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

Lecture 02:
Design Diamond

Tuesday / Thursday
12:00 to 1:20

James Fogarty
Kailey Chan
Dhruv Jain
Nigini Oliveira
Chris Seeds
Jihoon Suh
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?

Bayles and Orland, 2001
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
Today

Administrative

Assignment 0
Assignment 1c: Project Bid
Section Balance and Movement
Denny 303 on Tuesday 10/10

The Design Diamond

Examining a Design Process
Sketching and Prototypes
Assignment 0: Flash Card

Name
formal, preferred, pronouns

Majors/Minors
career goals

Year
1, 2, 3, 4, 5, 6, …

Hometown

Interesting Fact or
“What I did on my …”

Submit PDF via Canvas
Project Status and Assignments

Proposals to be “Funded” and Posted for Bidding
    Bidding Tomorrow, Team Formation Thursday
    Please Watch Your Email During This Process

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 Thursday
    Reading 1 Posted, Due Thursday
Section Balance and Movement

9:30  Section:  12 people
10:30 Section:  15 people
11:30 Section:  14 people
12:30 Section:  13 people

Project bidding will include “bid with section” and “bid in another section”, to allow moving

A “switch section” bid dominates your other bids

Most of you will bid “No Desire to Switch”
Denny 303 on Tuesday 10/10
Today

Administrative

Assignment 0
Assignment 1c: Project Bid
Section Balance and Movement
Denny 303 on Tuesday 10/10

The Design Diamond

Examining a Design Process
Sketching and Prototypes
Objectives

Be able to:

- Describe an iterative design process
- Describe the design diamond model of design, its implications, and how it can break down
- Describe properties of a sketch versus a prototype
- Differentiate examples of sketches from prototypes
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

Movies

Theater: Shattuck Cinemas
Phone: (510) 665-1342 Dist: 1.5 mi
Address: 2122 Shattuck Ave
Berkeley, 94709
Cost: $8.50 normal, $6.00 senior, 4x00 matinee

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

Bittersweet Motel: ★★★★
(11:00) - (1:30) 4:00 - 6:30 - 9:00

Godzilla: ★★★
(10:30) - (1:00) 5:30 - 9:00

The Cell: ★★★★
(11:00) - (1:00) 3:00 - 6:00 - 9:00

Store for the Style-Challenged

As it is...

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
Sketching
Sketching

UBIGITOUS RICE COOKER

- LCD display shows number of cups & time remaining
- Dial pad 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
IDEO’s Deep Dive (ABC News, 1999)

http://courses.cs.washington.edu/courses/cse440/videos/design/IDEO-DeepDive.mp4
ABC News and IDEO’s Deep Dive

Things to see in this video:

- brainstorming
- design research
- sketching
- critique

A highly iterative design process with a variety of intermediate artifacts

Why build a shopping cart with no bottom?
IDEO’s Deep Dive (ABC News, 1999)

http://courses.cs.washington.edu/courses/cse440/videos/design/IDEO-DeepDive.mp4
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IDEO’s Deep Dive (ABC News, 1999)
Perfect Shopping Cart?
Perfect Shopping Cart?

Several design flaws

- Kids will slide and fall out of that seat
- Where to put bags of dog food, cases of beer?
- Hook design with reusable bags
- Self-scanning challenges with theft

Focus on the design process

- Designs always have limitations and tradeoffs
Design as Choice
Design as Choice

In the diamond, what are two openings for creativity?

Why is your design research so important?
“Design as Choice”

“the creativity that you bring to enumerating meaningfully distinct options from which to choose”
Sketching in Design (2007)

“Design as Choice”

“the creativity that you bring to defining the criteria, or heuristics, according to which you make your choices”
Design as Choice

In the diamond, what are two openings for creativity?

- Palette of choices
- Heuristics to choose

Why is your design research so important?

- What you learn directly informs both of these, shaping everything you do this entire quarter
Design as Choice

Elaboration
palette of choices

Reduction
heuristics to choose
The Design Diamond

```
start

generate

select

intentional!

danger!

danger!

danger!

danger!
```
## Properties of Sketches

<table>
<thead>
<tr>
<th>Quick</th>
<th>Distinct Gesture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timely</td>
<td>Minimal Detail</td>
</tr>
<tr>
<td>Inexpensive</td>
<td>Appropriate Refinement</td>
</tr>
<tr>
<td>Disposable</td>
<td>Suggest and Explore</td>
</tr>
<tr>
<td>Plentiful</td>
<td>Ambiguous</td>
</tr>
<tr>
<td>Clear Vocabulary</td>
<td></td>
</tr>
</tbody>
</table>
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
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

Create

Sketch
representation

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 is Not Defined by Ink

Although sketching can often be done in ink, these properties can be found in other forms.

Those other forms are therefore sketches.
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

low-fi fabrication

3D model

low-fi fabricated

low-fi fabricated

low-fi fabricated

hi-fi fabricated

hi-fi fabricated
WirePrint (2014)

WirePrint
Fast 3D Printed Previews

Stefanie Mueller
Sangha Im
Serafima Gurevich
Alexander Teibrich
Lisa Pfisterer
François Guimbretière
Patrick Baudisch

Mueller, WirePrint, UIST 2014
WirePrint (2014)

WirePrint
Fast 3D Printed Previews

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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 Froehnlfen, Patrick Baudisch
Physical Sketching

(a) camera

(b) laser pointer

(c) laser cutter

(d) laser cutter
Constructable (2012)
Constructable (2012)
The Design Diamond

- start
- generate
- intentional!
- select

danger!
Idea Oscillation

- **start**
- **generate**
- **select**

**danger!**

**intentional!**
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.

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.
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