CMPT 363: User Interface Design
Spring 2021

Week 4: User-Centered Design, Sketching, & Prototyping

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School of Computing Science, Simon Fraser University

Recap from Last Lecture

- Evaluating Interfaces
  - Why? What? Where? When?
- Heuristic Evaluation
  - Usability experts using design heuristics to determine issues of design
- Usability Testing (watch the recorded video)
  - Invite potential end users to help with testing the usability by measuring performance & satisfaction

Today

- Usability Testing (cont'd)
- User-centered Design
- Sketching & Prototyping

- Office hours
  - Gayatri Ganapathy gganapat@sfu.ca| Mondays 6-7p @Zoom
  - Xinyi Zhong xza248@sfu.ca | TBA
- Individual assignment is due on 4 Jun (based on heuristic evaluation), ask questions at Canvas Discussion

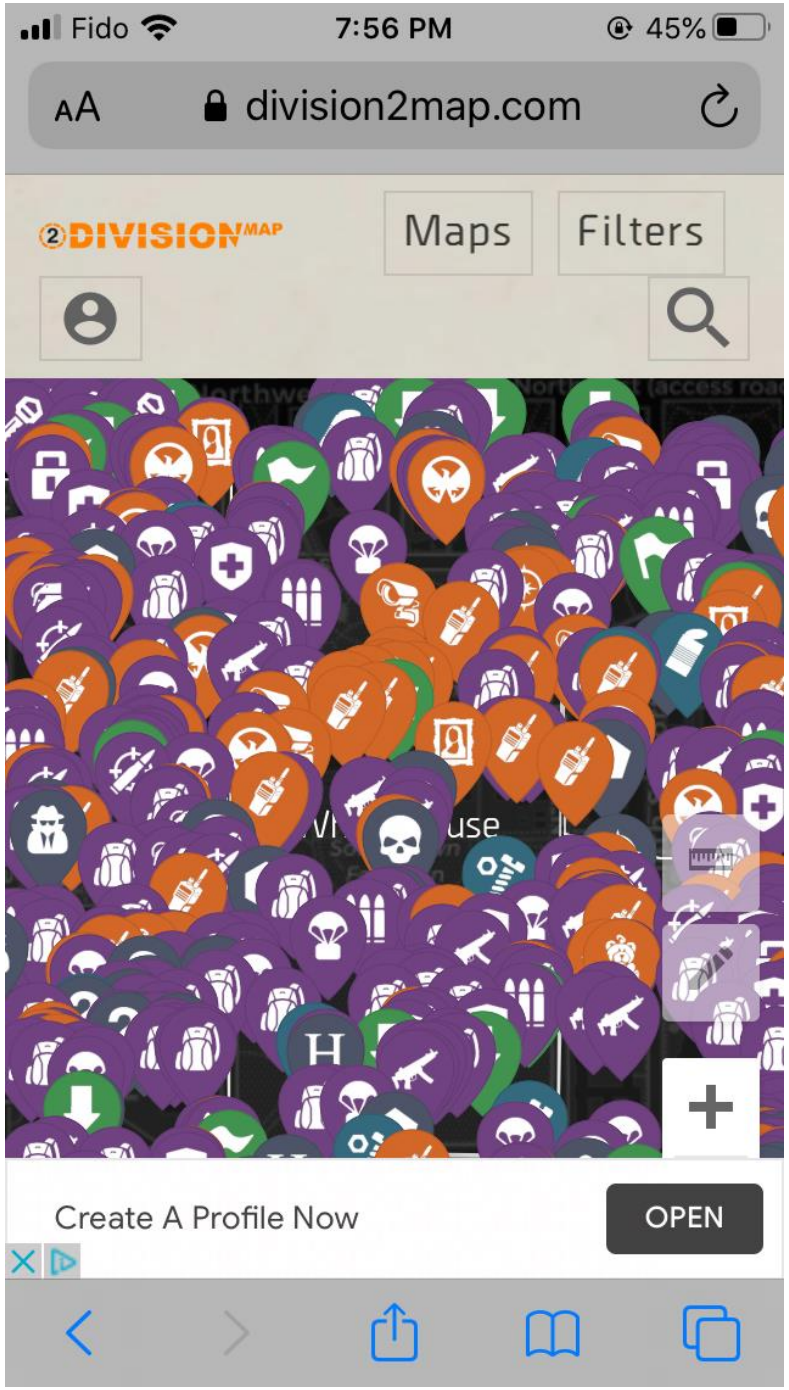
Forming Teams

- Project of 5 (max.)
  - ~~Use the Discussion to coordinate (or the CSSS Discord?)~~
  - ~~Recommended to form 5 of your own. Those with less than 5 might be assigned with someone without group~~
- ~~Use Canvas Collaborations to assign yourselves into pre-defined groups~~ (https://community.canvaslms.com/docs/DOC-10516-421264913)
  - Set a regular meeting time (at least once per week), know any time conflicts
  - Decide on a collaboration platform (e.g., Google Docs, Microsoft Teams, Dropbox, …etc)
  - Agree on and sign the Team Contract together
- Project description is available on Canvas

An Example of A Bad UI Example

Landing page on mobile interface begins with all available points of interest (indicated by drop-pin icons), overwhelms user.

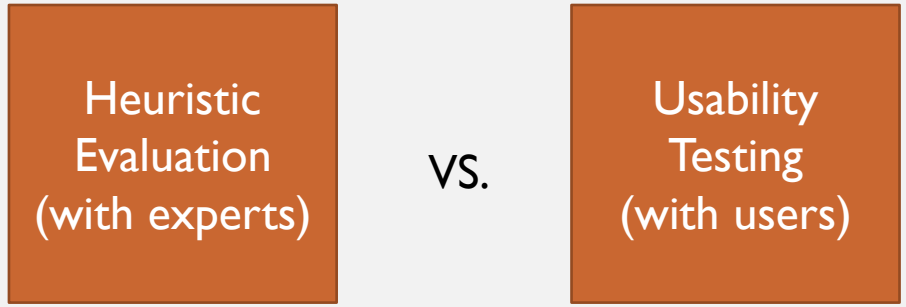
Makes it difficult for user to find things (task was to find the locations of a particular kind of items in the map).



Source: http://division2map.com (taken in 2020)

Important Bits about Heuristic Evaluation and Usability Testing

- HE is much faster
  - 1-2 hours each evaluator vs. days-weeks
  - Doesn't require interpreting user's actions
- UT is more accurate
  - Takes into account actual users and tasks
  - HE may miss problems & find "false positives"
- Good to alternate between HE & UT
  - Find different problems
  - Don't waste participants



Analyze The Data

We have them. Now what?

