uses today.

2003
Instead of sealing the entire top and bottom, Netflix introduces a circular sticker, affixed only on the top.

2004
A window shows the disc bar code. Speculation is that this enables storing discs in mailers prior to shipping.
Limitations of Data Driven Testing

Drives hill-climbing, but not overall design

A design may be better, but is it good?

Impossible for new designs to compete

Can be difficult to scale to many features

Now we step through a larger example
Red Hot Price for the Chili Peppers' New CD: $11.88!
Evolving after the popularity of California, the Chili Peppers release a new album featuring the hit song "By the Way".

In-Stock Now!
- **Weezer**, Weezer
- **Backstreet Boys**, Dolls
- **Brian Wilson**, Good Vibrations
- **Eminem**, The Slim Shady LP
- **Pink Floyd**, Echoes
- **Moby**, 18

<table>
<thead>
<tr>
<th>In-Stock Now!</th>
<th>Our Price</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weezer</strong>, Weezer</td>
<td>$6.99</td>
<td>$18.97</td>
</tr>
<tr>
<td><strong>Backstreet Boys</strong>, Dolls</td>
<td>$9.00</td>
<td>$18.98</td>
</tr>
<tr>
<td><strong>Eminem</strong>, The Slim Shady LP</td>
<td>$2.98</td>
<td>$18.97</td>
</tr>
<tr>
<td><strong>Pink Floyd</strong>, Echoes</td>
<td>$11.54</td>
<td>$24.97</td>
</tr>
<tr>
<td><strong>Moby</strong>, 18</td>
<td>$10.99</td>
<td>$18.98</td>
</tr>
</tbody>
</table>

**NEW: Counting Crows: Hard Candy** $11.88 Save 37%!
People with similar tastes also enjoyed...

**Weezer (1994)**
(CD, 1994)
Weezer **$5.00**
(Save $6.97)

**Pinkerton**
(CD, 1996)
Weezer **$6.00**
(Save $10.95)

**All Killer No Filler**
[ECG]
(CD, 2001)
Sum 41, Sum 41 **$4.29**
(Save $8.68)

**Weezer (2001)** Weezer, Weezer (Music)
CD, Release Year: 2001
Seller: naola@hotmail.com (35)
Condition: Like New • Notes: Perfect condition

Move to WishList • Remove from Cart • Find another one

---

**Shopping Cart**

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>$8.30</td>
</tr>
<tr>
<td>Media Mail</td>
<td>$2.45</td>
</tr>
</tbody>
</table>

**TOTAL**: $10.75

---

**Gift Certificates and Coupons**

Redeeming your Half.com Gift Certificate or Coupon is easy. Just enter your Claim Code in the box to the right and click "Redeem".

---

**Proceed to Checkout**
Checkout

Enter your User ID and Password.

Are you a half.com user having trouble signing in? Get help now.

eBay User ID

You can also use your registered email.

eBay Password

Forgot your password?
Learn how to protect your account

Secure Sign In or Register Now

Keep me signed in on this computer unless I sign out. Learn more.

Having problems signing in? Get help now.

For more information about sign in, visit sign in help.
Step 1 - Choose Shipping Address

Ship my order to:

Jason Hong  
387 Soda Hall Computer Science UC Berkeley  
Berkeley, CA 94720

OR

Enter a new shipping address:

Name
Street address
City
State  
Select State
ZIP code
Country  
USA

Use This Address

Save Changes
Quick Flow Checkouts

CSE440 - Autumn 2007
User Interface Design, Prototyping, and Evaluation

Order Summary

Seller: najoia@hotmail.com (35)
Condition: Like New • Notes: Perfect condition

<table>
<thead>
<tr>
<th>Item: $8.30</th>
<th>Media Mail: $2.45</th>
<th>Subtotal: $10.75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Merchandise: $8.30</td>
<td>Total Shipping: $2.45</td>
<td>TOTAL: $10.75</td>
</tr>
</tbody>
</table>

Ship to

Jason Hong
387 Soda Hall Computer Science UC Berkeley
Berkeley, CA 94720

Edit / Change Shipping Address

Bill to

MasterCard ending with 0155
Expires 11/2003
Zipcode: 94709

Edit / Change Billing

Use this shipping and billing information as my Speedy Checkout settings.

