IN4MATX 133: User Interface Software

Beyond Web & Mobile
and Wrap-Up

What is a wearable computer?

A MUCH More Diversified Market Than Investors Realize

CREDIT SUISSE

What is a wearable computer?

- A computer on the body that is:
  - Always on
  - Always accessible
  - Always connected
- Other actions:
  - It augments user actions
  - Is aware of the user and their surroundings

Rhodes, B.J. 1997. The wearable remembrance agent: a system for augmented memory. *Personal Technologies*, 1(4), 2018-224.

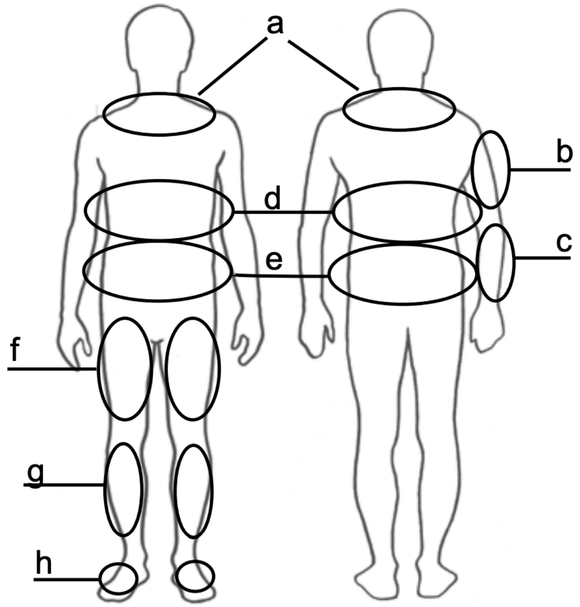
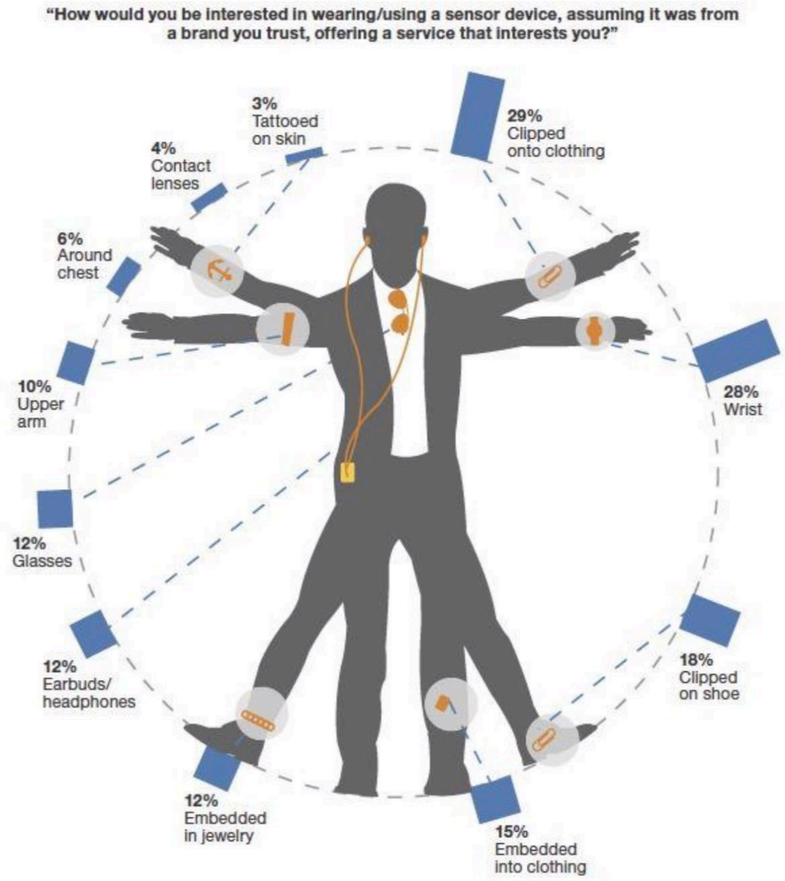


Fig. 1, The general areas we have found to be the most unobtrusive for wearable objects are: (a) collar area, (b) rear of the upper arm, (c) forearm, (d)rear, side, and front ribcage, (e) waist and hips, (f) thigh, (g) shin, and (h) top of the foot.