Types of Measurements (Data)

- Qualitative
  - Observational-based, either from facilitator (notes, recordings), or from participants (comments, feedback)
  - Mostly for insights, implications, proof-of-existence
- Quantitative
  - Assessment-based, mostly from participants (completing tasks, answering questionnaires)
  - Mostly for performance, hard numbers, proof-of-improvement
- Details on Qualitative vs Quantitative: https://www.nngroup.com/articles/quant-vs-qual/

Qualitative Analysis (Our Focus in this Lecture)

- Data come from notes, recordings, comments & feedback
- Look for
  - Frequently occurring problems (e.g., participants kept clicking the wrong button)
  - Severe problems (e.g., participants did this and the whole system froze)
  - Workarounds (e.g., participants kept reopening the browser window to refresh the content)
  - Enjoyment (e.g., participants expressed excitement when the animation comes up)
- Group them by themes
  - Affinity diagramming is a commonly used technique

Assessing Severity

- Severe problems are frequent and damaging

		Damage: Low	Damage: High
Frequency	Low	Not severe at all. Ignorable. Address if resources are available	Severe. Should be addressed.
	High	Annoyances. Should be addressed.	Catastrophic. Must be addressed.

What to Do with the Results

- Fix problems based on severity
  - Use usability goals to redesign
  - Use participants' suggestions as inspirations
- Highlight the goods
  - Don't forget about what's good about the design, what delights people
- Remember your role as a designer
  - Provide recommendation, not rules
  - Still need to consider constraints such as branding and standards

User-Centered Design

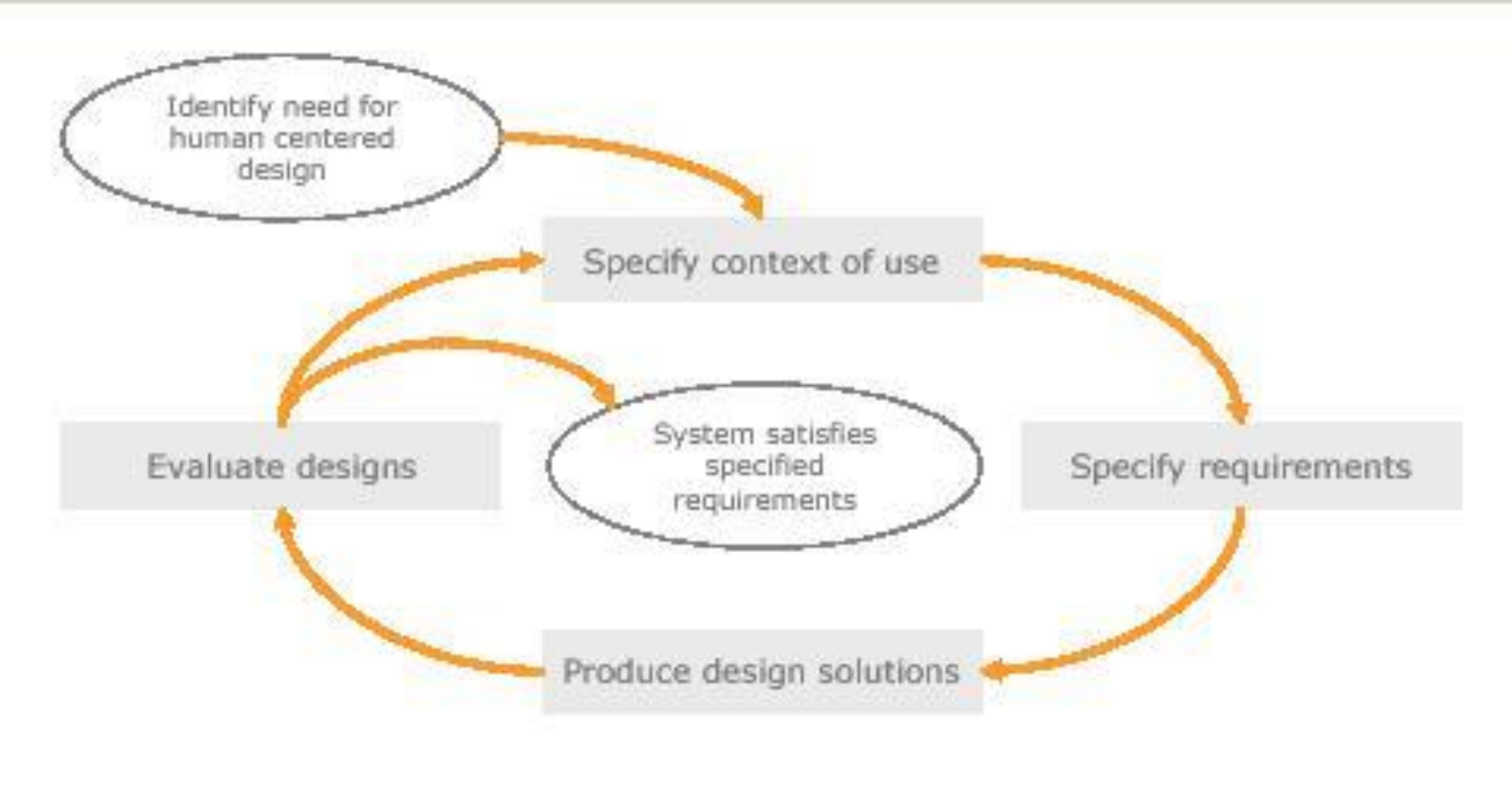
Why? What? Where? When?

There Is a Standard for The Design Process

- ISO 13407:1999 Human-centered design processes for interactive systems (withdrawn)
- ISO 9241-210:2019 Ergonomics of human-system interaction – Part 210: Human-centered design for interactive systems (https://www.iso.org/standard/77520.html)

Provides requirements and recommendations for human-centered design principles and activities throughout the life cycle of computer-based interactive systems. It is intended to be used by those managing design processes, and is concerned with ways in which both hardware and software components of interactive systems can enhance human–system interaction.

