Design Process

CS 347
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Announcements

Summary of feedback from High Resolution Course Evaluation:

Faster feedback on commentaries plz
Lectures/readings/section are working
Quiz seemed fair
How do we scope a novel project?
I apparently do the Naruto Run?
Writing a strong commentary

Don’t: nitpick low-level details, harp on already-acknowledged limitations / future work, bring expectations from other HCI paper genres (“needs a user study!”), spend too much time summarizing, levy judgment (“I like this!”) without digging into why or implications

Do: engage with the core contributions —

Step 1: What is the point that this paper is trying to make?

Step 2: How effectively does it convince you of that argument? How could the argument be even more persuasive, on its own terms?

Step 3: What are the implications of the argument? What future frontier projects might be suggested by this, to push the idea farther?
Last time

Cognitive accounts can explain many challenges we face in design:

**Design fixation:** unnecessarily focusing on a subset of the design space

**Demand characteristics:** influences that drive study participants to behave in ways that make our system look good

They can also help us be precise about how to improve design:

**Gulfs of execution & evaluation:** what needs to be reduced?

**Analogical transfer:** what do we see as related inspiration?
Today

Wicked problems

Strategies for managing wicked problems
  Participatory design
  Design patterns

Strategies for managing design fixation

Strategies for managing demand characteristics
Design is not a static process.
It can be studied, supported, and improved.
Wicked problems

So if you care to find me / look to the western sky
As someone told me lately / everyone deserves a chance to fly
“Math is easy. Design is hard.”

Jeffrey Veen, former VP of Product Design at Adobe
Why is design hard?

Design: “The transformation of existing conditions into preferred ones” [Simon 1969]

What is that makes design so hard to do well? Why is it hard to find preferred solutions that are actually better and creative?
Wicked problems

[Rittel and Webber 1973]

Wicked problems are problems whose requirements are contradictory or unknown: no global optimum

Conflicting perspectives and goals mean there is no “correct” solution:

Urban planning: I can widen the streets, but this will create more traffic in the non-major streets

Pedagogy: In CS 147, students simultaneously want to learn more design, and more technical depth—but nobody wants more work
Design + wicked problems

[Zimmerman, Forlizzi, and Evenson 2007]

Design is challenging because it must solve wicked problems.

Example: Wikipedia reduced the amount of spam it got, at the cost of pushing away many newcomers. It could be more welcoming to newcomers, at the cost of quality and spam.

Due to the conflicting perspectives and goals, traditional engineering methodologies will often fail.
Design + wicked problems

[Zimmerman, Forlizzi, and Evenson 2007]

Argument: designers’ skill and practice is better tuned for wicked problems than traditional engineering approaches

“Enlightened trial and error succeeds over the planning of the lone genius.” – Tom Kelley, IDEO

If traditional engineering approaches ask how we combine known facts and principles to solve a problem a priori, design praxis focuses on iteration and combining known facts, engineering opportunities, and user research into entirely new perspectives.
Well, that’s a downer…

What do we do when we’re facing a wicked problem? Just knowing that it’s wicked doesn’t help me…

Step one: console yourself by telling your friends at parties that what you do is way harder than what they do, so they should think that you’re cool. (This works for me 100% of the time.)

Step two: ensure that you’ve got the right perspectives represented either on your team or in the literature, and don’t reinvent the wheel
Participatory design
What power should the designer have?

In the traditional design process, designers hold positions of power and status. They decide which stakeholders to engage with, how to prioritize each stakeholder’s needs, and which design concepts to move forward with.

This power is a source of tension: synthesis is the designer’s role and expertise, but it also cuts out stakeholders from direct or indirect control.
Participatory design

[Schuler and Namioka 1993; Mueller and Kuhn 1993]

A design process that de-centers the designer’s role

Involve stakeholders in all phases of the design process:

- Needfinding
- Problem definition
- Develop and focus ideas
- Evaluation

Non-participatory design processes involve stakeholders most deeply here
Examples

Collaborating with gig workers to create a platform for online collective action [Salehi et al. 2015]

Working with patients and doctors to design translation systems for medical contexts [Deng et al. 2022]

Working with older adults to design health tracking applications [Davidson and Jensen 2013]
Elicitation studies

[Wobbrock and Morris 2009]

When entering a new design space (e.g., large multitouch tables, AR, mid-air interaction), how do we know which gestures would be the most effective for non-technical people?

Concept: tell people the command, and ask them to gesture in a way that they think should invoke that command. Then, look for agreement amongst these spontaneous gestures.
Elicitation studies

[Wobbrock and Morris 2009]

Select Single $\downarrow_1$ : tap
Select Single $\downarrow_2$ : lasso

Select Group $\downarrow_3$ : hold and tap
Select Group $\downarrow_4$ and Select Group $\downarrow_5$ : Use Select Single, or Select Single $\downarrow_2$
on all items in the group.

Move $\downarrow_1$ : drag
Move $\downarrow_2$ : jump

Object jumps to index finger location.
PD is not a panacea

[Harrington, Erete, and Piper 2019]

The design workshop is not a neutral ground

Status hierarchies cannot be erased, nor can trust be established, just by inviting people into a room.