Gemperle, F. Kasabach, C., Stivoric, J. Bauer, M. Martin, R. Design for Wearability. ISWC 1998.



North American Technographics Consumer Technology Survey, 2013.

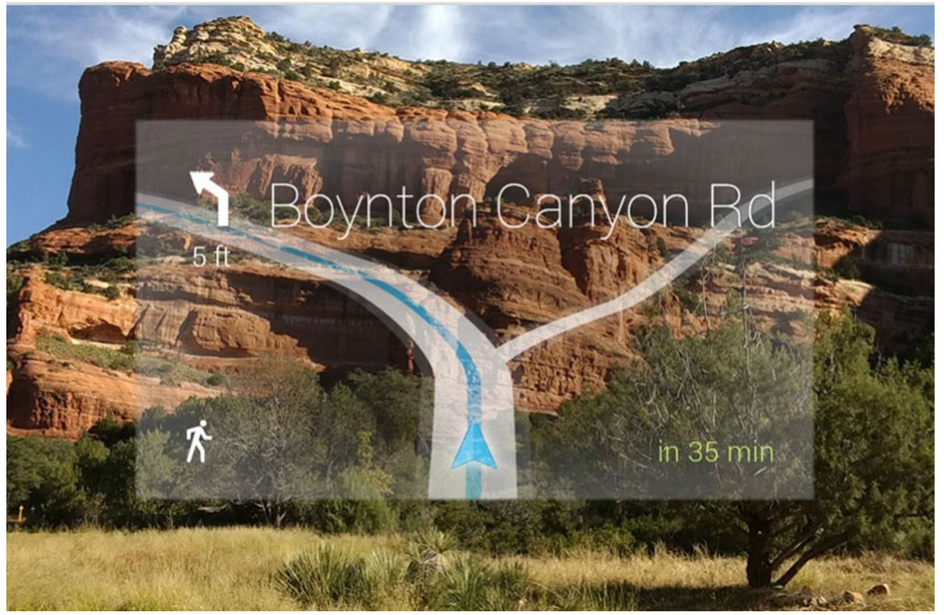
Body and head-mounted wearables

MIT Wearable Computing (1996)

Google glass

- Commercial smart glasses, released in 2013
  - Technology lead by Thad Starner, part of the MIT group
- Front-facing camera, rear-facing display
- Gyroscope/accelerometer/magnometer
- Natural language input capabilities

https://www.x.company/glass/



https://www.x.company/glass/

Google glass

- Privacy and safety concerns prevented take-off in the consumer space
- Lives on in enterprise spaces
  - New version released in 2017
  - Used in manufacturing, healthcare

https://www.x.company/glass/

Wrist-worn wearables

Fitbit (2011)

- One of the first commercially successful digital pedometers
- Early versions were hip-worn, now almost exclusively wrist-worn
- Current models are “fitness-first” smartwatches
  - Activity prominently included on the home screen
- Acquired by Google in 2019

Pebble (2013)

- Arguably the first commercially successful smartwatch
  - Two of the most funded Kickstarter projects ever
- E-ink display led to high battery life (a week vs. a day)
- Paired with a phone via Bluetooth
  - Could retrieve email, control music, receive notifications, etc.
- Acquired by Fitbit in 2016

Apple Watch (2015)

- From the onset, it was intended to be a “second screen” companion to iOS devices
- Original versions could do almost nothing without pairing to an iOS device
- Apps add a secondary component to an existing iOS app