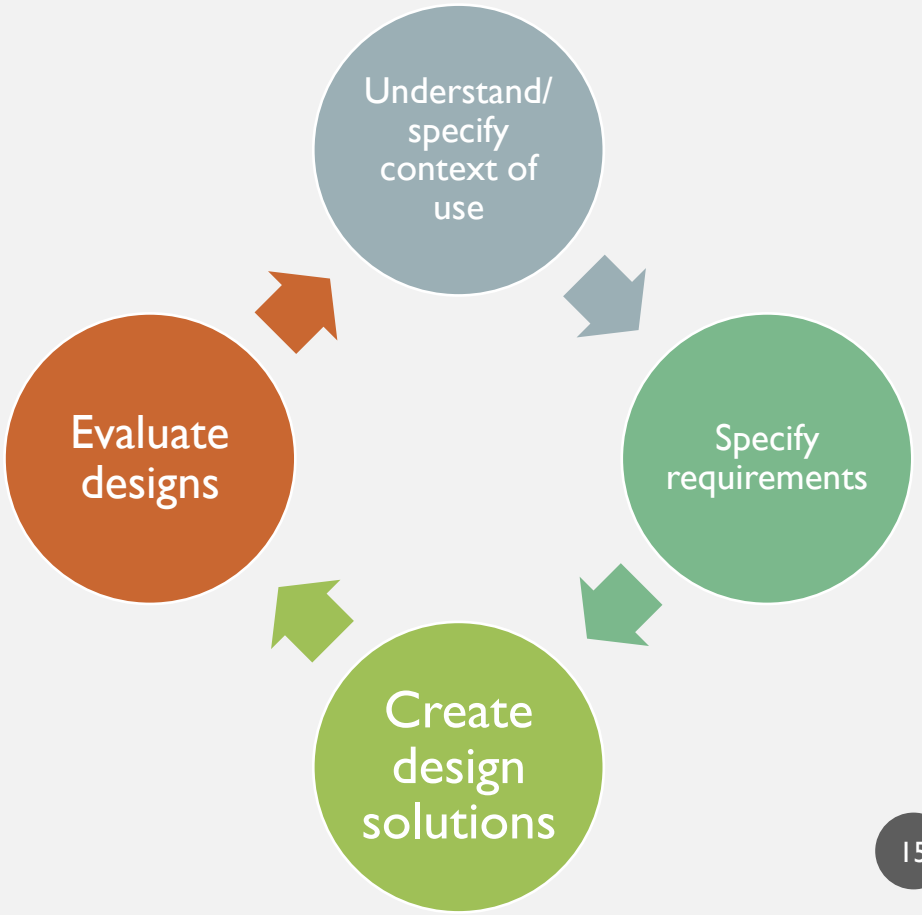
The Human-Centered Design Process



ISO 13407:1999

Involving Users in Every Step

- Understand/specify context of use
  - Interview users & examine tasks
- Specify requirements
  - Verify & prioritize with users
- Create design solutions
  - Design with users (co-design)
- Evaluate designs
  - Invite users to assess



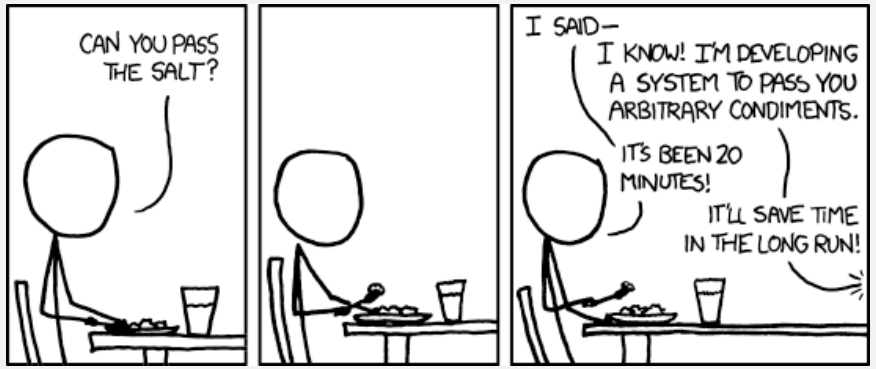
Design Thinking – A Similar Concept

- An approach to problem-solving and innovative design that focuses on understanding what people want and what technology can deliver it (ID-Book p456)
- An iterative process in which we seek to understand the user, challenge assumptions, and redefine problems in an attempt to identify alternative strategies and solutions that might not be instantly apparent with our initial level of understanding (https://www.interaction-design.org/literature/article/what-is-design-thinking-and-why-is-it-so-popular)

Prototyping

Prototyping

- "The original or model on which something is based or formed" (dictionary.com)
  - Sometimes also called "mock-ups", "simulation"
- "One manifestation of a design that allows stakeholders to interact with it and explore its suitability" – ID-Book p422



https://xkcd.com/974/

Why Do We Want to Create Prototypes?

- To ideate and problem-solve
- To communicate - if a picture is worth a thousand words, a prototype is worth a thousand pictures!
- To start a conversation (with users, other team members)
- To fail quickly and cheaply - committing as few resources as possible to each idea means less time and money invested up front
- To test possibilities - pursue many different ideas without committing to a direction too early on
- To manage the solution-building process - break a large problem down into smaller, testable chunks

What Form Can A Prototype Take?

- a series of screen sketches
- a storyboard, i.e. a cartoon-like series of scenes
- a powerpoint slide show
- a video simulating the use of a system
- a lump of wood (e.g., palmpilot)
- a cardboard mock-up
- a piece of software with limited functionality written in the target language or in another language

What Can We Use to Prototype?

HARDWARE

- Pen & paper
- Arduino
  - Simulators like Tinkercad Circuits, Circuitio
- 3D printing
- Laser cutting
- …etc.

SOFTWARE

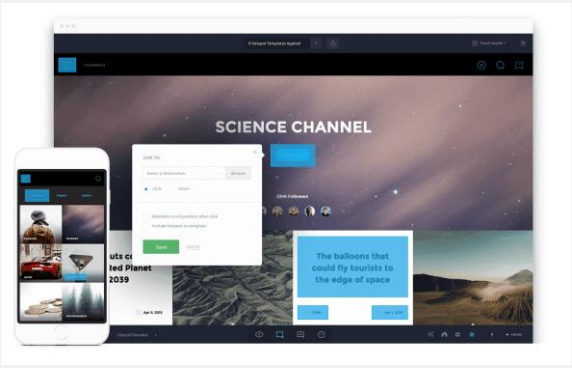
- Powerpoint, Keynote
- Invision
- MockFlow
- Balsamiq, Figma
- Origami (Mac-only)
- Axure
- …etc.

Different Levels of Fidelity

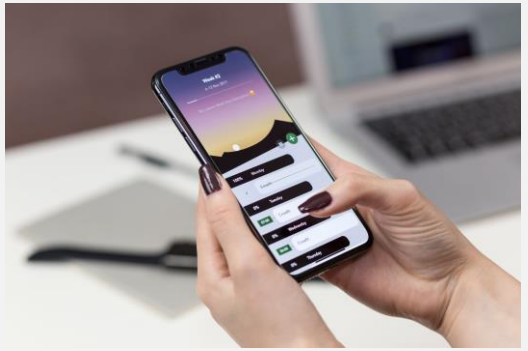
- Amount of functionality, details, and performance relative to product

