Early Stage (lo-fi & med-fi) Prototyping

Prof. James A. Landay
Computer Science Department
Stanford University

Autumn 2025

October 15, 2025

Music: https://soundcloud.com/dansuneroquette

Interface Hall of Fame or Shame?

Dyson AirBlade hand dryer
example courtesy of Maya I.

Interface Hall of Fame or Shame?

Good

- shape indicates function
- so simple that instructions fit in 1 image
- fun!

Bad

- dripping water?
- too much noise
- still takes too long

Dyson AirBlade hand dryer
example courtesy of Maya I.

Interface Hall of Fame!

Good

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Bad

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- too much noise
- still takes too long

Dyson AirBlade hand dryer
example courtesy of Maya I.

Can We Do Better?

Good?

- Drip on the floor…

Can We Do Better?

Good

- Integrate hand dryer into sinks…

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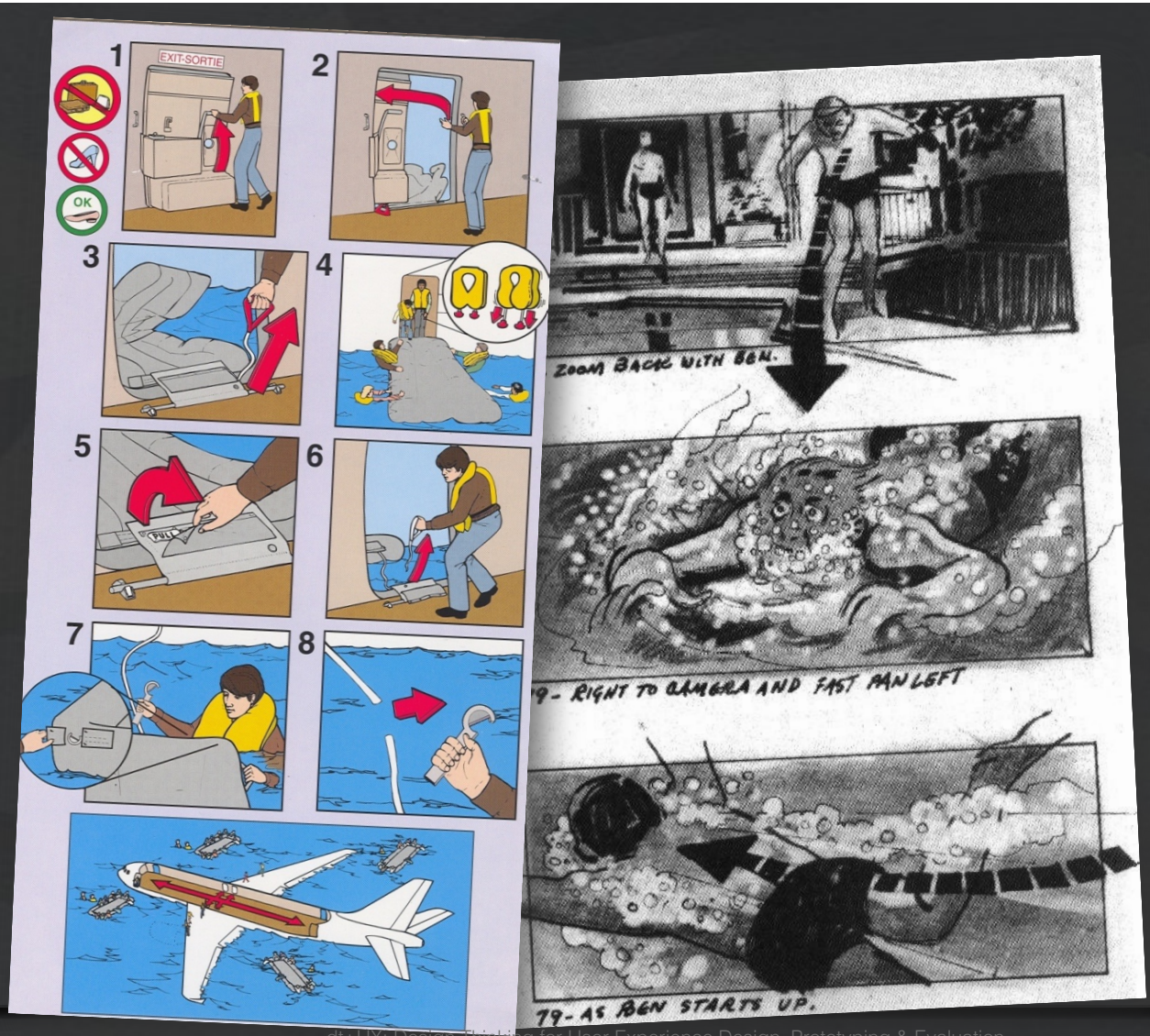
Outline

- Sketching vs. Storyboarding
- Prototyping
- Low-fi prototyping
- Conducting a low-fi test
- Medium-fi prototyping

Sketches & Storyboards

- Where do storyboards come from?
  - film & animation
- Give you a “script” of important events
  - leave out the details
  - concentrate on the important interactions


1
EXIT-SORTIE
2
OK
3
4
5
PULL
6
7
8
ZOOM BACK WITH BGM.
9- RIGHT TO CAMERA AND FAST PAN LEFT
79- AS BGM STARTS UP.

DESCRIPTION: EXT. FOREST - MS LUKE & LEIA - TRUCKING

Luke & Leia coming toward camera. Behind them, Biker #3 & Biker #4 bank in, chasing.

NOTES:

ELEMENTS:	STAGE	ANIM	PLATE	MATTE	NON-ILM
Forest			x		
Luke			x		
Leia			x		
Biker #3	x				
Biker #4	x				