Wearables in Research

https://chrisharrison.net/index.php/Research/Welcome

Design recommendations for (wrist-worn) wearables

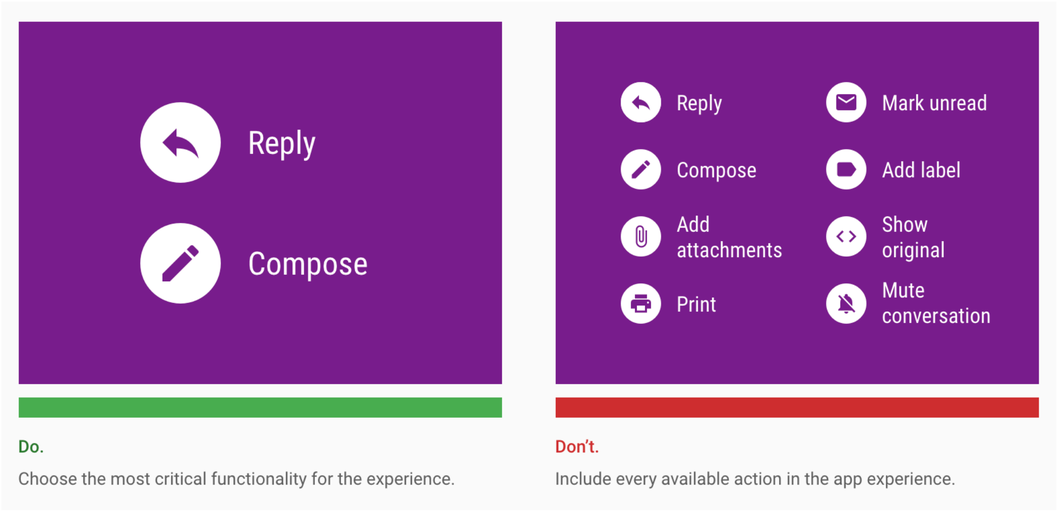
One visual thought per screen

- Real estate is extremely valuable on watches
- Shrinking a mobile or desktop app will create a bad experience
- Keep words and interactions to a minimum

https://mayvendev.com/blog/10-tips-for-designing-for-wearables-and-watches

Reduce input options

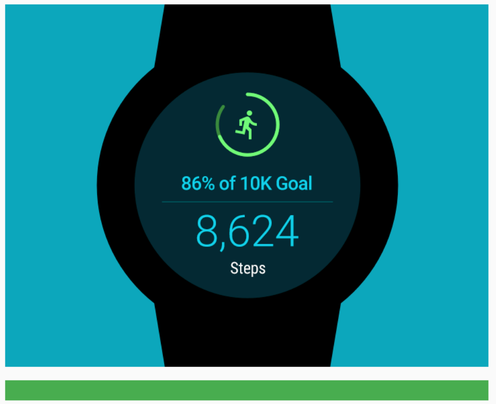
- Have only a couple of buttons per screen
- This may mean a watch app has fewer features than a mobile app
  - That’s okay!
  - The watch augments the experience
- Consider voice input when longer instruction is needed



https://designguidelines.withgoogle.com/wearos/wear-os-by-google/designing-for-watches.html

Some apps don’t need a watch interface

- For some apps, a watch app may not add to the experience
- Focus on use cases which make sense
  - Quick input
  - Glanceable feedback



Do.

Design experiences where tasks can be accomplished easily using the watch interface.

Don’t.

Complex, detailed apps that include items like spreadsheets may be difficult to edit and view on a watch.

https://designguidelines.withgoogle.com/wearos/wear-os-by-google/designing-for-watches.html

Questions to consider

- Would a watch app add anything to my mobile app?
  - Is there timely information the app needs to provide?
  - Can it be shown in a very small format?
  - Are there simple controls to the app that would be added to a watch?
- Do I have the resources/time to do this?
  - Currently limited market impact, but growing
- What type of interaction do you want the user to have?