Low-Fidelity

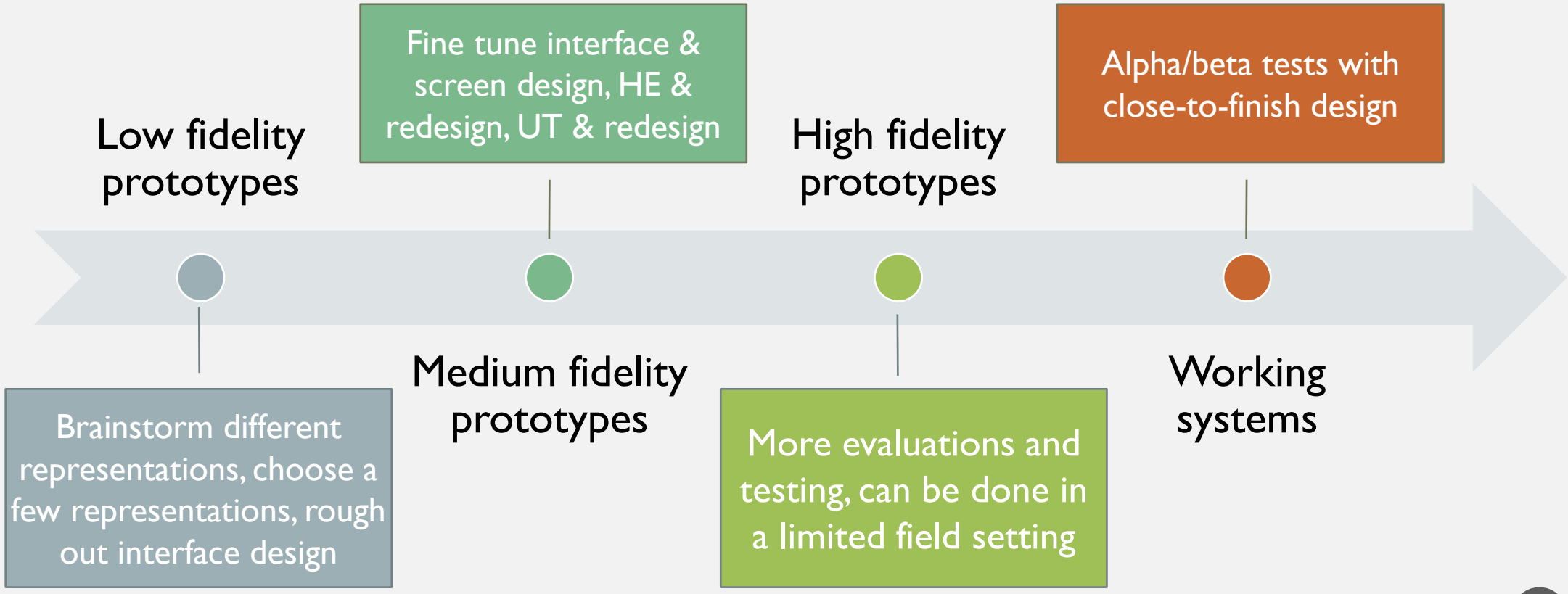
Medium-Fidelity



High-Fidelity



Timeline for Testing Prototypes

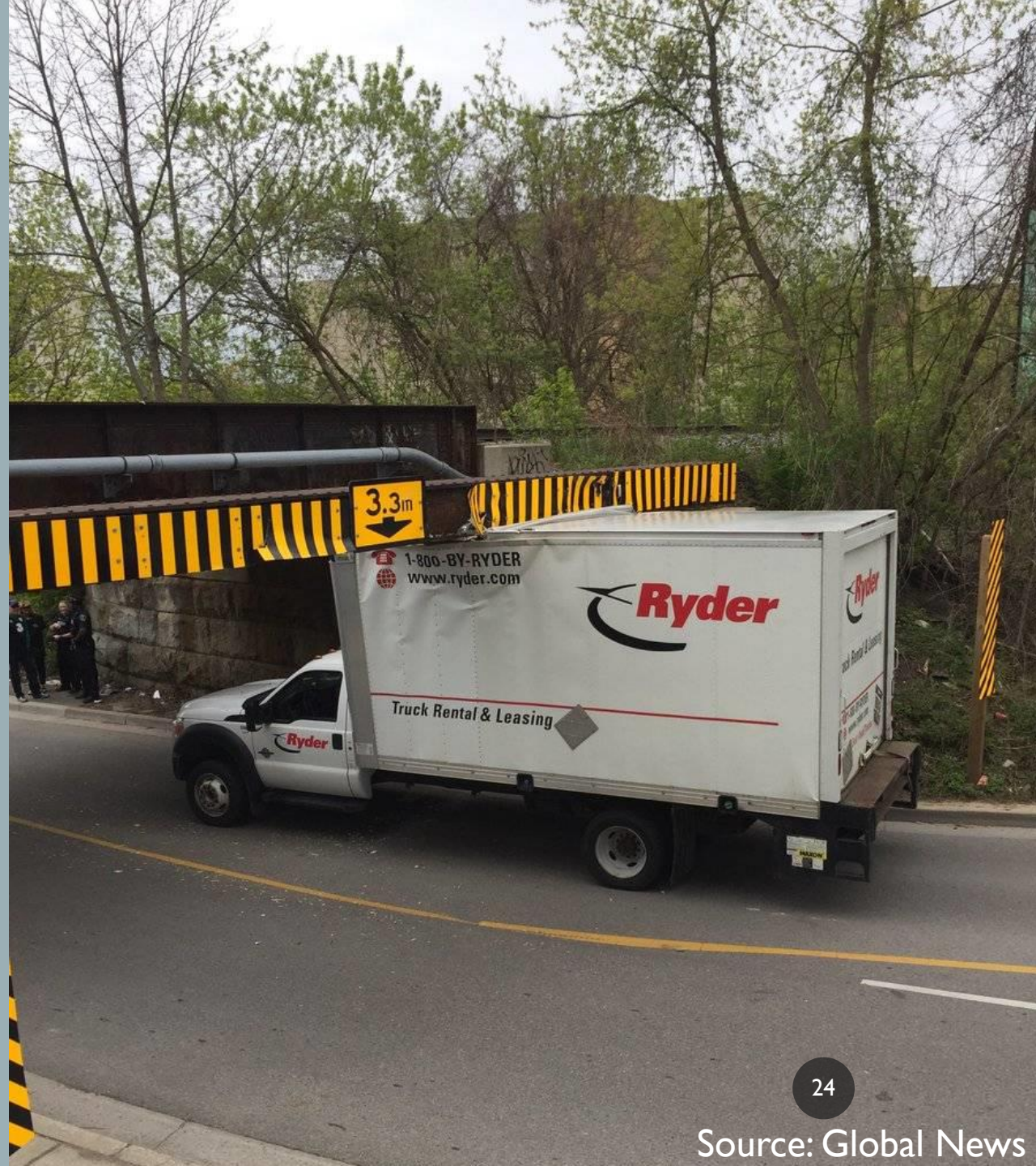


5min + 5min Break

The Talbot Street Bridge is a 3.3m bridge at London Ontario, on average 5 trucks got stuck per year before 2017