Place my order!
Testing in a Larger Design

OK, so the strategy behind this redesign is—
WAIT, did you increase the border size??
HOLY CRAP! We better isolate and re-test!

But... that change is just part of a larger design...
CALM DOWN, pixel-boy. We've got scientific ways to handle this.

3 MONTHS LATER...
SEE? That border would have cost us 0.012%. Thank goodness I stopped your sloppy "redesign."
ABSOLUTELY. Once again our business is safe.
Goodbye, Google

Part 1 of 2 (here’s Part 2)

Today is my last day at Google.

I started working in-house at Google almost three years ago. I built a team from scratch. I was fortunate to hire a team of very talented designers. We introduced Visual Design as a discipline to Google. And we produced amazing work together. I’m very proud of my team, and I wish them well. They have a lot of challenging work ahead. But for me, it’s time to move on.

Do I have something else lined up? Yes. That will be covered in Part 2. So I’m not leaving just to leave. But I’m not going to sugarcoat the reasons for my departure either. The scale at which Google operates was an early attractor for me. Potential to impact millions of people? Where do I sign? Unfortunately for me, there was one small problem I didn’t see back then.

When I joined Google as its first visual designer, the company was already seven years old. Seven years is a long time to run a company without a classically trained designer. Google had plenty of designers on staff then, but most of them had backgrounds in CS or HCI. And none of them were in high up, respected leadership positions. Without a person at (or near) the helm who thoroughly understands the principles and elements of Design, a company eventually runs out of reasons for design decisions. With every new design decision, critics cry foul. Without conviction, doubt creeps in. Instincts fail. “Is this the right move?” When a company is filled with engineers, it turns to engineering to solve problems. Reduce each decision to a simple logic problem. Remove all subjectivity and just look at the data. Data in your favor? Ok, launch it. Data shows negative effects? Back to the drawing board. And that data eventually becomes a crutch for every decision, paralyzing the company and preventing it from making any daring design decisions.

Yes, it’s true that a team at Google couldn’t decide between two blues, so they’re testing 47 shades between each blue to see which one performs better. I had a recent debate over whether a border should be 3, 4 or 5 pixels wide, and was asked to prove my case. I can’t operate in an environment like that. I’ve grown tired of debating such minuscule design decisions. There are more exciting design problems in this world to tackle.

I can’t fault Google for this reliance on data. And I can’t exactly point to financial failure or a shrinking number of users to prove it has done anything wrong. It has been a pleasure to work here, and I’m leaving with a smile on my face.
Testing and Patterns

Wizard of Oz and Low Fidelity Testing

Remote Usability Testing

Controlled A/B Experiments

Patterns
Red Hot Price for the Chili Peppers' New CD: $11.88!

Evolving after the popularity of *Californication*, the Chili Peppers release a new album featuring the hit song "By the Way".

### In-Stock Now!

<table>
<thead>
<tr>
<th>Artist</th>
<th>Our Price</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weezer</strong></td>
<td>$6.99</td>
<td>$18.97</td>
</tr>
<tr>
<td><strong>Gutterflower</strong></td>
<td>$9.00</td>
<td>$18.98</td>
</tr>
<tr>
<td><strong>The Slim Shady LP</strong></td>
<td>$2.98</td>
<td>$18.97</td>
</tr>
<tr>
<td><strong>Echoes</strong></td>
<td>$11.54</td>
<td>$24.97</td>
</tr>
<tr>
<td><strong>18</strong></td>
<td>$10.99</td>
<td>$18.98</td>
</tr>
</tbody>
</table>

**New CD Releases!**

only $11.88

The Smallest Place to Buy and Sell  Books, Music, Computers, Electronics, DVDs & more...

### Advance Orders

- **The Simpsons: Complete 2nd Season (DVD) $34.97**  Save 30%
- **The Sopranos: Complete 3rd Season (DVD) $67.99**  Save 32%
- **Tom Clancy: Red Rabbit (Hardcover) $19.40**  Save 33%

### In Computers

- **Gateway Desktop Under $400!**
  - $399.00
  - Includes an 800MHz Intel Celeron processor, 256MB RAM, 20GB hard drive, DVD-ROM drive, and more!

