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

**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, $4.00 matinees

- 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)-(2:00): 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...
- As it should be...

<table>
<thead>
<tr>
<th>Outfit #1</th>
<th>Outfit #2</th>
<th>Outfit #3</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Outfit 1" /></td>
<td><img src="image2.jpg" alt="Outfit 2" /></td>
<td><img src="image3.jpg" alt="Outfit 3" /></td>
</tr>
</tbody>
</table>

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

MAP SHOWING PARKING AVAILABILITY BASED ON IMPORRTED DATA, IMPORTED ON MAP

- Different colors
- Highlights availability

- 43RD
- 92ND
- 16TH
- 34TH

PACIFIC AVE

Full

Parking

[Diagram of a map showing parking availability with different colors highlighting availability]
Sketching
UBIGITOUS RICE COOKER

LCD display shows number of cups & time remaining

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

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

danger!  intentional!  danger!
danger!  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.

[Sketches of two different designs]
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

low-fi fabrication

3D model

3D model

low-fi fabricated

low-fi fabricated

low-fi fabricated

hi-fi fabricated

hi-fi fabricated

Mueller, WirePrint, UIST 2014
WirePrint (2014)

WirePrint
Fast 3D Printed Previews

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

WirePrint
Fast 3D Printed Previews

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François Guimbretière
Patrick Baudisch
Physical Sketching

Mueller, Fabrickation, CHI 2014
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
Constructable (2012)
Constructable (2012)
The Design Diamond

start

generate

select

intentional!

danger!

danger!

danger!

danger!
Idea Oscillation

\[ \text{start} \rightarrow \text{generate} \rightarrow \text{select} \rightarrow \text{intentional!} \]

\[ \text{danger!} \rightarrow \text{danger!} \rightarrow \text{danger!} \]
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

start \quad generate \quad \text{intentional!} \quad select \quad \text{intentional!} \quad prototype
Iteration Toward a Design

- Ideation
- Usability

- Sketch
- Prototype

Time

Weight of Design Criteria

Investment
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.
Project Status

Looking Forward

2c: Design Research Check-In due Friday 1/20
2d: Design Research Review due Tuesday 1/24
2e: Task Review due Friday 1/27
2f: Design Check-In (3x4) Due Tuesday 1/31
2g: Design Review (1x2) Due Friday 2/3

Other Assignments

Readings to be Posted Soon
Rotating Feedback From Staff

We made a spreadsheet

<table>
<thead>
<tr>
<th></th>
<th>Section A</th>
<th>Section B</th>
<th>Section C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue 2b</td>
<td>A-Mainta</td>
<td>B-Cancer</td>
<td>C-Goals</td>
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<td>ality</td>
</tr>
<tr>
<td>Fri 2c</td>
<td>Ravi</td>
<td>Eunice</td>
<td>Elisabeth</td>
</tr>
<tr>
<td></td>
<td>Eunice</td>
<td>Ravi</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Ravi</td>
<td>Eunice</td>
<td></td>
</tr>
</tbody>
</table>

Several goals in the resulting rotation

Equal time with the two TAs in your section

No “streaks” greater than two with either TA

Balanced Friday pairings with other groups
## Rotating Feedback From Staff

<table>
<thead>
<tr>
<th>Eunice</th>
<th>David</th>
<th>Elisabeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Maintaining Social Relationships</td>
<td>C - Finding Time to Read</td>
<td>C - Mental Wellness</td>
</tr>
<tr>
<td>A - Student Self Tracking</td>
<td>C - Goals and Habit Formation</td>
<td>C - Transit while Traveling</td>
</tr>
<tr>
<td>B - Cancer Treatment Side Effect Management</td>
<td>D - Eye Strain and Breaks</td>
<td>D - Personal Utility Tracking</td>
</tr>
<tr>
<td>B - Distracted Driving</td>
<td></td>
<td>D - Wardrobe Management and Fashion</td>
</tr>
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