ELEMENTS:	STAGE	ANIM	PLATE	MATTE	NON-ILM

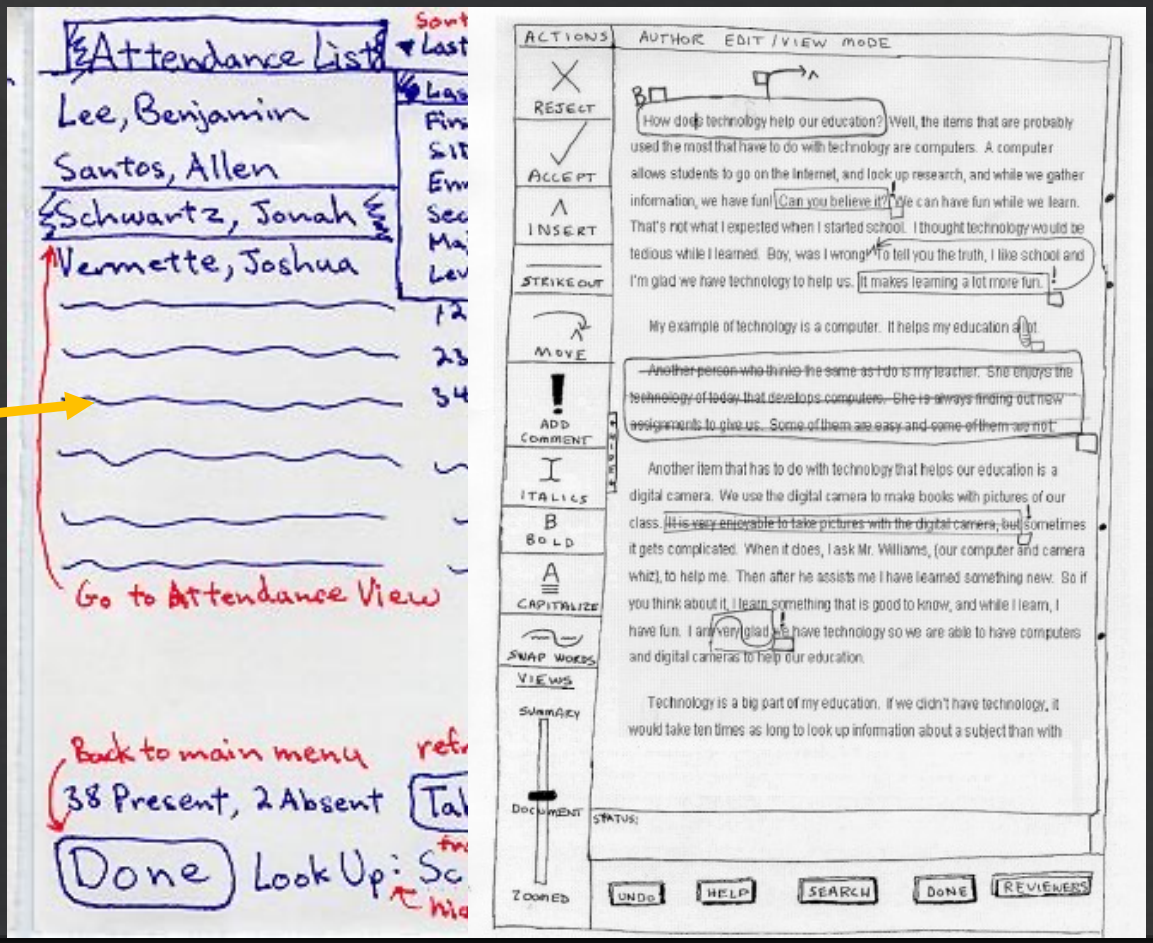
SHOT # / SEQUENCE

BC 28

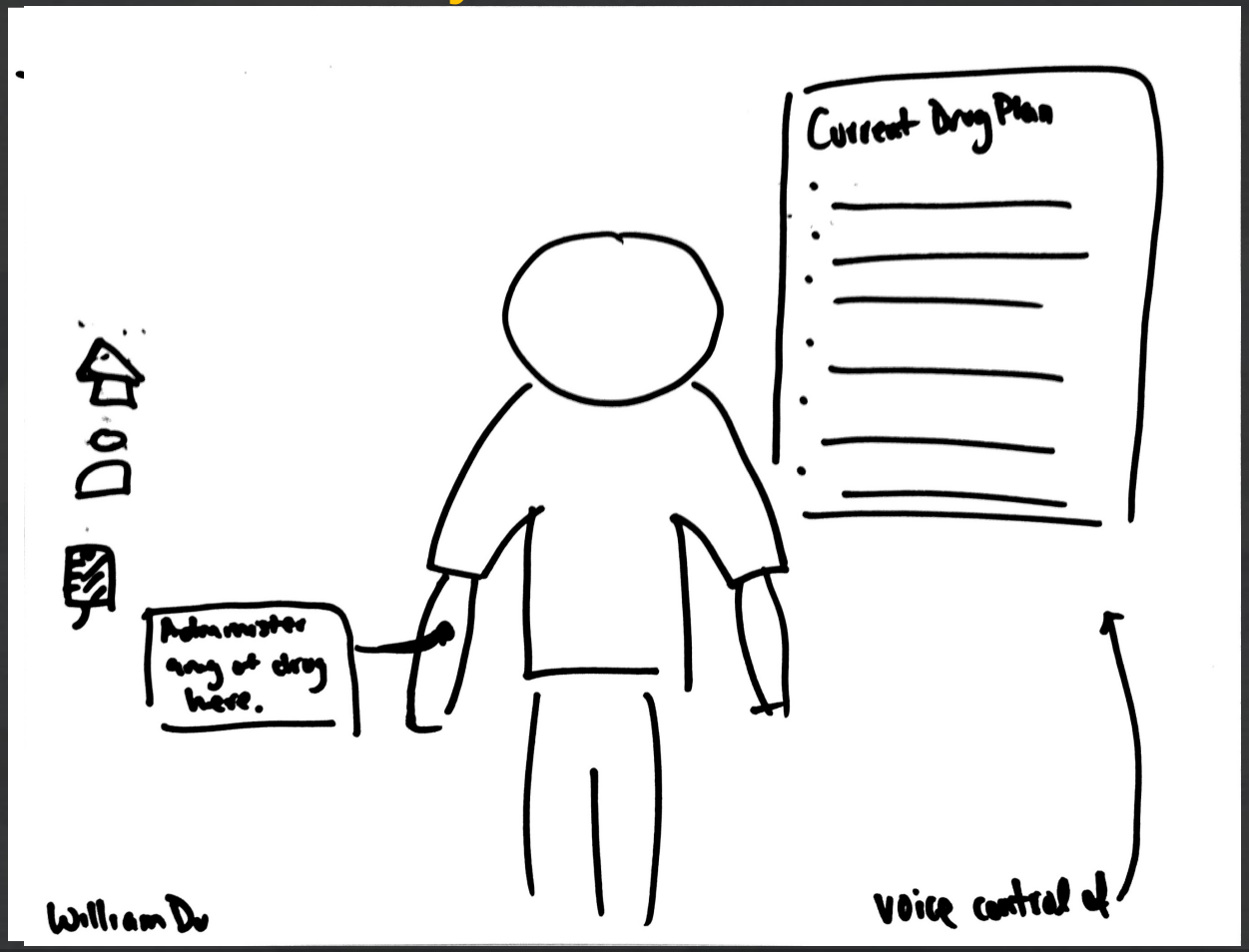
FRM COUNT	PAGE #
50	

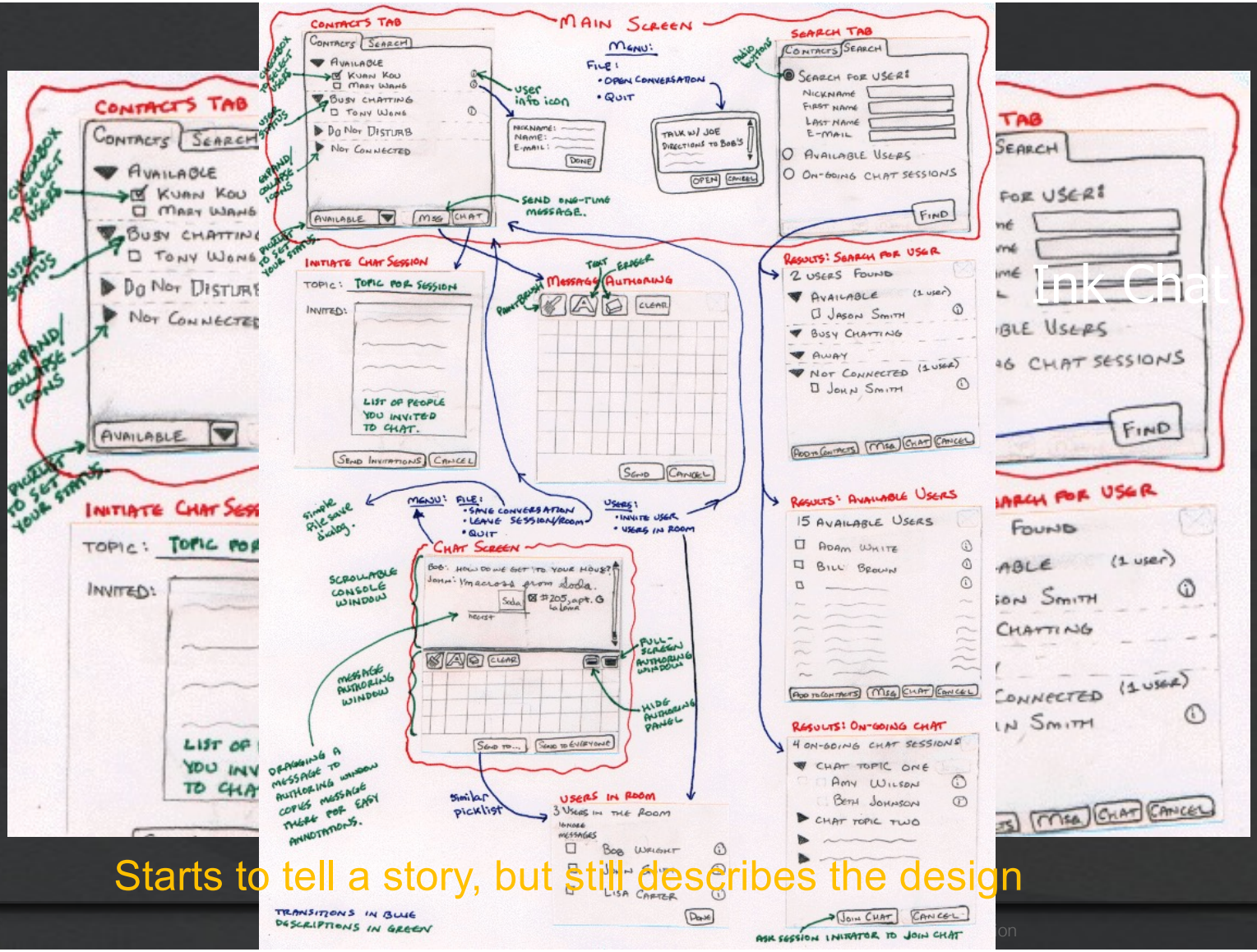
Sketches & Storyboards in UX Design

Greeking



Sketches & Storyboards in UX Design

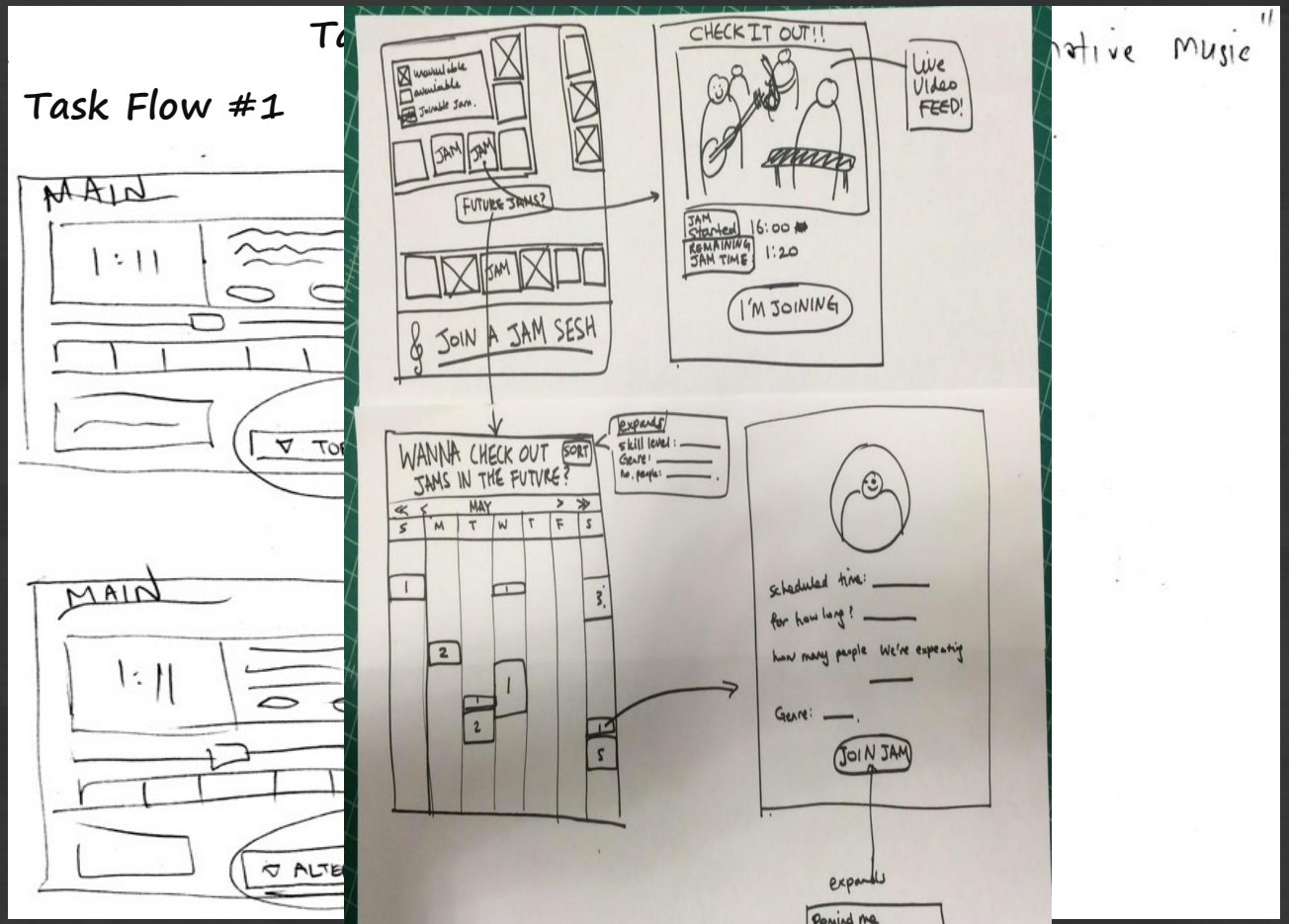




Starts to tell a story, but still describes the design

Sketches & **Storyboards in UX Design**

Task Flow
(Wireframe)

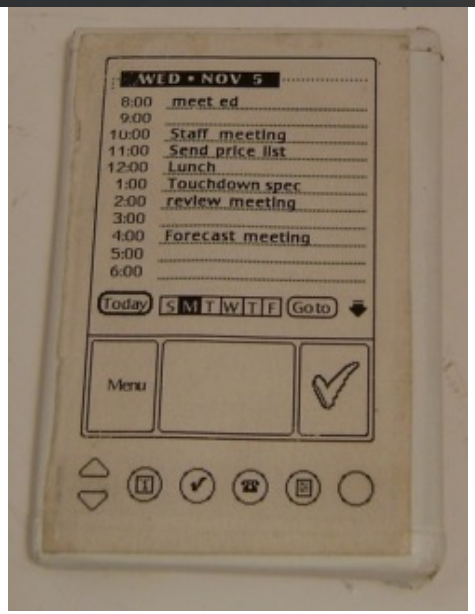


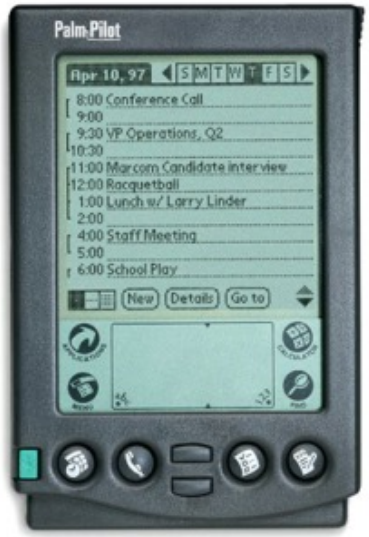
What is a Prototype?