- **Save Over $100 on Dell Latitude CPx!**
  - $639.00
  - Get the best quality at the best price with the Dell Latitude CPx featuring an Intel Pentium III @ 500 MHz processor, 256 MB RAM and 12GB hard drive.

- **Gateway Desktop Under $500**
  - $499.00
  - Includes a 1GHz Intel Pentium III processor, 256MB RAM, 20GB hard drive, CD-RW drive, 250MB ZIP Drive, and more!

**Just Released: The Royal Tenenbaums for $18.45**

Wes Anderson (*Rushmore*) directs a motley crew of talented actors in this hysterical comedy about the rise and fall of an eccentric family.

### In-Stock Now!

<table>
<thead>
<tr>
<th>Title</th>
<th>Our Price</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monster's Ball (DVD)</strong></td>
<td>$11.25</td>
<td>$24.99</td>
</tr>
</tbody>
</table>
• What site is this?
  – Logo in top-left corner denotes the site
  – Another logo at top-right to reinforce
  – examples of SITE BRANDING
What kind of site is this?
- Shopping cart icon
- Tab row content & categories on left
- Prices in content area
- UP-FRONT VALUE PROPOSITION
- example of PERSONAL E-COMMERCE
• What can I do here?
  – *Welcome* for new visitors
  – Tab row / Search on top
  – “Categories”
  – Prices
  – Examples of OBVIOUS LINKS
Most important info visible without scrolling
ABOVE THE FOLD
### Weezer (2001)

**Weezer**

**Our best price:** $6.99  
**List Price:** $18.97 (Save: $11.98)

---

### Like New

<table>
<thead>
<tr>
<th>Price</th>
<th>Total Price</th>
<th>Seller (Rating)</th>
<th>Seller Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7.75</td>
<td>$10.20 Media Mail</td>
<td>custodian46 (149)</td>
<td>best buy</td>
</tr>
<tr>
<td>$8.00</td>
<td>$10.45 Media Mail</td>
<td>stargaze13 (3)</td>
<td>Disk, case, and liner all in excellent condition</td>
</tr>
<tr>
<td>$8.25</td>
<td>$10.70 Media Mail</td>
<td>dazzyliz (1205)</td>
<td>SEALED NEW BMG</td>
</tr>
<tr>
<td>$8.30</td>
<td>$10.75 Media Mail</td>
<td><a href="mailto:naolia@hotmail.com">naolia@hotmail.com</a> (35)</td>
<td>Perfect condition</td>
</tr>
</tbody>
</table>

### Very Good

<table>
<thead>
<tr>
<th>Price</th>
<th>Total Price</th>
<th>Seller (Rating)</th>
<th>Seller Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>$8.00</td>
<td>$10.45 Media Mail</td>
<td>lucidsky (14)</td>
<td>perfect</td>
</tr>
<tr>
<td>$8.84</td>
<td>$11.29 Media Mail</td>
<td>steveeq1 (82)</td>
<td></td>
</tr>
<tr>
<td>$9.00</td>
<td>$11.45 Media Mail</td>
<td>sainttimothy (18)</td>
<td>Great shape...first class shipment</td>
</tr>
</tbody>
</table>

Standard shipping (USPS Media Mail) for this item is $2.30.
• What site am I at?
  – Logo in upper-left reinforces brand, can click to go to home
  – Same font, layout, color scheme also reinforces
  – examples of SITE BRANDING (E1)
Where am I in the site?

- “Home > Music” are LOCATION BREAD CRUMBS
- TAB ROW says “Music”
- Album cover, “Product Highlights”, and CD cover
• Can I trust these sellers?
  – Who am I buying from?
  – Are they reputable?
  – What about shipping?
The Fold

Hmm, what’s below here?
• Impulse buy
  • PESONALIZED RECOMMENDATIONS
• About this album
• Lots of unused space
• Still more info below…
• Is this product any good?
  – Editorial reviews
  – Customer reviews
  – RECOMMENDATION COMMUNITY
Redeeming a Gift Certificate or Coupon?