First 5min:
propose a solution to reduce the incident numbers

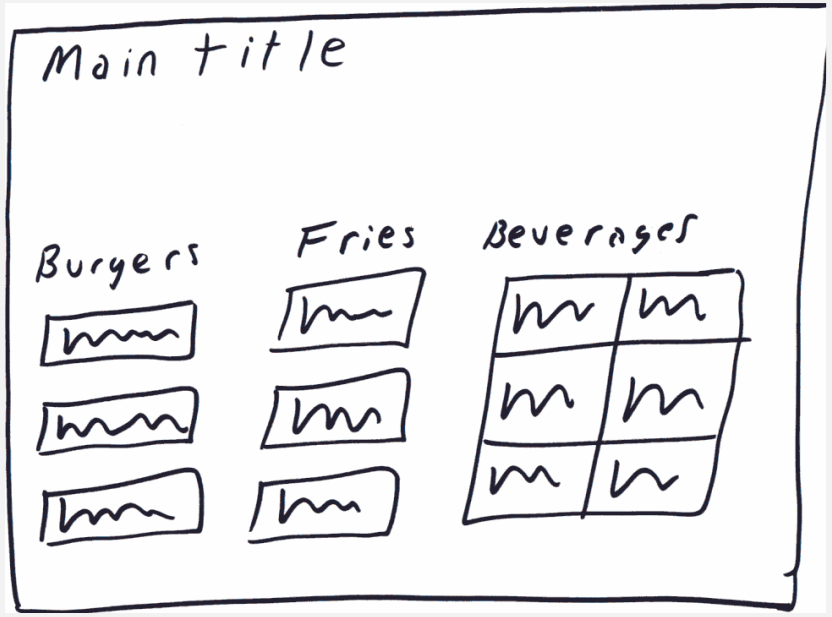
Write your answer on chat, don't press enter yet!

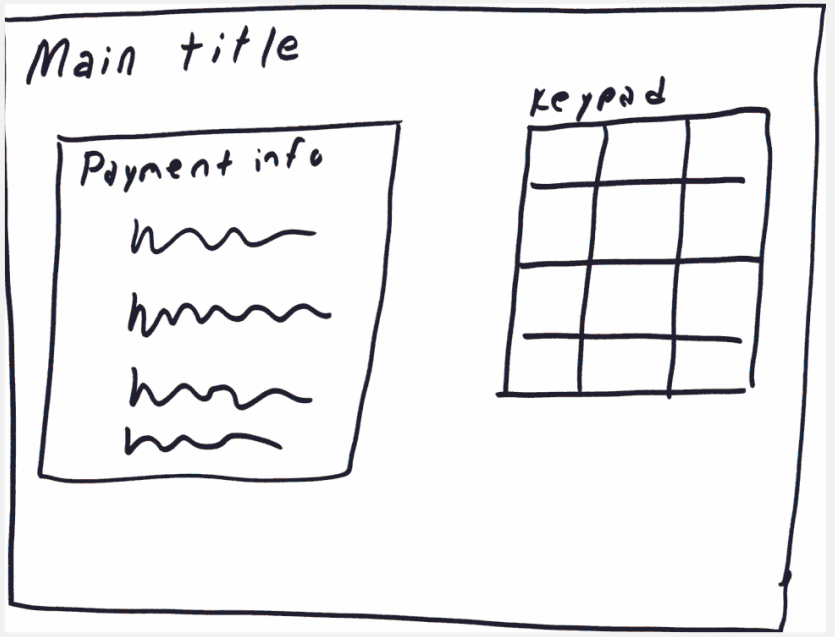


Source: Global News

Low-Fidelity Prototypes (LFPs)

- Sketching is a very useful and commonly used technique to create LFPs
  - Requires very few resources, better than just words, gives the impression of easily scraped and replaced



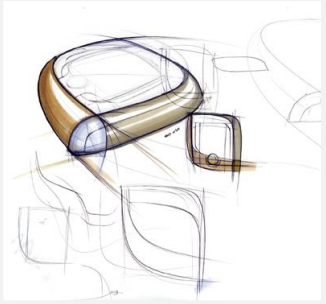


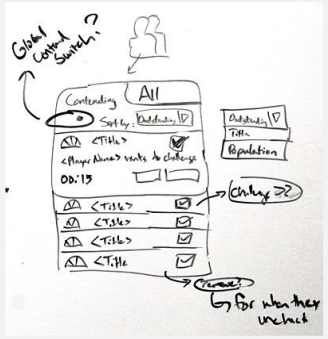
Slides by Mark Hancock

Benefits & Drawbacks of Sketching

BENEFITS

- Communicate high-level concepts
  - Visualize & annotate
- Easy to generate
  - Uses cheap & handy materials
- Easy to change
  - Replace & overwrite



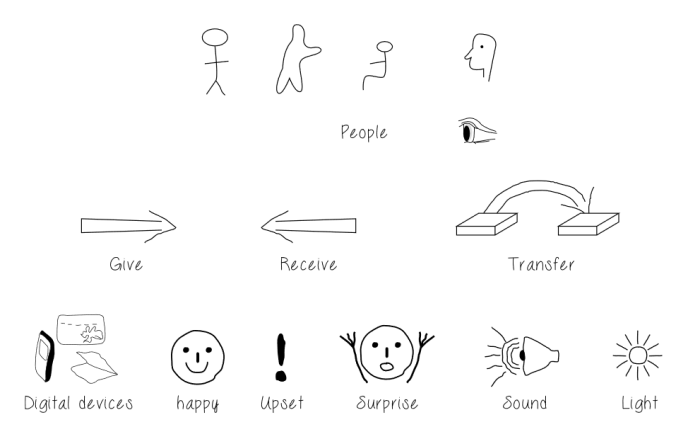


DRAWBACKS

- Hard to envision dynamics
  - Lack transitions & animations
- Can give an unfinished impression
  - Typically hand-drawn
- Doesn't actually work
  - No automation
  - Not using the actual medium

Some Examples of LFPs (from the ID-Book)