"A prototype is an early sample or model built to test a concept or process or to act as a thing to be replicated or learned from."
– Wikipedia

CS147 definition: a working representation of a final artifact

http://www.computerhistory.org/collections/accession/102716262





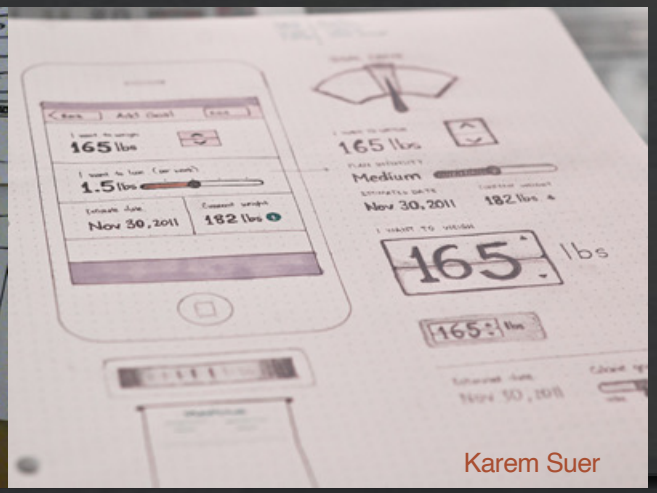
Types of Prototypes

Prototypes are concrete representations of a design

Prototype dimensions

- representation: form of the prototype
  - off-line (paper) or on-line (software)
- precision: level of detail (e.g., informal or polished)


PJ McCormick



Karem Suer

Types of Prototypes

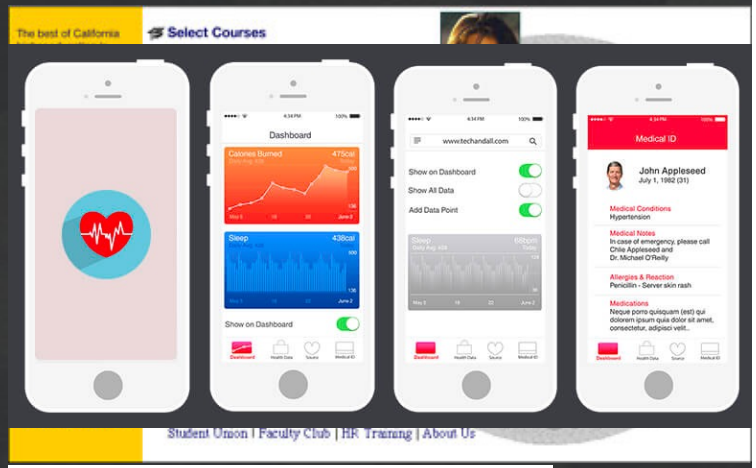
Prototypes are concrete representations of a design

Prototype dimensions

- representation: form of the prototype
  - off-line (paper) or on-line (software)
- precision: level of detail (e.g., informal or polished)
- interactivity: watch-only to fully interactive
  - fixed prototype (video clips)
  - fixed-path prototype (each step triggered by specified actions)
    - at extreme could be 1 path
  - open prototype (real, but limited error handling or performance)
- evolution: expected life cycle of prototype
  - e.g., throw away or iterative

Fidelity in Prototyping

- Fidelity refers to the level of detail
- High fidelity?
  - prototypes look like the final product

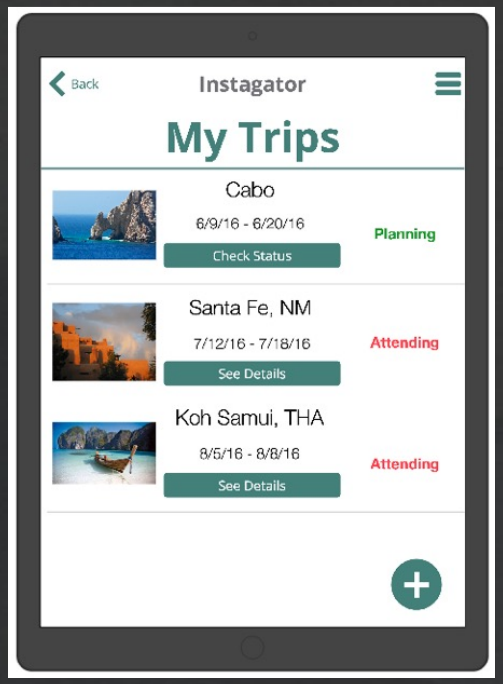


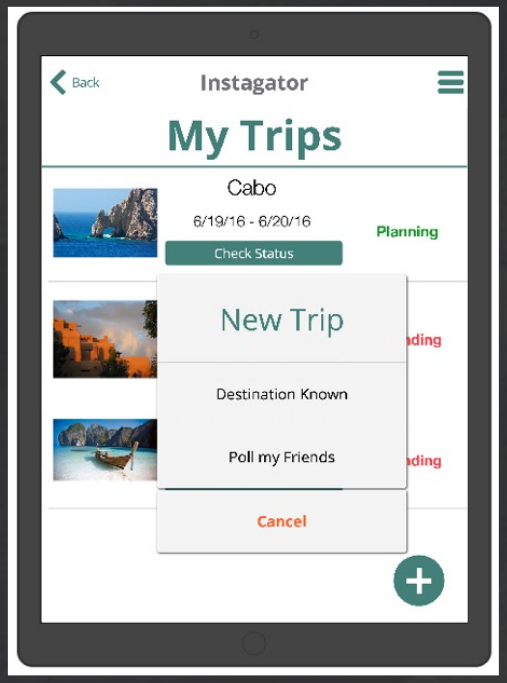
- Low fidelity?
  - (often) sketched renditions with many details missing

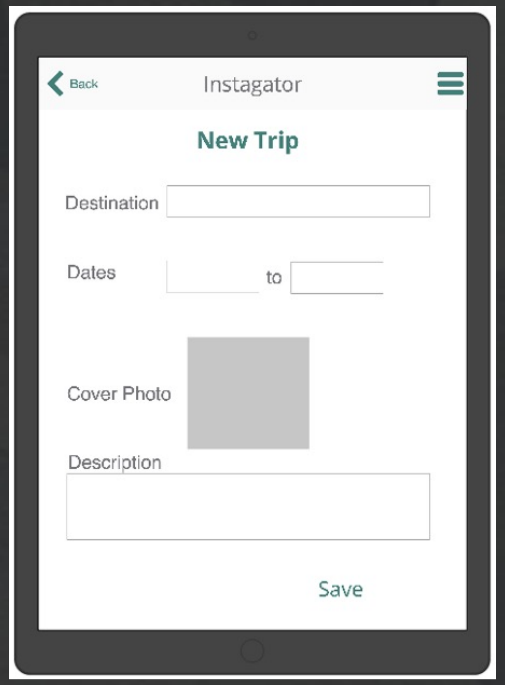
What do we like about this low-fi prototype?

What do we wish could be improved?

What do we like about this medium-fi prototype?



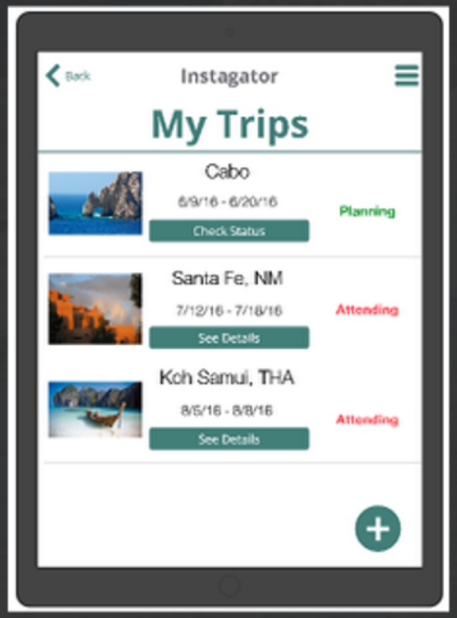




What do we wish could be improved?