Shopping Cart

**Weezer (2001)** Weezer, Weezer (Music)
CD, Release Year: 2001
Seller: naoli@hotmail.com (35)
Condition: Like New • Notes: Perfect condition

- Item: $8.30
- Media Mail: $2.45

**TOTAL**: $10.75

Gift Certificates and Coupons

Redeeming your Half.com Gift Certificate or Coupon is easy. Just enter your Claim Code in the box to the right and click "Redeem".

Proceed to Checkout

S Speedy Checkout
• What site am I at?
  – Logo in upper-left
  – Colors, layout, font
  – examples of SITE BRANDING
Where am I in the site?

- Last link clicked was “Buy!”
- “Shopping Cart” and “Proceed to Checkout” reinforce that this is “the right page”
- SHOPPING CART
• Cross-selling
  – Possibly a pleasant surprise
  – Impulse buy
  – CROSS-SELLING & UP-SELLING
• What am I going to buy?
  – Easy to remove
  – Easy to move to wishlist

• How much will it cost?
  – Shipping costs there, no nasty surprises

• SHOPPING CART
• What can I do?
  – “Proceed to Checkout”
    HIGH VISIBILITY ACTION BUTTON
  – Visually distinct
  – 3D, looks clickable
  – Repeated above and below fold
Enter your User ID and Password.

Are you a 4half.com™ user having trouble signing in?  Get help now.

**eBay User ID**

You can also use your registered email.

**eBay Password**

Forgot your password?
Learn how to protect your account

Secure Sign In  or  Register Now

Keep me signed in on this computer unless I sign out. Learn more.

Having problems signing in? Get help now.

For more information about sign in, visit sign in help.
- What if I don’t have a User ID?
- What if I forgot my password?
- SIGN-IN/NEW ACCOUNT options
Step 1 - Choose Shipping Address

Ship my order to:

Jason Hong
387 Soda Hall Computer Science UC Berkeley
Berkeley, CA 94720

OR

Enter a new shipping address:

Name
Street address
City
State: Select State
ZIP code
Country: USA

Save Changes
• What site?
  – Logo, layout, color, fonts

• Where in site?
  – Checkout, step 1 of 3
  – “Choose shipping address”
  – QUICK-FLOW CHECKOUT
• Note what’s different
  – No tab rows
  – No impulse buys
  – Only navigation on page takes you to next step

• This is a PROCESS FUNNEL
  – Extraneous info and links removed to focus customers
Quick Flow Checkouts

CSE440 - Autumn 2007
User Interface Design, Prototyping, and Evaluation

Order Summary

Seller: naison@hotmail.com (35)
Condition: Like New • Notes: Perfect condition

Item: $8.30
Media Mail: $2.45
Subtotal: $10.75
Total Merchandise: $8.30
Total Shipping: $2.45
TOTAL: $10.75

**Ship To**

Jason Hong
387 Soda Hall Computer Science UC Berkeley
Berkeley, CA 94720

**Bill To**

MasterCard ending with 0155
Expires 11/2003
Zipcode: 94709

Use this shipping and billing information as my Speedy Checkout settings.

Place my order!
• Last step of process
  – Step 3, “Place Order”
  – “Place my order” button

• **Two** HIGH-VISIBILITY ACTION BUTTONS for fold
• No nasty surprises
  – Can see order
  – Total price is same as shopping cart
  – ORDER SUMMARY
• Easy to change shipping and billing
• Easy to save this info
  – Easier to setup info in context of specific task
Design Equals Solutions

Design is about finding solutions

Designers often reinvent

- Hard to know how things were done before
- Why things were done a certain way
- How to reuse solutions

One option is patterns

- But this is also why we point you at research
Design Patterns

Design patterns communicate common design problems and solutions

First used in architecture [Alexander]

How to create a beer hall where people socialize?

Somewhere in the community at least one big place where a few hundred people can gather, with beer and wine, music, and perhaps a half-dozen activities, so that people are continuously criss-crossing from one to another.