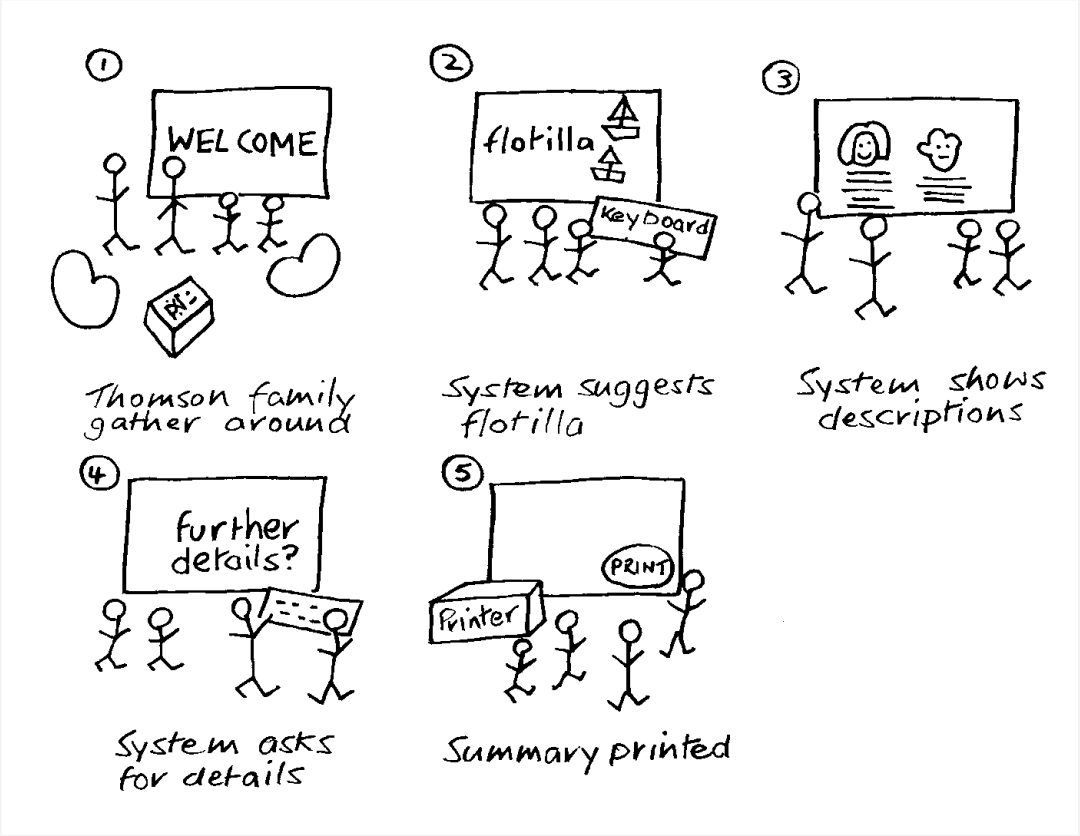
Storyboarding scenarios



Simple sketches of elements in the interaction

Paper prototype for a mobile phone user interface

Some More Examples of LFPs (1) – Overall Experience/Flow



Simple drawings

Annotated scenarios

Shows sequence of important steps

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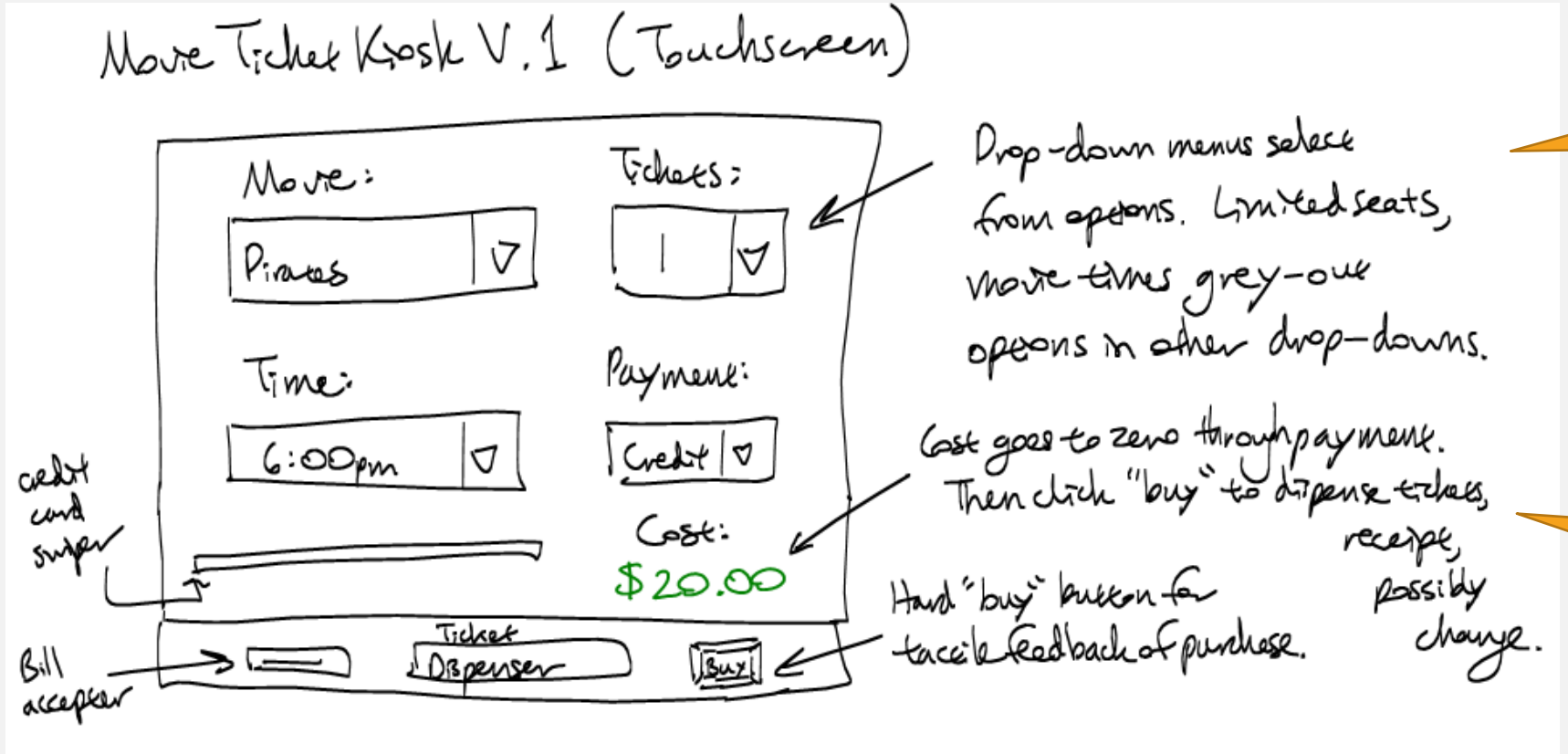
Some More Examples of LFPs (2a) – User Interface