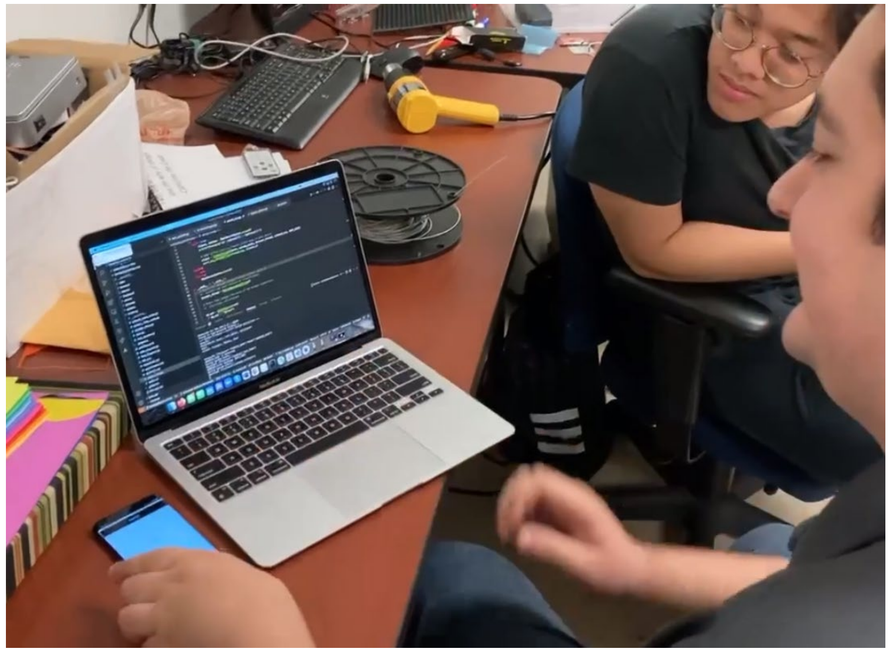
Implementing watch apps

- Requires native development, as far as I know
    - WatchKit for iOS, Wear OS for Android
- Requires a companion iOS or Android app for building/deploying, though may be able to run as a standalone
- However, you can develop a hybrid mobile app and connect it to a native watch app