- criss-cross paths
- activities
- open alcoves
Somewhere in the community at least one big place where a few hundred people can gather, with beer and wine, music, and perhaps a half-dozen activities, so that people are continuously criss-crossing from one to another.

- criss-cross paths
- activities
- open alcoves
Using Design Patterns

Not too general and not too specific
use a solution “a million times over, without ever doing it the same way twice”

Design patterns are a shared language
for “building and planning towns, neighborhoods, houses, gardens, and rooms”

Beer hall is part of a center for public life
Beer hall needs spaces for groups to be alone
ALCOVES
A Web of Design Patterns

(8) Mosaic of Subcultures

(31) Promenade

(33) Night Life

(90) Beer Hall

(95) Building Complex

(179) Alcoves

(181) The Fire

Cities & Towns

Local Gatherings

Interiors
Web Design Patterns

Communicate design problems & solutions

how to create navigation bars for finding relevant content

how to create a shopping cart that supports check out

how to make e-commerce sites where people return & buy
Problem: Customers need a structured, organized way of finding the most important parts of your Web site.
NAVIGATION BAR (K2)

Solution diagram

Captures essence on how to solve problem
Pattern Groups

Patterns organized by group

A Site genres
B Navigational framework
C Home page
D Content management
E Trust and credibility
F Basic ecommerce
G Advanced ecommerce
H Completing tasks
I Page layouts
J Search
K Page-level navigation
L Speed
M The mobile web
PROCESS FUNNEL (H1)

Problem:

Need a way to help people complete highly specific stepwise tasks

- Ex. Create a new account
- Ex. Fill out survey forms
- Ex. Check out
PROCESS FUNNEL (H1)
• What’s different?
  – No tab rows
  – No impulse buys
  – Only navigation on page takes you to next step

• What’s the same?
  – Logo, layout, color, fonts
PROCESS FUNNEL (H1)

Problem:

What if users need extra help?
PROCESS FUNNEL (H1)

FEATURING SYSTEM

Featured Dimension 4100

The Dimension 4100 desktop offers you amazing power and flexibility at a price that won’t break your budget.

- Intel® Pentium® III processor at 933MHz
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- 128MB SDRAM
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Free Ground (3-5 day) Shipping with purchase of any new Dell Home System. Offer ends 4/23/01. Click here for details.

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Intel® Pentium® III processor at 933MHz

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E-Value Code
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Add
Ink-Jet Printer
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More Details
FEATURED

Featured Dimension 4100

Keyboard Choices to Suit Your Needs:

- Choose from standard-size and "space-saver" designs
- Ergonomic design for added comfort
- Hot keys provide quick, one-touch access to frequently used programs and Web sites
- USB ports allow for quick and easy access to USB peripherals, such as digital cameras, scanners and joysticks

Dell Enhanced Performance Keyboard

Benefits:

- Quiet key response
- "rubberdome" touch
- 10 Hot Keys for easy access to your Internet and e-mail
- 3 programmable keys
- Soft "rubberdome"
- 7 programmable keys
- Built-in 2 port USB Hub

Dell Glossary

Need a definition? Click on it.

Keyboard Type

Dell QuietKey

Microsoft Internet Keyboard, Dell Edition

Dell Enhanced QuietKey

Dell Enhanced Performance

Zoom for a closer look.
FLOATING WINDOWS (H6)
FLOATING WINDOWS (H6)
PROCESS FUNNEL (H1)

Solution Diagram
Related Patterns

(A1) E-Commerce

(A10) Web Apps

(A11) Intranets

(H1) Process Funnel

(K2) Navigation Bars

(K3) Tab Rows

(K4) Action Buttons

(H8) Context-Sensitive Help

(I2) Above the Fold

(K5) High-Viz Action Buttons

(K12) Preventing Errors

(K13) Meaningful Error Messages
Patterns Support Creativity

Patterns come from successful examples
sites that are so successful that lots of people
are familiar with their paradigms
interaction techniques/metaphors that work well
across many sites (e.g., shopping carts)

Not too general and not too specific
you need to specialize to your needs

Patterns let you focus on the hard,
unique problems of your design situation
Principles, Guidelines, Templates

Patterns help design without over-constraining

unlike principles, patterns are not too general

unlike guidelines, patterns discuss tradeoffs, show good examples, and tie to other patterns

unlike style guides, patterns not too specific, can be specialized to a design

unlike templates, patterns illustrate flows and relationships among different pages
Web Design Patterns

**Background**

All Web applications that lead visitors through stepped tasks—PERSONAL E-COMMERCE (A1), SELF-SERVICE GOVERNMENT (A4), WEB APPS THAT WORK (A10), and ENABLING INTRANETS (A11)—need ways to help people succeed at completing the tasks.