Design valorizes d.school-style creativity—not a skill taught or necessarily comfortable for underserved communities. “The crayons, markers and stuff… it’s like an elementary school activity.”

Design foregrounds blue-sky utopianism when underserved communities may simply be looking for pragmatic solutions.
Needfinding doesn’t solve this, either [Bennett and Rosner 2019]

We espouse Empathize as a designer’s solution to knowing enough about a stakeholder group to design with or for them.

However, typical design strategies for Empathize can lend false confidence and incorrect conclusions (e.g., beer goggles).
Struggles in the classroom

[Roldan et al. 2020]

HCI education says “go out there and work with people!”, but we often rely on convenience samples [Hui et al. 2014]

And even when students try to engage in participatory design...

The HCI students self-segregate and don’t build relationships with other stakeholders

Students feel uncomfortable guiding co-design sessions: who’s in charge here? Am I supposed to listen to them, or are they supposed to listen to me?

What ought we to do?
Design patterns
The trouble with design

Design is a praxis with many degrees of freedom, but also many ways to screw it up.

Temptations to be different or creative can wind you up with terrible designs.

How do we maintain breathing space for new ideas while not accidentally stepping off the ledge?
Design patterns

[Alexander 1977]

Originated in urban planning

“Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of a solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice.”
"Metropolitan regions will not come to balance until each one is small and autonomous enough to be an independent sphere of culture": patterns include...

- Community of 7000: not too many people, not too few people
- Subculture boundary: e.g., SF Chinatown is bounded by the banking area
- Identifiable neighborhood: < 500 people in local neighborhood units
- Neighborhood boundary: subcultures in neighborhoods need restricted physical access
Establish community and neighborhood policy to control the character of the local environment: patterns include...

- Four story limit: keep the majority of buildings <4 stories
- No more than 9% of land dedicated to parking
- Embellish sacred and meaningful sites in the neighborhood
- Ensure that the community include a balance of people at every stage of the life cycle
A pattern language is a set of design patterns, collected together, organized, and connected to each other.
Interaction design patterns
[van Duyne, Landay and Hong 2006]

Web design, much like urban planning, can be characterized by design patterns

Examples...
- News mosaics
- Distinctive HTML titles
- Quick-flow checkout
- Floating windows
Interaction design patterns

Web design also features pattern languages: very similar to a “design system” except design systems are focused lower level.
Web design patterns
[Kumar et al., CHI '13]

Crawl the web and index large-scale design elements

Main idea: what happens if we start data mining design patterns, rather than user behavior?
App design patterns

[Liu et al. 2018]

Collect a large dataset of Android app interaction traces

Query with a design, and find how others have developed similar designs
Quantifying Visual Preferences
[Reinecke and Gajos 2014]

Online quiz about which web sites you like

Analyzed to identify levels of, e.g., visual complexity that are preferred in different cultures
Dark design patterns

[Mathur et al. 2019]

Not all design patterns are good: dark patterns are strategies that designs use to coerce, steer, or deceive you into making a decision that its creators want.

- Forced enrollment
- Pressure tactics (applied to every item in the store)
- Graying out the option to decline
Well, that’s still a downer...

“Michael, you haven’t solved the deep structural and socio-technical issues with the human-centered design process as centered in Western educational systems and capitalist industrialized societies.”

Sorry. We’re all working on it.

But we can intervene in nearly any part of this process if we have ideas.
Process intervention: dealing with fixation
Quantity or Quality?
[Bayles and Orland 2001]

Can forcing yourself to try multiple options combat fixation and produce better designs?
“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”
Parallel prototyping

[Dow et al. 2010]

serial prototyping condition

parallel prototyping condition
Parallel design → more clicks

<table>
<thead>
<tr>
<th></th>
<th>Clicks per million impressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel</td>
<td>445</td>
</tr>
<tr>
<td>Serial</td>
<td>398</td>
</tr>
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Parallel design results in more clicks compared to serial design.
Process intervention: dealing with demand characteristics
How many designs? [Tohidi et al. 2006]

Prior practice: create your prototype, then show it to people to get feedback. But is this really optimal?

Study design:

- Method: show participants low fidelity prototypes for a redesigned smart thermostat and ask for feedback
- Control: show participants just one design ("the best")
- Treatment: show participants three designs

Measure: quantitative ratings of the design, as well as valence of the verbal feedback
How many designs? [Tohidi et al. 2006]

“We found that when presented with a single design, users give significantly higher ratings and were more reluctant to criticize than when presented with the same design in a group of three.”

Why?

Weakening demand characteristics
Summary

The design process is a set of structured activities meant to address problems in how we generate and develop ideas.

These activities are well attuned to solving wicked problems, which feature contradictory or conflicting goals.

Participatory design is a movement to decenter the designer’s power in these activities. It offers many opportunities, but also many challenges.

Design patterns help us avoid reinventing the wheel.

We can intervene on these activities to address shortcomings in how we practice design: e.g., parallel prototyping and comparing multiple designs.
References


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