The feedback you get is different

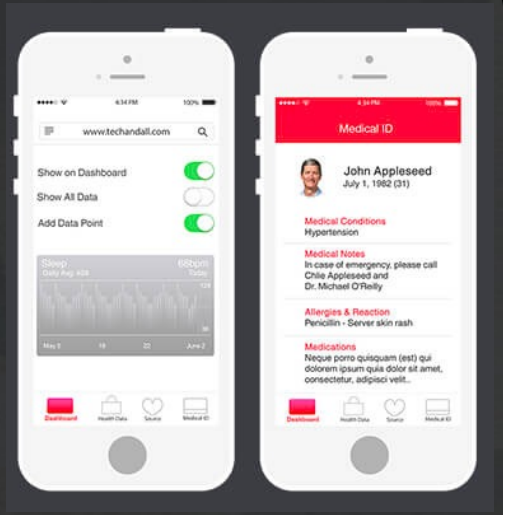
Low-fi



Medium-fi

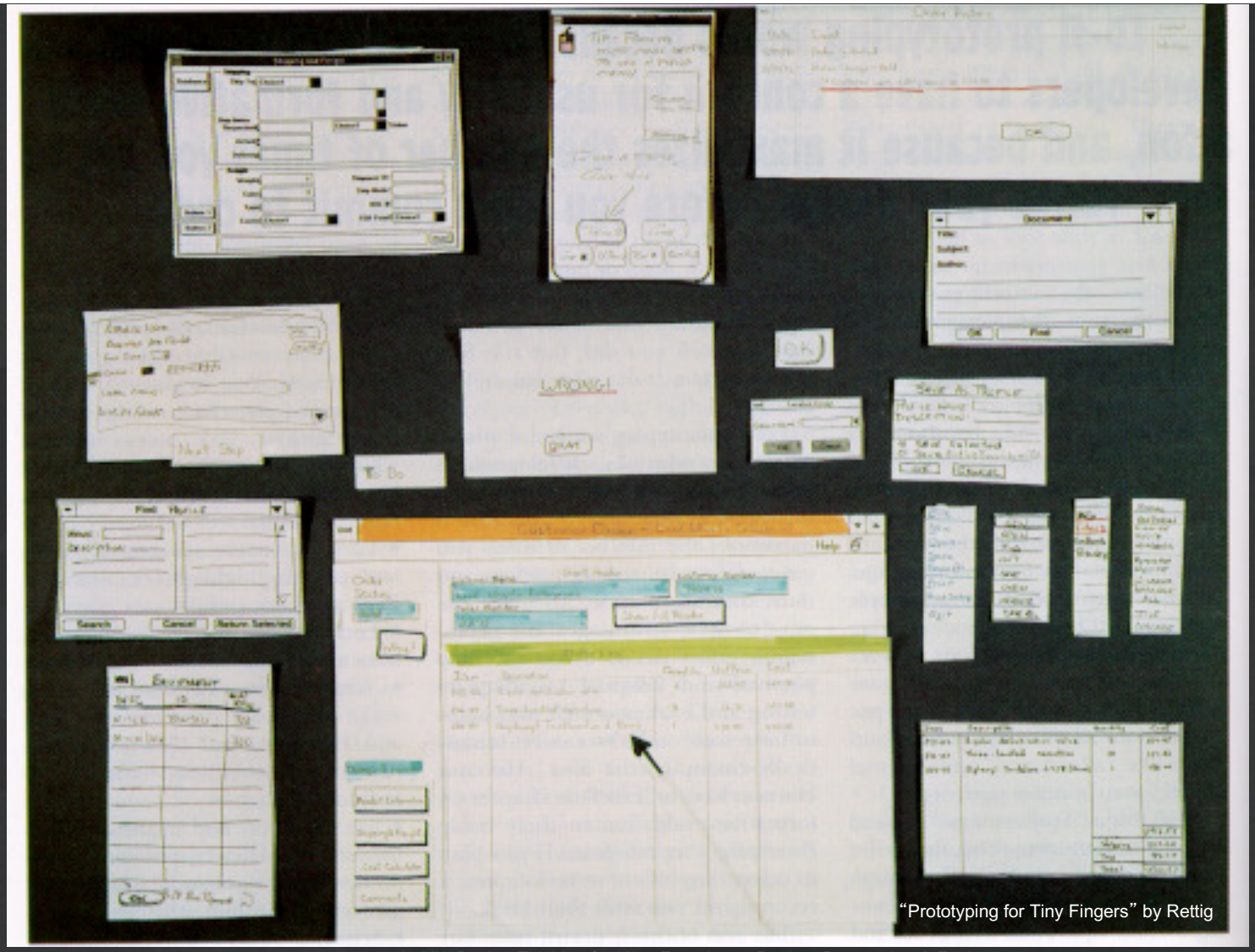
Hi-fi Prototypes Warp

- Perceptions of the tester/reviewer
  - representation communicates “finished”
    - comments focus on color, fonts & alignment
- Time of the designer
  - encourage precision
    - specifying details takes more time
- Creativity of the designer
  - lose track of the big picture

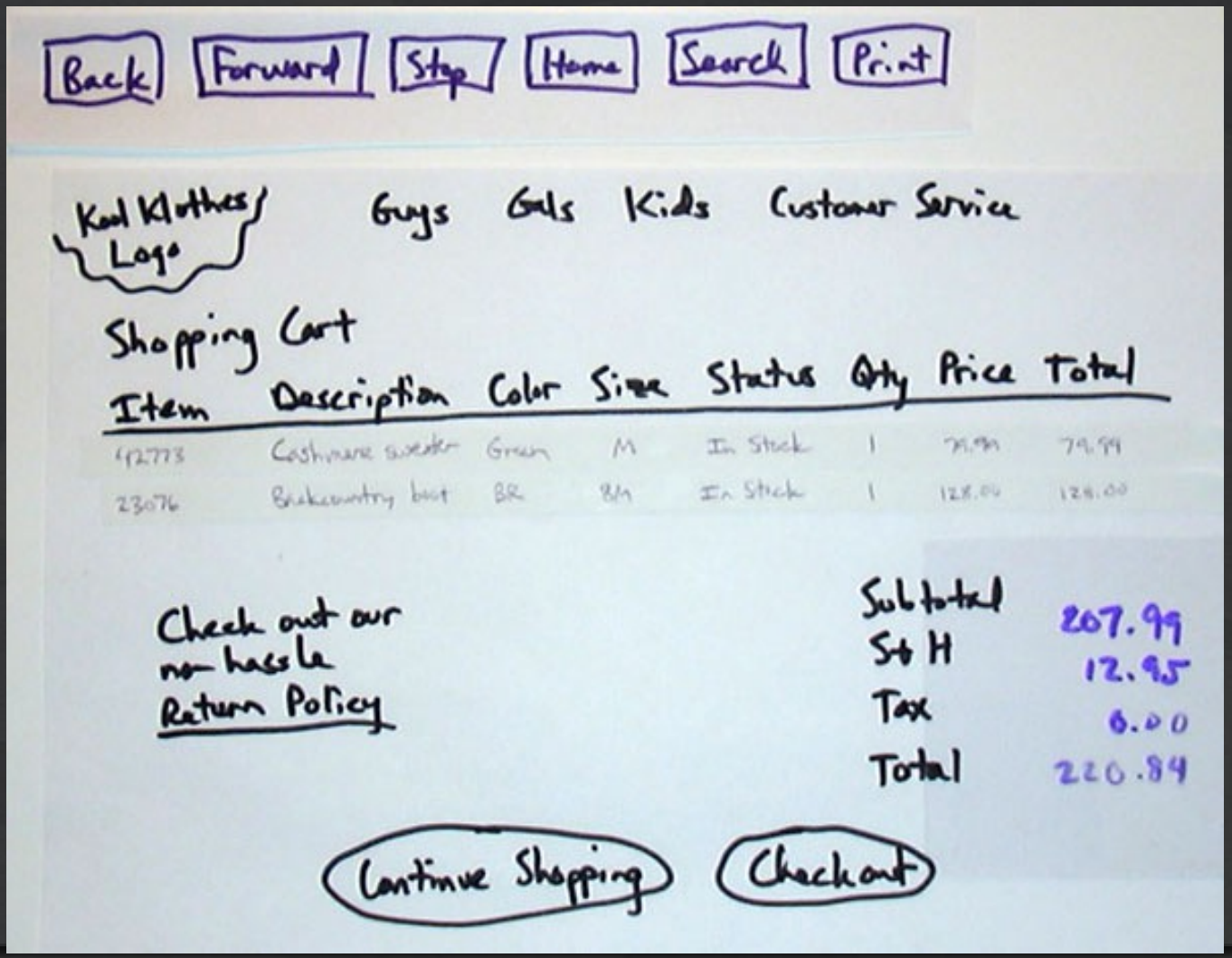


Why Use Low-fi Prototypes?

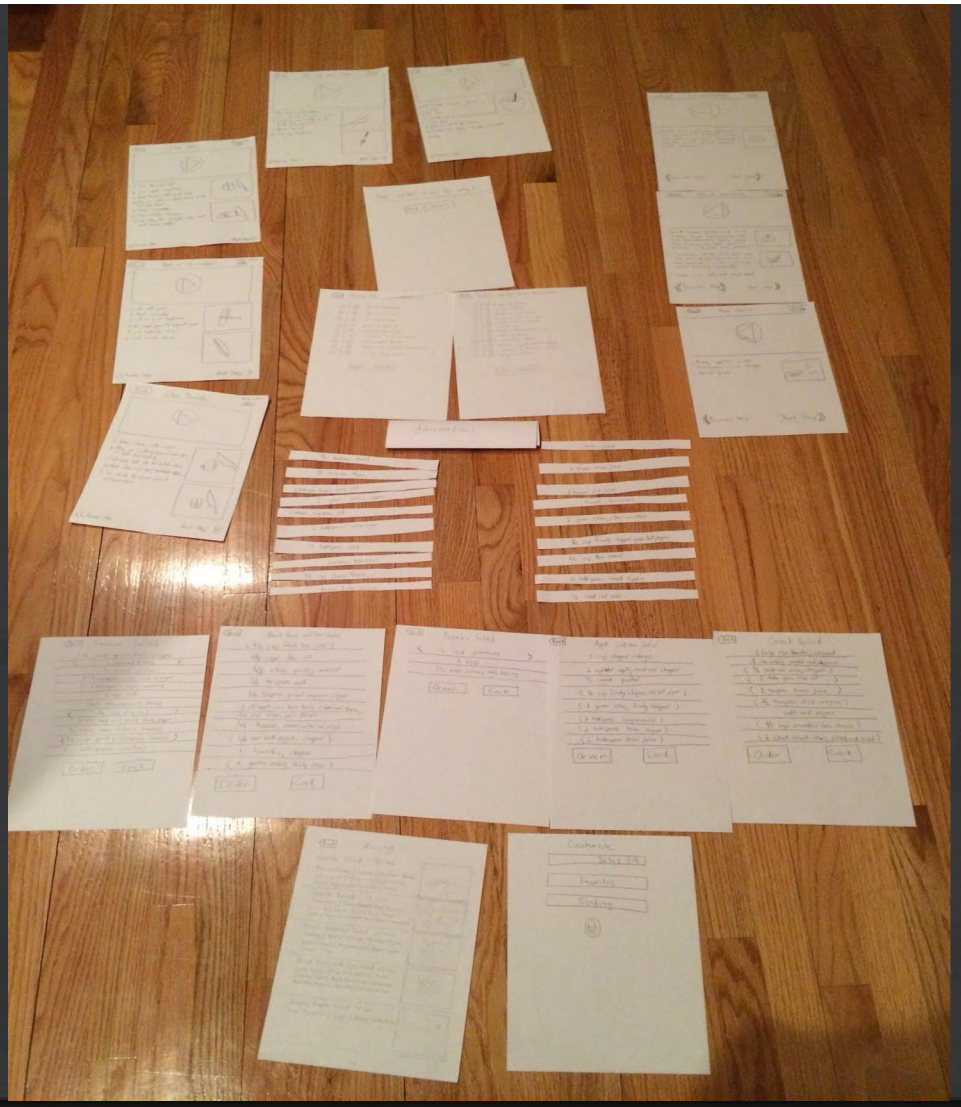
- Traditional methods take too long
  - sketches → prototype → evaluate → iterate
- Can instead simulate the prototype
  - sketches → evaluate → iterate
  - sketches act as prototypes
    - designer “plays computer”; others observe & record
- Kindergarten building skills
  - allows non-programmers to participate