Annotate if needed

Use colour if needed

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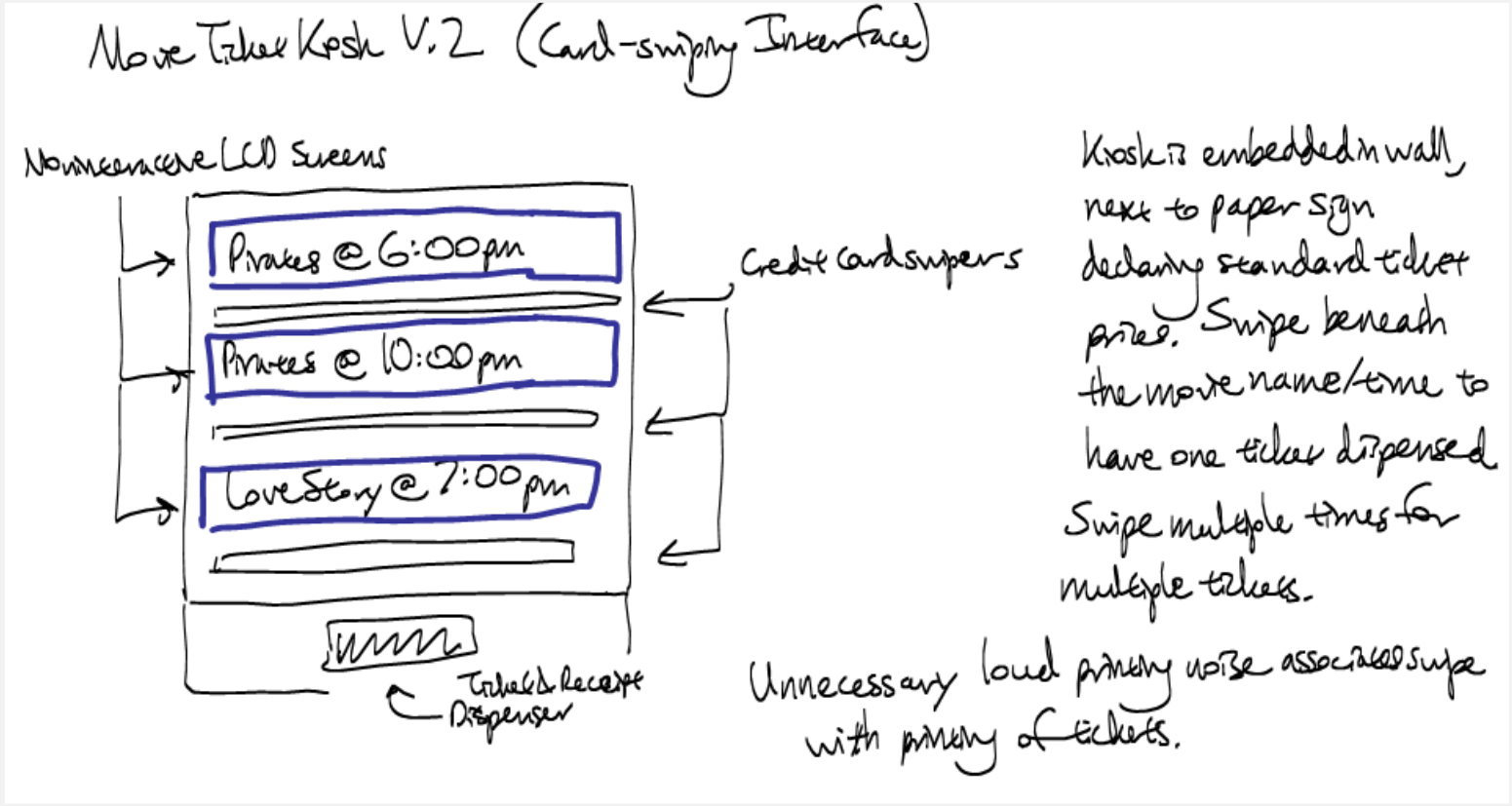
Some More Examples of LFPs (2b) – User Interface



Annotate if needed

Use colour if needed

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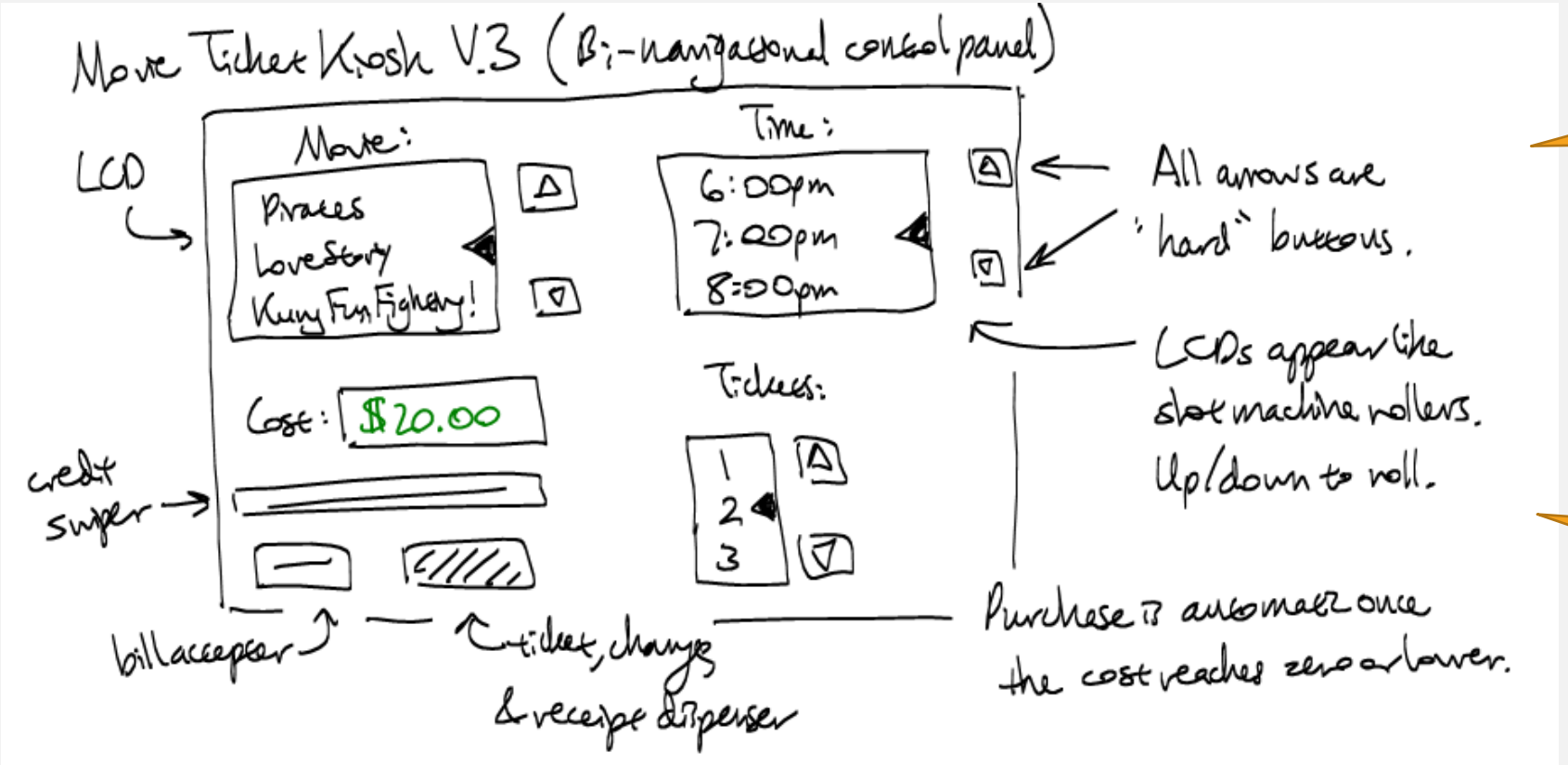
Some More Examples of LFPs (2c) – User Interface