**Problem**

Customers often need to complete highly specific tasks on Web sites, but pages with tangential links and many questions can prevent them from carrying out these tasks successfully.

People enjoy completing the tasks they start. Yet all kinds of distractions—including links that lead off the critical path, extraneous steps, and extra

**Exemplar**

Dell uses a process funnel consisting of several logical steps that guide customers to quickly configure and purchase a complete computer system. A pop-up window shows additional details but keeps customers in the funnel so that they can continue to complete.

**Pattern Name and Number**

PROCESS FUNNEL

**Forces & Solution**

Figure H1.1

- Required to Complete a Task: Customers need many steps. A process funnel should be broken into eight steps. Anything less than two steps is not recommended, and eight steps is unmanageable. If there are more than eight steps, try to split the process into two or more separate process funnels, or try combining multiple steps into one page. However, this is not always a viable solution because one choice may precede another, and not every page can hold all the information that customers might need at certain points.

- Provide a Progress Bar to Let Customers Know How Far They Are: Showing a progress bar as the customer goes through the funnel is often not worth your time to implement a progress bar clickable because doing so is unlikely to benefit for customers.

- Remove Unnecessary Navigation Links and Content: Removing navigation links and content unrelated to the task at hand will reduce the frustration and make it more likely that your customers will complete the tasks. Remove all navigation bars (K2), TAB CONTROLS (K6), and EMBEDDED LINKS (K7), leverage CONTENT NAVIGATION (K4) that help visitors reach their goals. Take out any content that is superfluous to the task.

- Reinforce the Web site brand to minimize any disorientation customers might feel from sudden changes in navigation options. Use the same

- Link from top and navigation bar throughout the site so that no one knows they're still on the same site.
Web Design Patterns

Solution Summary

Bus Stops

Solution Diagram

Related Patterns

Figure 1.2
A process funnel lets people complete
their goals by breaking down complica-
ted tasks into a
small number of
steps, using pop-up
windows for detailed
information, and
reducing the number of
links to only the
critical ones, so that
people are never
distracted.

CONSIDER THESE OTHER PATTERNS

Many kinds of Web sites use process funnels, including sites for personal
e-commerce (A1), self-service government (A4), Web apps that work
(A10), and enabling intranets (A11). Customers use process funnels
when they finalize purchases through quick-flow checkout (F1), when
they create new accounts through sign-in/new account (H2), and when
they post new messages to a recommendation community (G4), to name
some examples.

Solution

Remove navigation bars (K2), tab rows (K3), irrelevant action but-
tons (K4), location breadcrumbs (K6), and embedded links (K7) to
ensure that customers stay on their path. However, keep strong site
branding (E1) so that customers still know where they are.

Design process funnels to prevent errors (K12), and provide mean-
ful error messages (K13) when errors do occur.

Test your customers through persistent custom sessions (H5) to
avoid problems with the Back button, and to save customer-entered
information.

Move extra content, such as context-sensitive help (H8) and frequently
asked questions (H7), to pop-up windows (H6) to keep the main task
page on the screen. Make the next action visible by keeping it above the
fold (I2) and by using high-visibility action buttons (K5).
Pre-Patterns

Patterns require broad adoption and examples
  Many version of the same basic idea
  Shown successful in many contexts
  That is what makes them patterns

This is challenging in novel domains

Pre-patterns are based in weaker evidence
  Can help speed diffusion of techniques and results
  Can help see relationships among ideas
UbiComp Pre-Patterns

Literature review

Button-up card sorting of lessons from literature
Cut down based on critique by other researchers
UbiComp Pre-Patterns

B6 • FIND A FRIEND

Figure 1. AT&T Wireless’ mMode service allows customers to add friends to a friend list, find out who is nearby, and call or send messages to them. Users can make themselves invisible whenever they want.