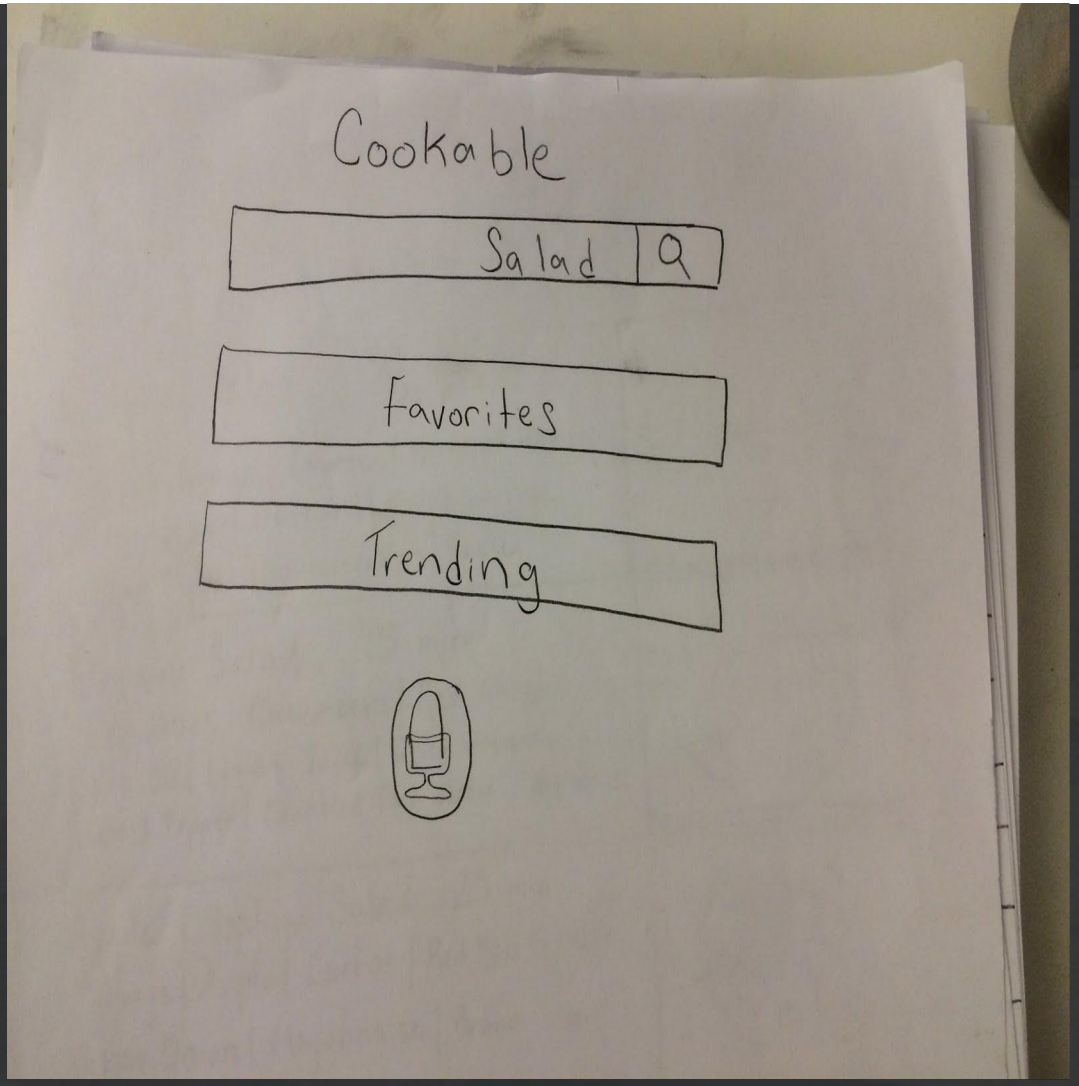


“Prototyping for Tiny Fingers” by Rettig


Back
Forward
Stop
Home
Search
Print
Kool Klothes Logo
Guys
Gals
Kids
Customer Service
Shopping Cart
Item
Description
Color
Size
Status
Qty
Price
Total
12773
Cashmere sweater
Green
M
In Stock
1
79.99
79.99
23076
Backcountry boot
BR
8/M
In Stock
1
128.00
128.00
Check out our no hassle Return Policy
Subtotal
207.99
S & H
12.95
Tax
0.00
Total
220.84
Continue Shopping
Checkout

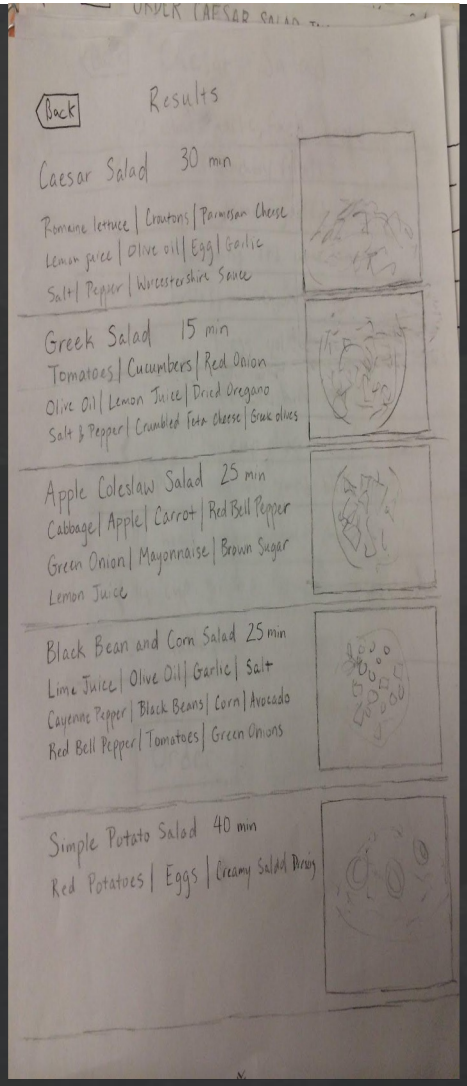
Cookable

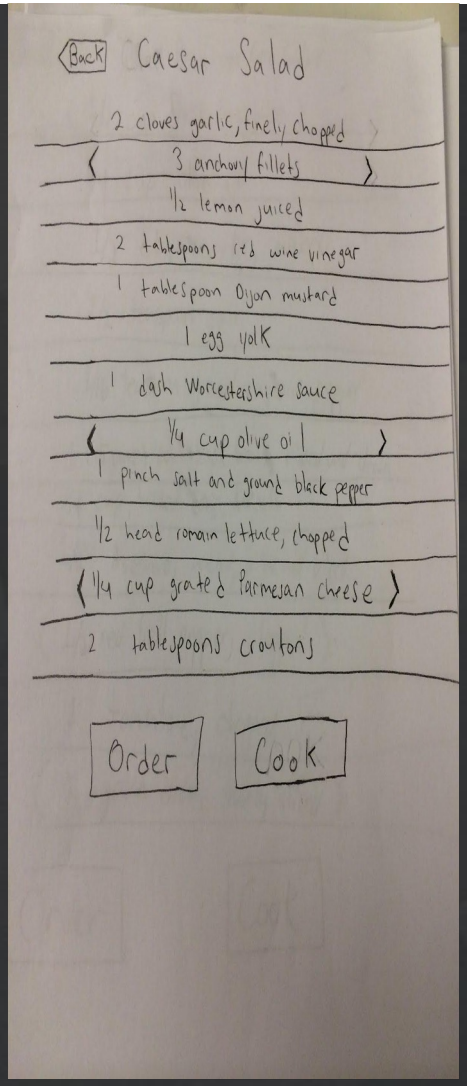




Cookable

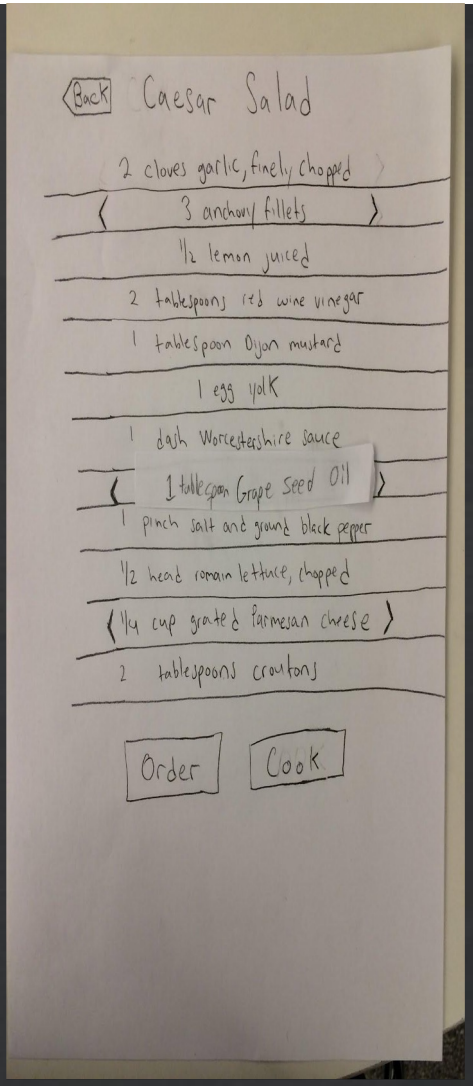
Cookable


Back
Results
Caesar Salad 30 min
Romaine lettuce | Croutons | Parmesan Cheese
Lemon juice | Olive oil | Egg | Garlic
Salt | Pepper | Worcestershire Sauce
Greek Salad 15 min
Tomatoes | Cucumbers | Red Onion
Olive Oil | Lemon Juice | Dried Oregano
Salt & Pepper | Crumbled Feta Cheese | Greek olives
Apple Coleslaw Salad 25 min
Cabbage | Apple | Carrot | Red Bell Pepper
Green Onion | Mayonnaise | Brown Sugar
Lemon Juice
Black Bean and Corn Salad 25 min
Lime Juice | Olive Oil | Garlic | Salt
Cayenne Pepper | Black Beans | Corn | Avocado
Red Bell Pepper | Tomatoes | Green Onions
Simple Potato Salad 40 min
Red Potatoes | Eggs | Creamy Salad Dressing


Back
Caesar Salad
2 cloves garlic, finely chopped
3 anchovy fillets
1/2 lemon juiced
2 tablespoons red wine vinegar
1 tablespoon Dijon mustard
1 egg yolk
1 dash Worcestershire sauce
1/4 cup olive oil
1 pinch salt and ground black pepper
1/2 head romain lettuce, chopped
1/4 cup grated Parmesan cheese
2 tablespoons croutons
Order
Cook

Cookable

Cookable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1 egg yolk
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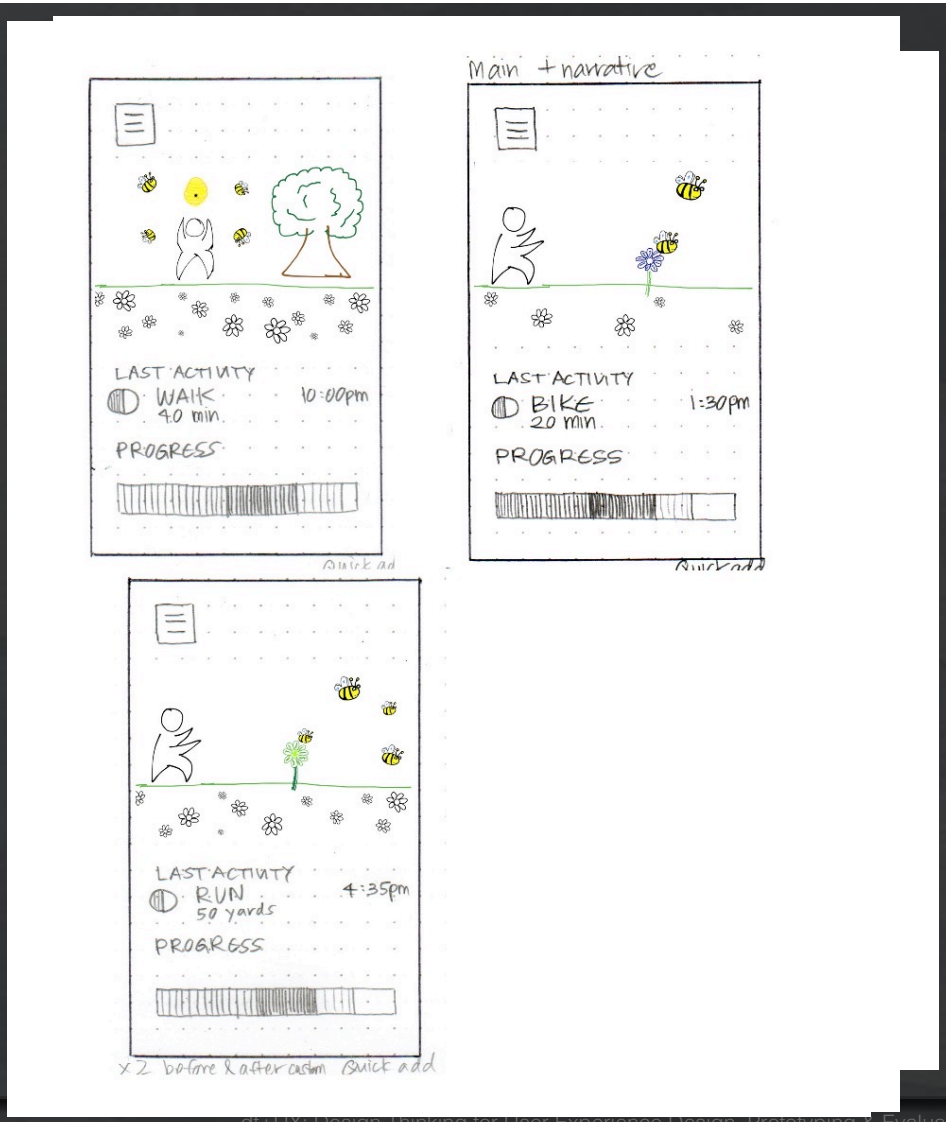
1 tablespoon Grape seed Oil
1 pinch salt and ground black pepper
1/2 head romain lettuce, chopped
1/4 cup grated Parmesan cheese
2 tablespoons croutons
Order
Cook