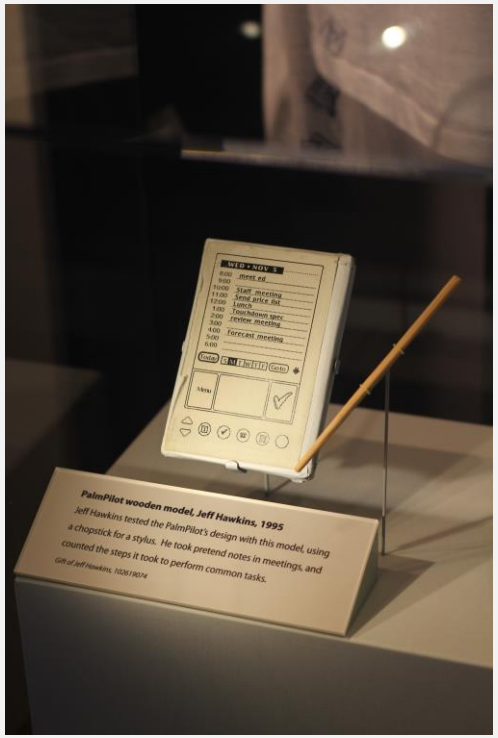
Annotate if needed

Use colour if needed

Slides by Mark Hancock

Example: PalmPilot Wooden Model

- An earlier generation of personal digital assistant (1992)
- Jeff Hawkin (founder of the company) carved up a piece of wood roughly the size of the imagined device
  - Carried it around
  - Pretend to use it

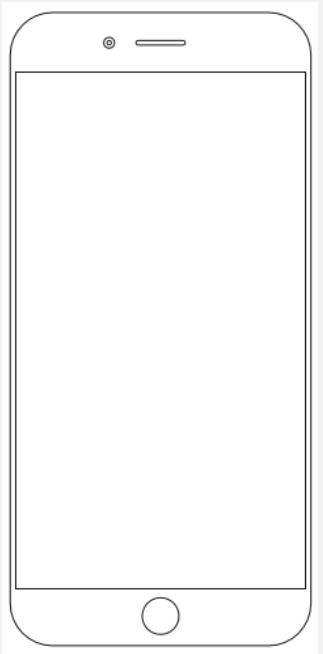


Potential Pitfalls with Prototyping

- Diving into the first good idea
  - Explore a range of ideas first
- Spending too much time & effort to perfect your prototypes
  - Use cheap materials and make them fast
- Wasting time explaining & pitching
  - Focus on showing & let others try it
- Prototyping without a purpose
  - Start with a purpose or design goal

Tips for Creating LFPs

- Don't worry about aesthetics, efficiency & robustness
- Use fictional data
- Just show how it looks like, supplement with annotation and verbal description
- Use your hand to provide some interaction/automation (e.g., changing screens)
- Use templates & printouts
  - Many online resources



- Fun watch: Jewelers using modern prototyping tool
  https://precise3dhub.com/2019/06/15/jewelers-use-3d-printing-to-prototype-custom-rings/

Real-World Sketching & Prototyping (Example from Google)

https://www.youtube.com/watch?v=JMjozqJS44M

Summary

- Usability Testing (cont'd)
  - Ranking severity, what to do with the results
- User-centered Design
  - Useful in every steps of the design process
- Sketching & Prototyping
  - Levels of fidelity
    - LFPs (we'll continue with the rest in the next lecture)

Post-Lecture Activity

- Read/watch these (and those in the slides)
  - Chapters 12 of ID-Book: Design, Prototyping, and Construction, Chapter 11 of the UX book
  - Paper Prototyping 101, UX Prototypes: Low Fidelity vs. High Fidelity https://www.nngroup.com/videos/paper-prototyping-101/, https://www.nngroup.com/articles/ux-prototype-hi-lo-fidelity/
  - Prototyping 101: The Difference between LFP and HFP and When to Use Each https://theblog.adobe.com/prototyping-difference-low-fidelity-high-fidelity-prototypes-use/
  - How to Create a LFP like an App Expert https://www.thinklions.com/blog/how-to-create-a-low-fidelity-prototype-like-an-app-expert/

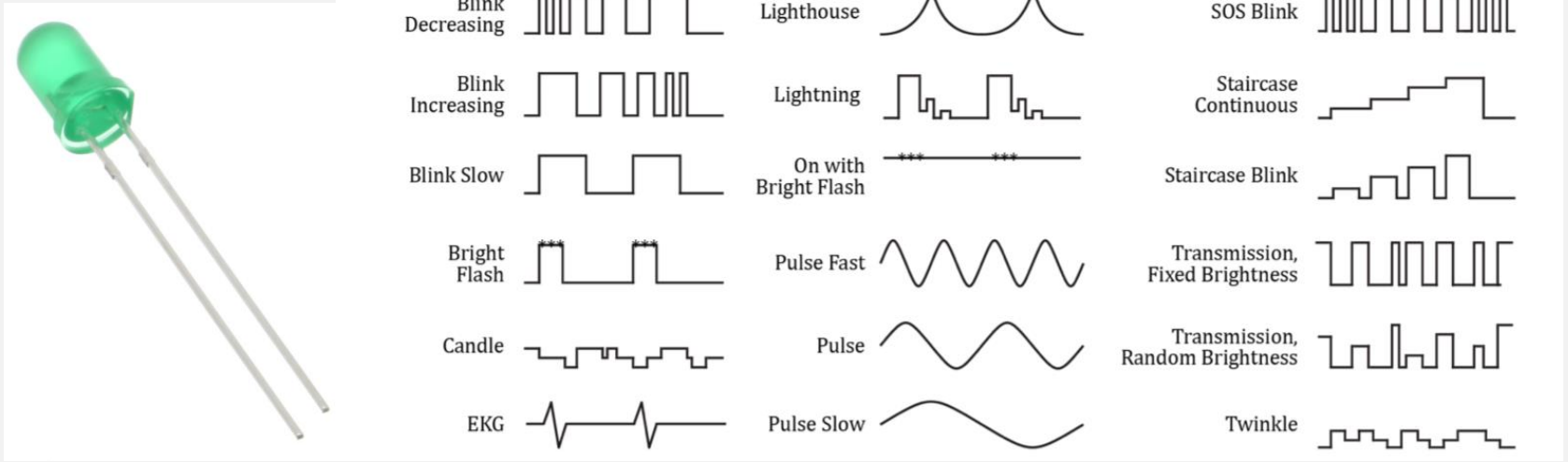
- With your LFP design for the LED behaviour
  - Sketch it out using only pen & paper, then think about how you can create an LFP to show the behaviour without any electronics
  - Show this to your friends & family, give them the list of the 6 informational states, see if they can correctly map them to your design

A Design Exercise

- Pick an electronic device from shavers, toothbrushes, toasters, or any appliance
- To use a single LED light to show 4 of the 6 informational states
  - The device is notifying the user about an event or scheduled item
  - The device has low battery
  - The device is thinking, computing, or processing
  - The device is sleeping, suspended, or hibernating
  - The device is turning on, booting, or warming up
  - The device is transmitting or receiving data

Challenge

- The LED has only one colour
- The LED can vary in intensity over time



Source: http://www.chrisharrison.net/index.php/Research/LEDBehaviors

In-Class Activity

- Meet & greet your teammates
  - Assign yourself into the breakout group with the same team number in Canvas
  - Some groups might have new members or newly formed (work on meeting time, platform, other logistics)

- If there is time, discuss how you can create a prototype with just pen & paper for the LED design challenge