• BACKGROUND
This pattern discusses services that allow people to find where their friends are while allowing those friends some level of privacy. This pattern is useful for GUIDES FOR EXPLORATION AND NAVIGATION (A5).

• PROBLEM
People would like to know where their friends are, for impromptu communication and gatherings. At the same time, those people may not always want to be tracked.

Displaying people’s location • There are several different ways of displaying a person’s location. A straightforward approach is to simply show the location in text, for example “near corner of Euclid Ave and Hearst Ave” or “in Soda Hall”. Another approach is to show the data on a map, or possibly even an ACTIVE MAP (B1) that is constantly updated.

Figure 2. UC San Diego’s ActiveCampus project shows your friends’ location in real time. While useful, this visualization raises many privacy concerns.

Managing privacy concerns • There are many privacy concerns about find-a-friend applications due to the potential for abuse. This is not just the fear of “Big Brother,” but also so-called “Little Brother” including law enforcement agencies.
## UbiComp Pre-Patterns

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<th>A – Ubiquitous Computing Genres</th>
<th>B – Physical-Virtual Spaces</th>
<th>C – Developing Successful Privacy</th>
<th>D – Designing Fluid Interactions</th>
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<td>Associating physical objects and spaces with information and meaning; location-based services; helping users navigate such spaces</td>
<td>Policy, systems, and interaction issues in designing privacy-sensitive systems</td>
<td>How to design for interactions involving dozens or even hundreds of sensors and devices while making users feel like they are in control</td>
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</table>
Patterns

When you see advice, consider its depth
  Result of an individual study / rant
  Pre-pattern based on some meta-analysis
  Established pattern

Be aware of misapplying patterns
  And be aware of anti-patterns
Touch and Microsoft Windows

2004

2012
Consistency vs. Specialization

Beware of simply copying a design language

Consistency is your friend
until it is not your friend

Not limited to platform-level decisions

One “look” for your app
Or targeted at each device
Dark Patterns

A Dark Pattern is an interface that has been carefully crafted to trick people into doing things, such as buying insurance with their purchase or signing up for recurring bills.

Disguised Ads

Ads that are disguised as other kinds of content or navigation, in order to get users to click on them
Dark Patterns

A Dark Pattern is an interface that has been carefully crafted to trick people into doing things, such as buying insurance with their purchase or signing up for recurring bills.

Friend Spam

A site or game asks for your credentials, then goes on to publish content or send out bulk messages.
Dark Patterns

After Lawsuit Settlement, LinkedIn’s Dishonest Design Is Now A $13 Million Problem

HOPEFULLY, THIS WILL BE A LESSON TO OTHER COMPANIES WHO USE DARK UX PATTERNS TO TRICK THEIR USERS.

Anyone who has ever signed up, or even known anyone who has signed up, for LinkedIn has probably found themselves on the receiving end of dozens of follow-up emails, inviting you to “expand your professional network.” Even worse, they’re virtually impossible to opt-out of. It’s a scummy use of dark UX patterns by a company that should know better. Now, LinkedIn is going to be paying for it as part of a class-action lawsuit, to the tune of $13 million.

Presented in San Jose’s U.S. District Court, the key issue in Perkins v. LinkedIn is spam. Namely, during the user sign-up process, LinkedIn claims that it “will not store your password or email anyone without your permission.” Despite this, LinkedIn sends automated follow-up email reminders on a new user’s behalf to any contacts harvested from their email accounts, which are presented in such a way as to appear as if they came directly from the user.

Under California law, the sitting judge says has deemed this illegal. Consequently, if you were a member of LinkedIn’s “add connection” program between September 2011 and October 2014, you can submit a claim to the BARGAIN.

1. Google Goes Analog With Its New Note-Taking Tools
2. Will Flat Design Ever Die?
3. This Note-Taking System Turns You Into An Efficiency Expert
4. 3 Radical Ideas To Totally Disrupt Air Travel