Who is Zuki?


main + narrative
LAST ACTIVITY
WALK
40 min.
10:00pm
PROGRESS
LAST ACTIVITY
BIKE
20 min.
1:30pm
PROGRESS
LAST ACTIVITY
RUN
50 yards
4:35pm
PROGRESS
x2 before & after custm Quick add

Administrivia: Assignment 2 Grades/Feedback

A2 Group Presentations: -: 0% ✓- -: 0% ✓-: 22% ✓: 30% ✓+: 48% ✓ ++: 0%

A2 Individual Presentation: -: 0% ✓- -: 0% ✓-: 4% ✓: 43% ✓+: 35% ✓ ++: 17%

We liked

- "prototype findings were grounded in observations and quotes"
- "thorough documentation of experience prototype methods"
- "creativity and diversity of HMWs"
- "intentionality behind the diversity of prototype testers"
- "use of empathy maps to unpack interview insights"

We wished

- "we wonder statements for POVs were more *user-specific* & took *bigger leaps*"
- "HMWs were more generative to capture user pain"
- "*stronger rationale* for chosen assumptions"
- "*stronger connection* between prototype learnings & final solution choice"
- "exploration of *design opportunities* in relation to *excluded communities*"
- more novel, robust solutions that **don't feel like "Tinder for X"**

Administrivia

- Video slide deck to turn in but not present
- Add/Check these slack channels
  - #ask-for-feedback (feedback from peers and CAs as they get time)
  - #slack-overflow (crowdsourcing tech support – web site and reactive native)
  - If you help your peers in a significant way, we can raise your class participation grade
- Figma Workshop on Tue. went well! Check web site for recording if missed it
- Web site directories will be created for each team by this week
  - each team should have filled out this form by Monday, Oct 13th
    - https://forms.gle/kiqYJea1Q2tL3tiD6
    - start to get sites (even basic) up there this weekend
    - should have all your work – not graded until mid-point check-in & near end of quarter
  - CAs will send you your directory path/name on web.stanford.edu

Good Examples from A2

Revised POV - Nicole

WE MET...

Nicole, a devoted mother who spends much of her day grocery shopping, prepping, and cooking low-FODMAP meals for her adult son.

WE WERE SURPRISED TO NOTICE...

Although Nicole finds cooking stressful, exhausting, and time-consuming, she uprooted her life to move across the country to care for her son through food.

WE WONDER IF THIS MEANS...

She **feels guilty stepping back** from cooking because it is tied to her son's well-being.

IT WOULD BE GAME CHANGING TO...

It would be game-changing to **reframe cooking** as a source of **connection and love** for Nicole's son, rather than a constant **burden**.

Nicole's POV: reframe cooking as a source of connection and love for Nicole's son, rather than a constant burden.

How might we make cooking **feel like an activity/hobby** and not a responsibility?

Good Examples from A2

EXPERIENCE PROTOTYPE #2

1. Ask participant to write down everything they did in the last two days.

2. Have them plot the valence of each event in chronological order (higher on the board/map = more positive).

3. Ask them to reflect on the experience of intentionally attaching emotions to their events.

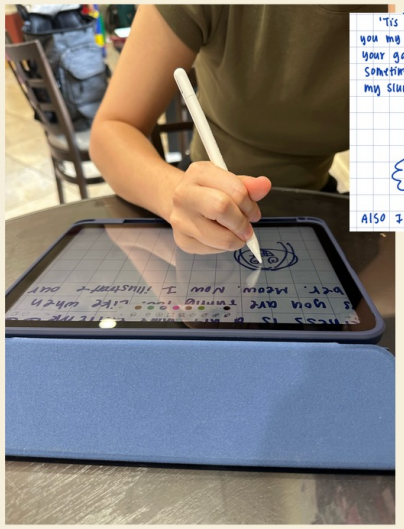
BAGG

Good Examples from A2

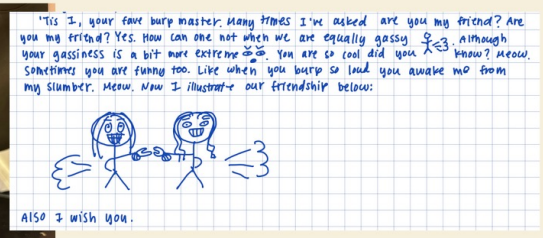
Prototype 3: Digital Letters

Test Setup (n = 2)

The send spends 5 min crafting a digital letter, which is then messaged to the receiver.



Sender



Digital letter

We also follow up with the receiver to ask them questions about how the digital letter made them feel.

"I'm honored that she took the time to hand write this for me. This message is very her."

Receiver

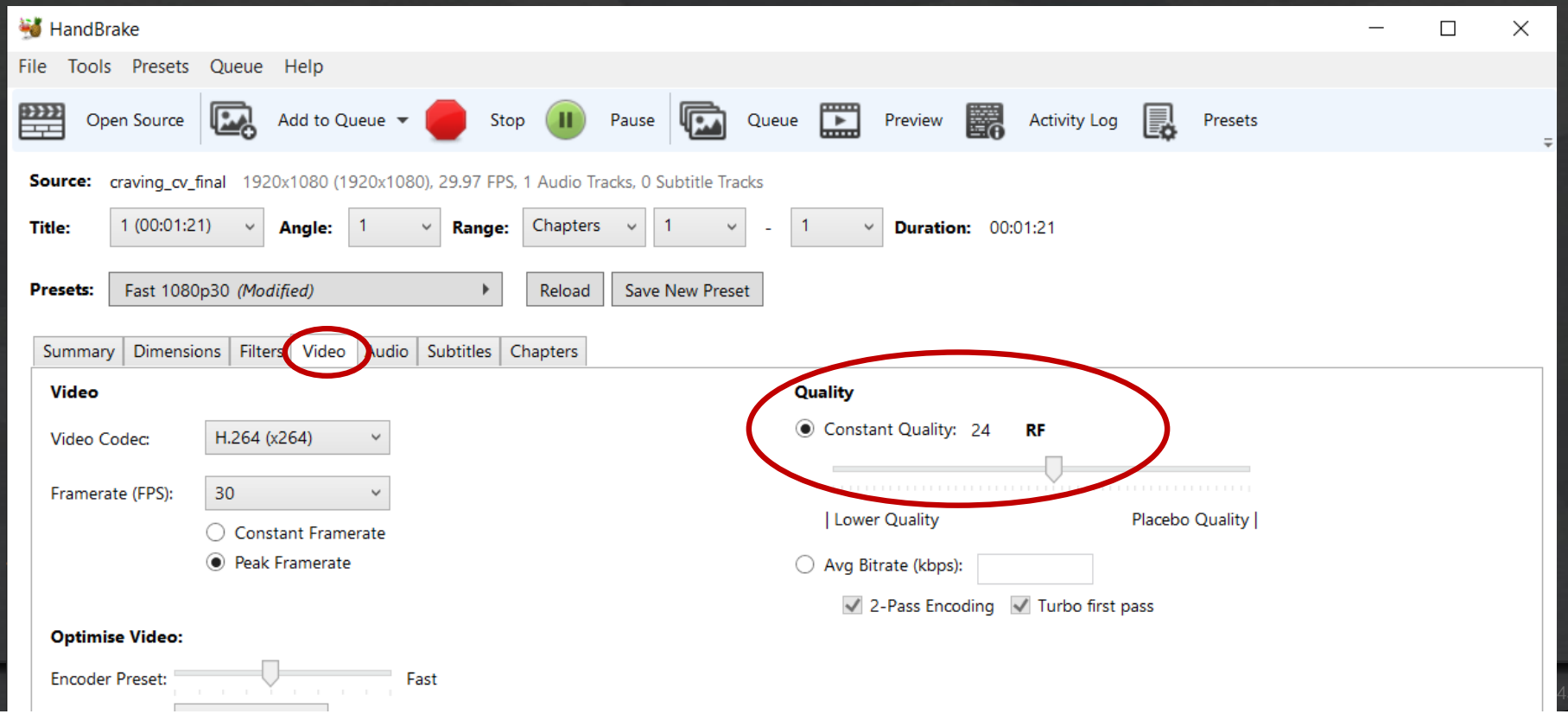
Administrivia: Video Hints

- Under 2 minutes (90 seconds or less even better)

- Add credits at end
  - Team/project name
  - Your names (first name & last initial)
  - “CS 147 – Autumn 2025”
  - Will not count in your time limit

Administrivia

- Use *must* use handbrake to compress your video
  - It will take your video from 250MB-1GB down to ~50MB



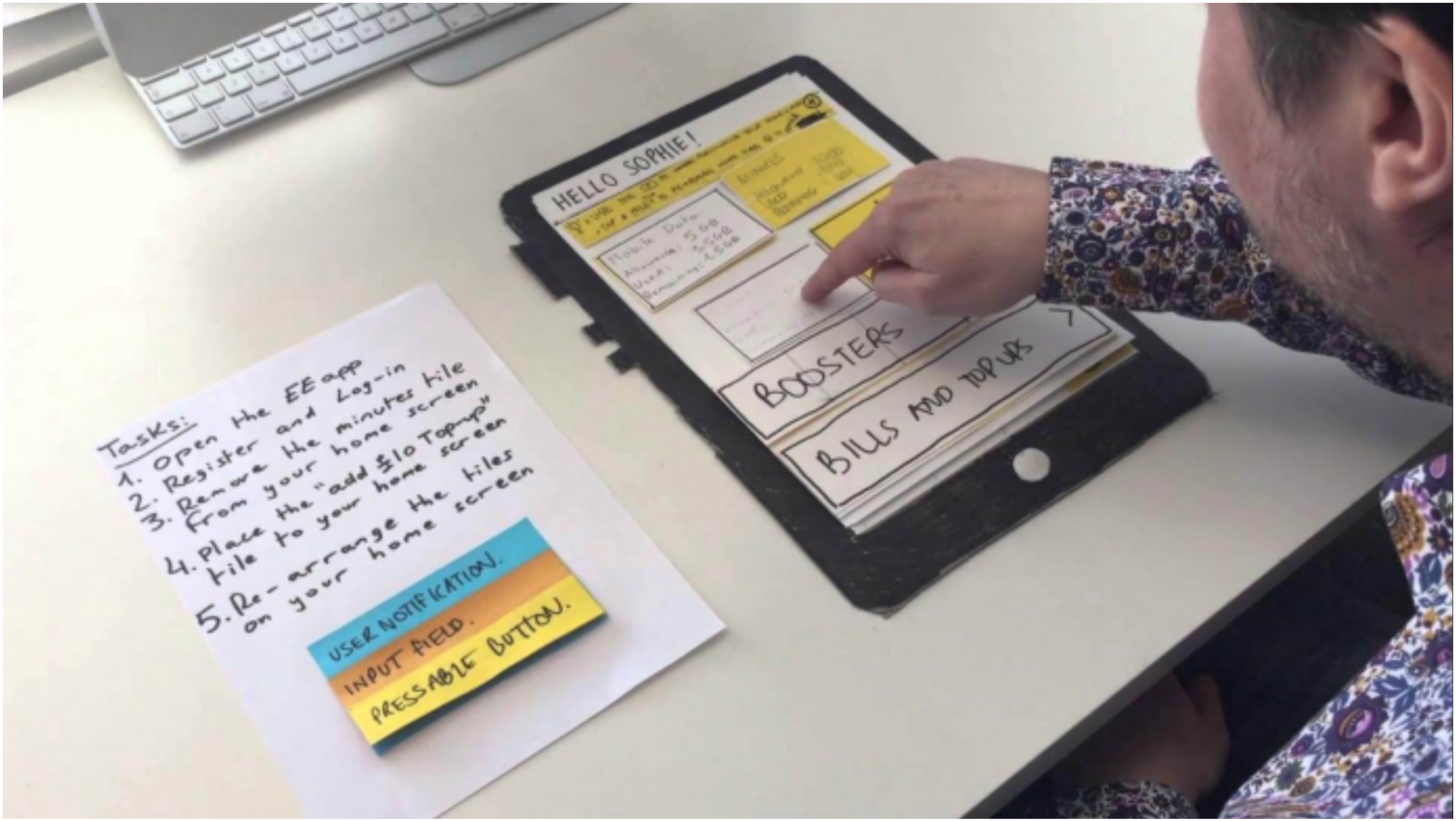
Team Break

- Reflect on last week's assignment (~5-8 min)
  - what did you like about your teamwork?
  - what do you wish could be improved?
  - share out with each other

- This week's assignment (~15 min)
  - Get greenlight from CA on solution + tasks
  - work on your video storyboards/editing

Constructing the Model

- Set a deadline
  - don't think too long - *build it!*
- Draw a window/phone frame on large paper
- Put different screen regions on cards
  - anything that moves, changes, appears/disappears
- Ready response for any user action
  - e.g., have those pop-up dialogs, etc. already made
- Use printer/scanner to make many versions


HELLO SOPHIE!
BOOSTERS
BILLS AND TOP UPS
Tasks:
1. Open the EE app
2. Register and Log-in
3. Remove the minutes tile from your home screen
4. Place the "add £10 Topup" tile to your home screen
5. Re-arrange the tiles on your home screen
USER NOTIFICATION.
INPUT FIELD.
PRESSABLE BUTTON.

Preparing for a Test

- Select your “customers”
  - understand background of intended users
  - use a screening questionnaire to get the people you need
  - don’t use friends or family (at most 1 Stanford student)
  - start recruiting today
- Prepare scenarios that are
  - typical of the product during actual use
  - make prototype support these (small, yet broad)
- Practice to avoid “bugs”

Conducting a Test

Four Roles

- Greeter – puts users at ease & gets data
- Facilitator – only team member who speaks
  - gives instructions & encourages thoughts, opinions
- Computer – knows application logic & controls it
  - always simulates the response, w/o explanation
- Observers – take notes & recommendations

Can combine


Incident Forms Book
Battalion 3412

Who is Zuki?

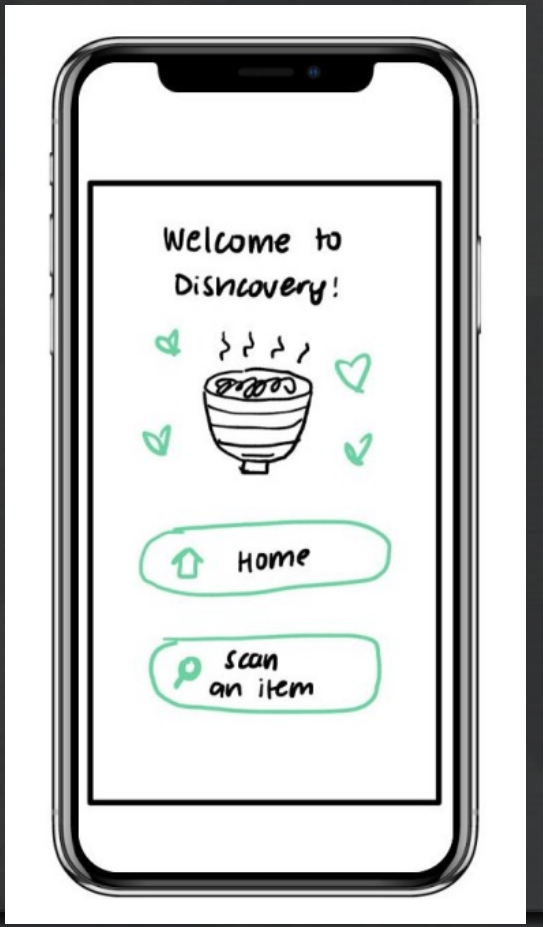
Practice: Low-fi Prototype Testing

In a group of 3-4 people around you, you will test the low-fi prototype of Dishcovery app!

One will play user, one will play facilitator, and 1- 2 will play observers taking notes.

Share the *critical incidents* (both positive and negative events) from your test in Slack.

Note: If you are the user, remember to talk-aloud about what you are thinking as you navigate the prototype

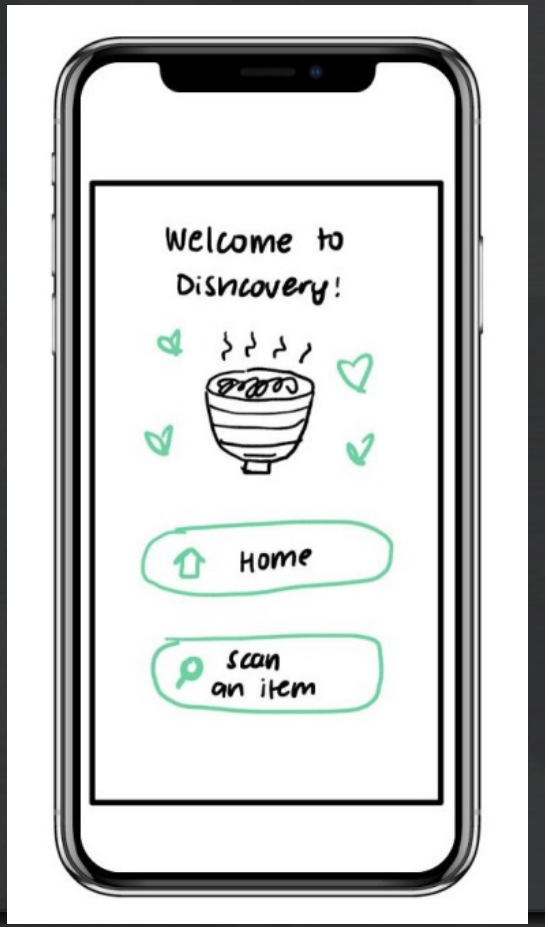


Practice: Low-fi Prototype Testing

Dishcovery allows users to cook with foreign ingredients by learning more about their history & how they are consumed.

- Simple task: Scan an ingredient
- Moderate task: Learn about the ingredient
- Complex task: Cook with the ingredient

https://tinyurl.com/dishcovery-lofi



Evaluating Results From a Low-fi Test

- High level questions about your design
  - does it address the problem you want to solve?
  - is this the right realization of your solution?

- Sort & prioritize observations
  - what was important?
  - lots of problems in the same area?

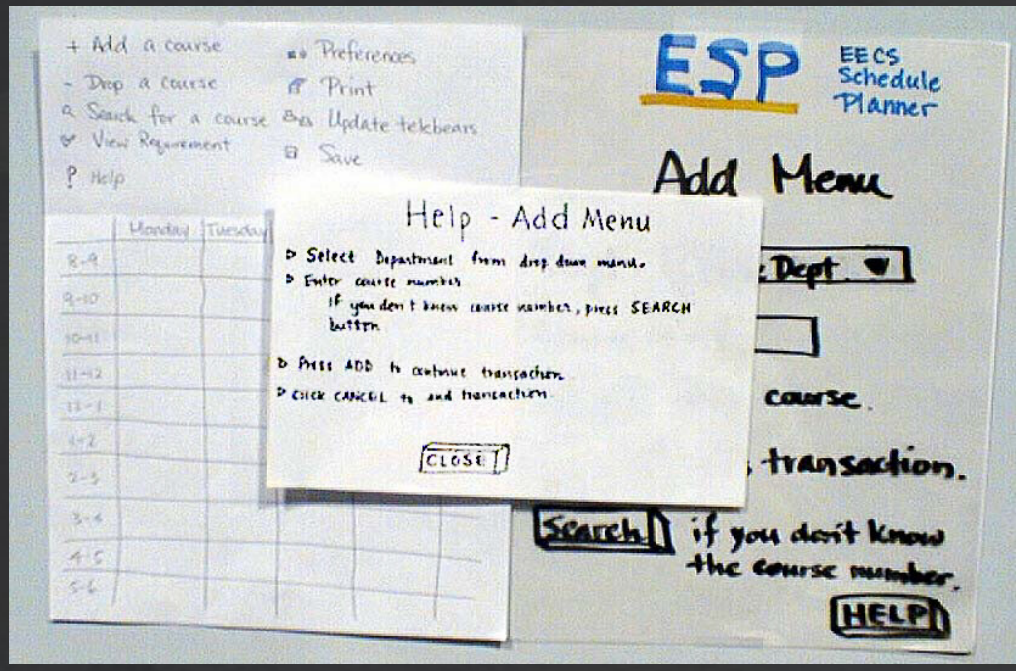
- Make changes & iterate
  - even *iterate between tests*

Advantages of Low-fi Prototyping

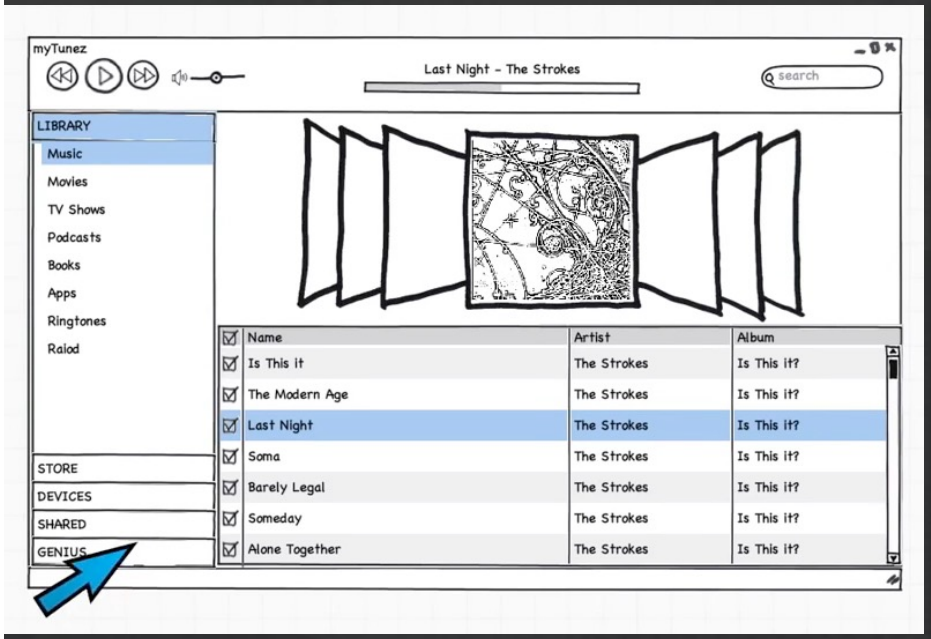
- Takes only a few hours
  - no expensive equipment needed
- Can test multiple alternatives
  - fast iterations
    - number of iterations is tied to final quality
- Almost all interaction can be faked (Wizard of Oz)

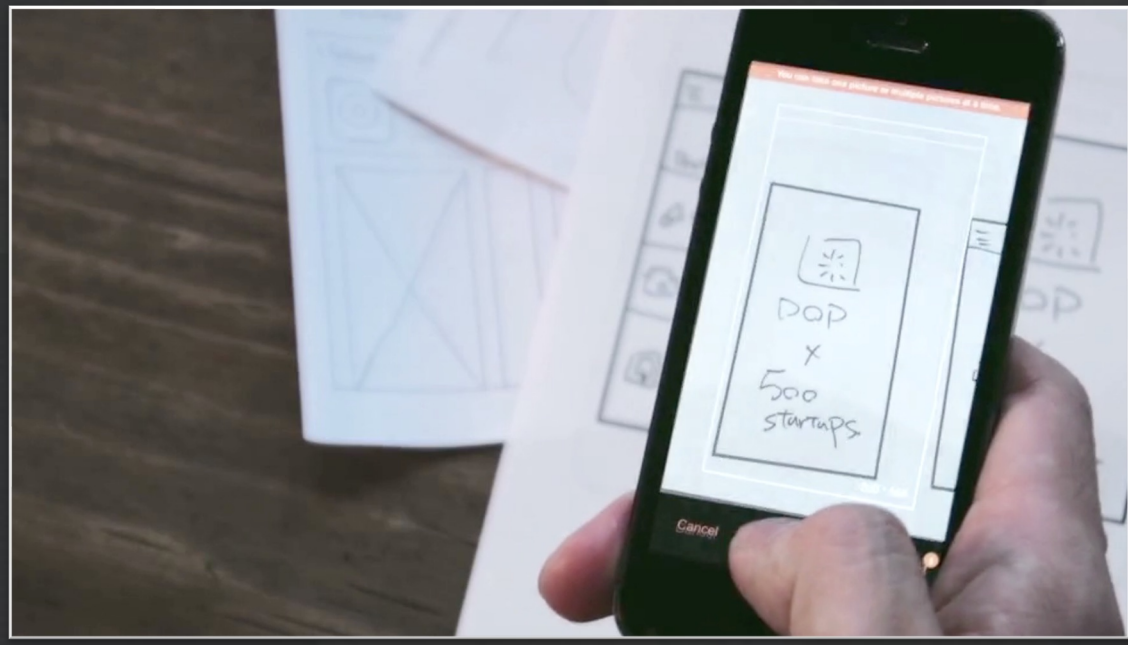
Problems with Low-fi Prototypes

- "Computer" inherently buggy
- Slow compared to real app
  - timings not accurate
- Hard to implement some functionality
  - pulldowns, feedback, drag, viz …
- Won't look like final product
  - some widgets/controls hard to recognize
- End-users can't use by themselves
  - not in context of user's work environment



Interactive Lo-fi Tools





Balsamiq Mockups
http://balsamiq.com

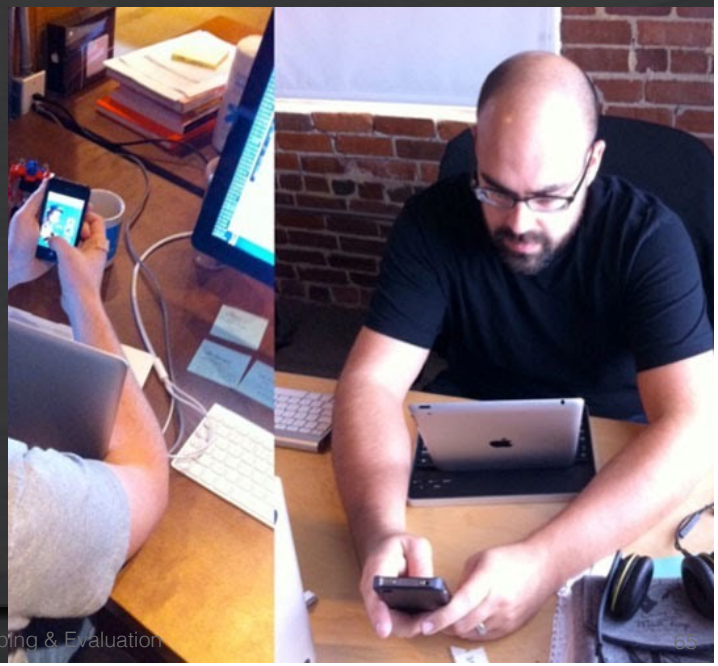
POP
https://marvelapp.com/pop

Remote Testing of Low-fi Prototypes

1. Participant runs & records prototype (e.g., Balsamiq/POP) on their phone [hardest]
   - user records interaction by recording screen on iOS/Android
   - you record zoom meeting while participant speaks aloud
   - https://uxdesign.cc/moderating-ux-research-with-zoom-1d4e89614277

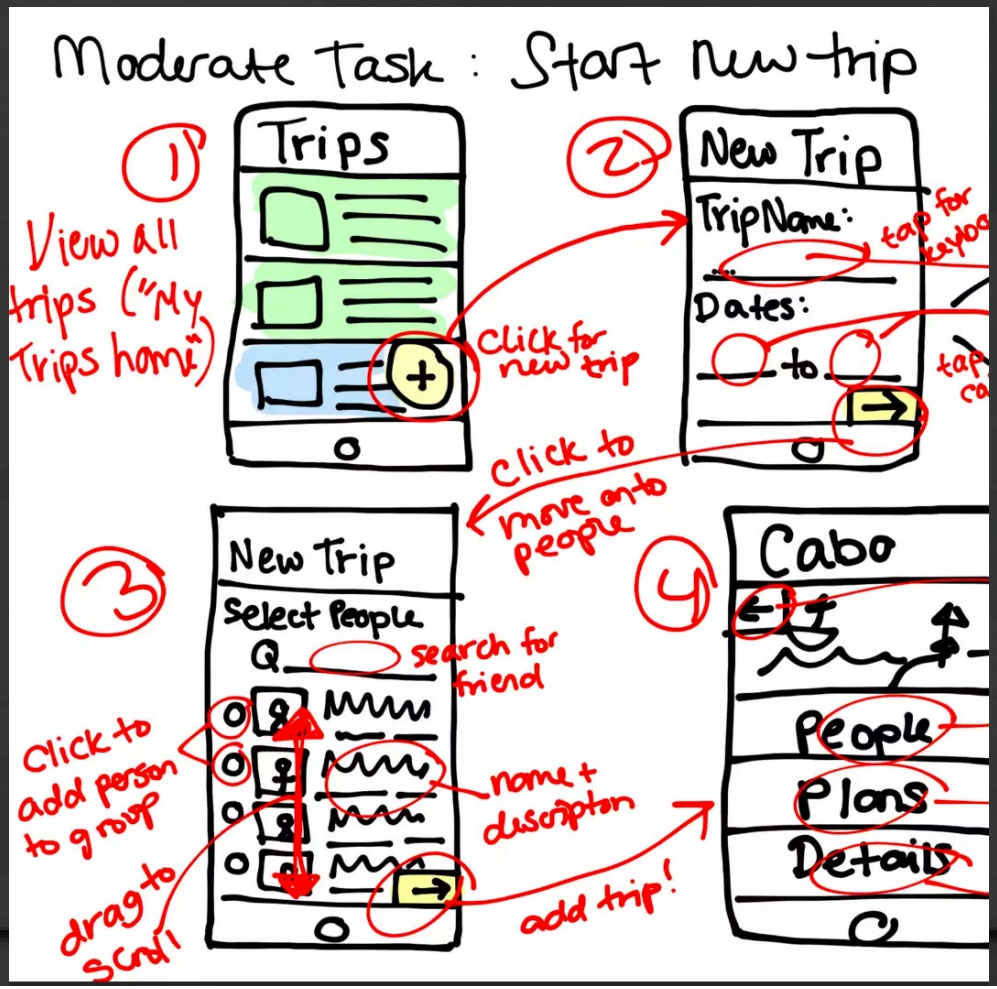
2. Participant runs zoom on their phone while you screen share prototype [moderate]
   - user taps on items & verbalizes aloud
   - *you control prototype & record meeting*
   - https://uxdesign.cc/moderating-ux-research-with-zoom-1d4e89614277

3. Participant hugs their laptop [easiest]
   - user runs your prototype (e.g., Balsamiq/POP) on their phone
   - you record zoom of their screen as *captured by their laptop camera*
   - https://medium.com/@beparticular/were-still-hugging-our-laptops-8c7f22ed800e



Fidelity in Prototyping:

Instagator



Fidelity in Prototyping

Task 1: Take a Destination Poll

Low-fi

Medium-fi

Summary

- Prototypes are a concrete representation of a design or final product
- Low-fi testing allows us to quickly iterate
  - get feedback from users & change right away

Further Reading

Prototyping

- Books
  - Paper Prototyping: The Fast and Easy Way to Design and Refine User Interfaces, by Carolyn Snyder, Morgan Kaufmann, 2003

- Articles
  - "Prototyping for Tiny Fingers" by Marc Rettig, in Communications of the ACM, 1994
  - "Using Paper Prototypes to Manage Risk" by Carolyn Snyder, http://world.std.com/~uieweb/paper.htm
  - "The Perils of Prototyping" by Alan Cooper, http://www.chi-sa.org.za/Documents/articles/perils.htm

Next Time

- Lecture on Monday: Human Abilities
- Read/Listen
  - "Learning From Design Critiques" by Fowler and Haskins
  - "Cognitive Aspects in Interaction Design", pages 66-99 from Interaction Design, 3rd Edition by Rogers, Sharp, & Preece
  - Wait Wait... Tell Me!, 99% Invisible, Episode 369 (36 minutes)
- Project next week
  - 15-20 sketches of 3-5 design realizations (start in studio…)
  - pick the top two & storyboard/task flow those
  - pick the top 1 & build/test low-fi prototypes using 3 key tasks for next week's studio presentation
    - recruit representative participants now!

Exit Ticket

hci.st/cs147-25au-exit-4-783