https://developer.android.com/training/wearables/apps

https://developer.apple.com/documentation/watchkit

Rethinking The User Interface



Tangible Interaction

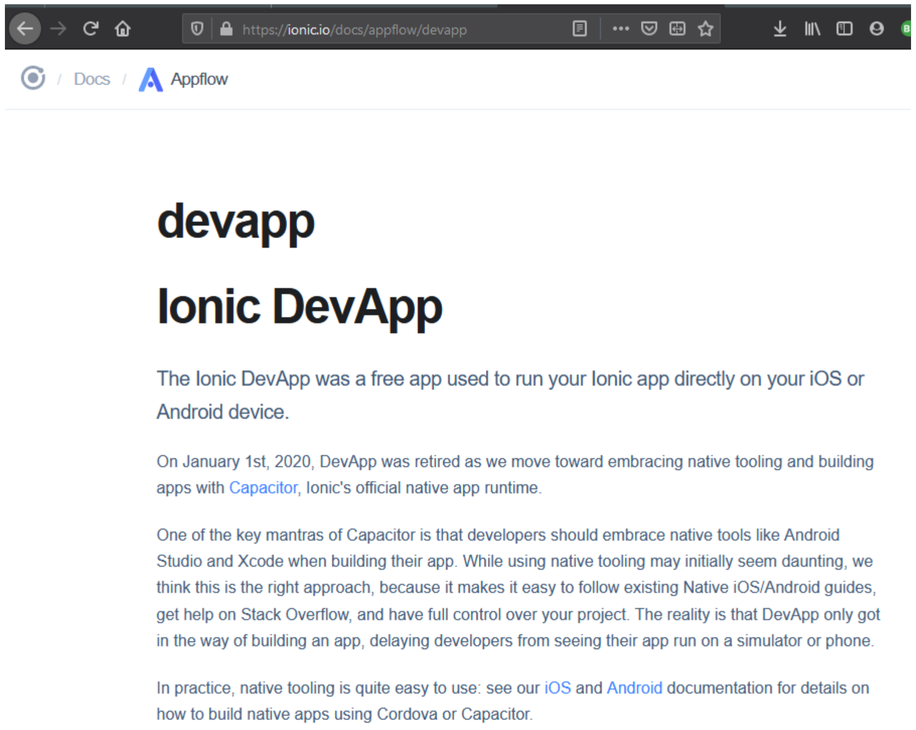
Cooperative Interaction

Mixed Ability Interfaces

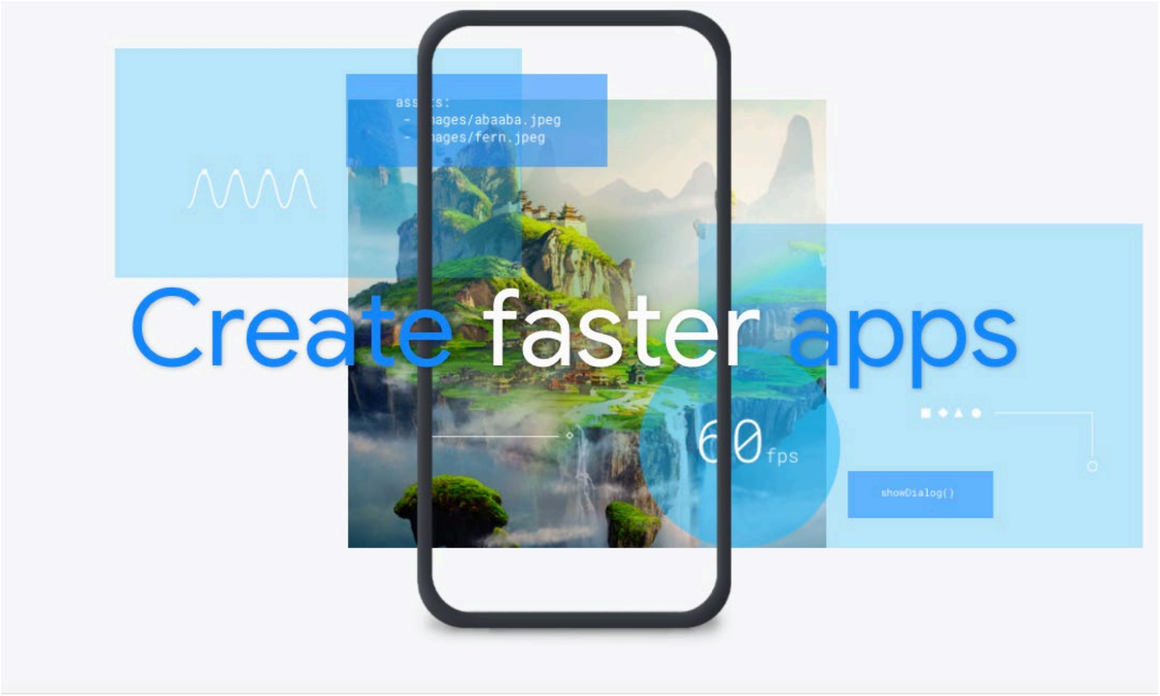
Reflecting on 133

Technology changes quickly

Technology changes quickly



Technology changes quickly



Made by Google

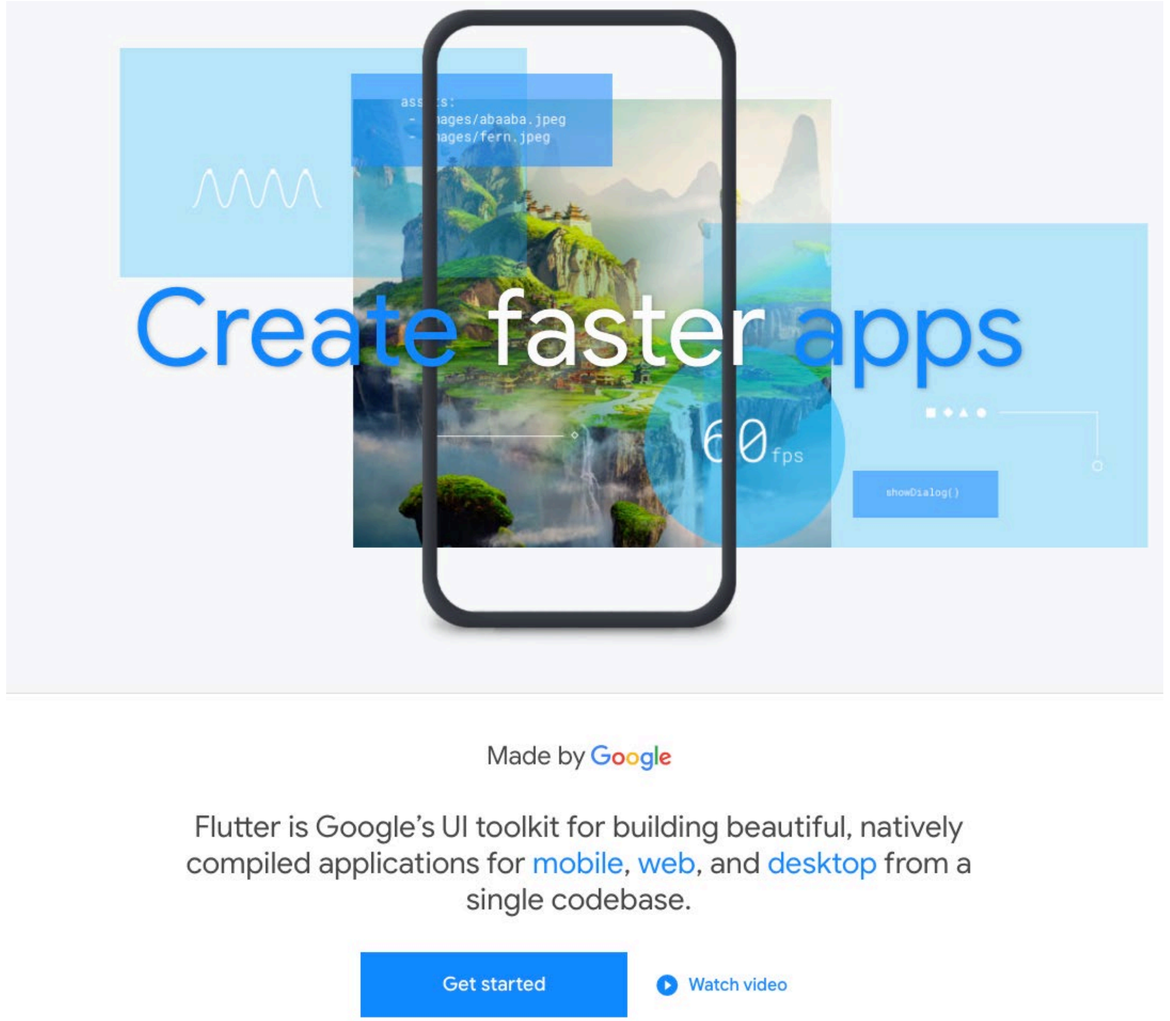
Flutter is Google's UI toolkit for building beautiful, natively compiled applications for mobile, web, and desktop from a single codebase.

Get started Watch video

https://flutter.dev/

Technology changes quickly

- A hybrid framework for building Android and iOS apps
- Goal: higher performance
- Written in Dart, an object-oriented language Google has been pushing
  - Downside: new language…
- Includes libraries for some native resources (Camera/photos)
  - May be more reliable than Ionic



https://flutter.dev/

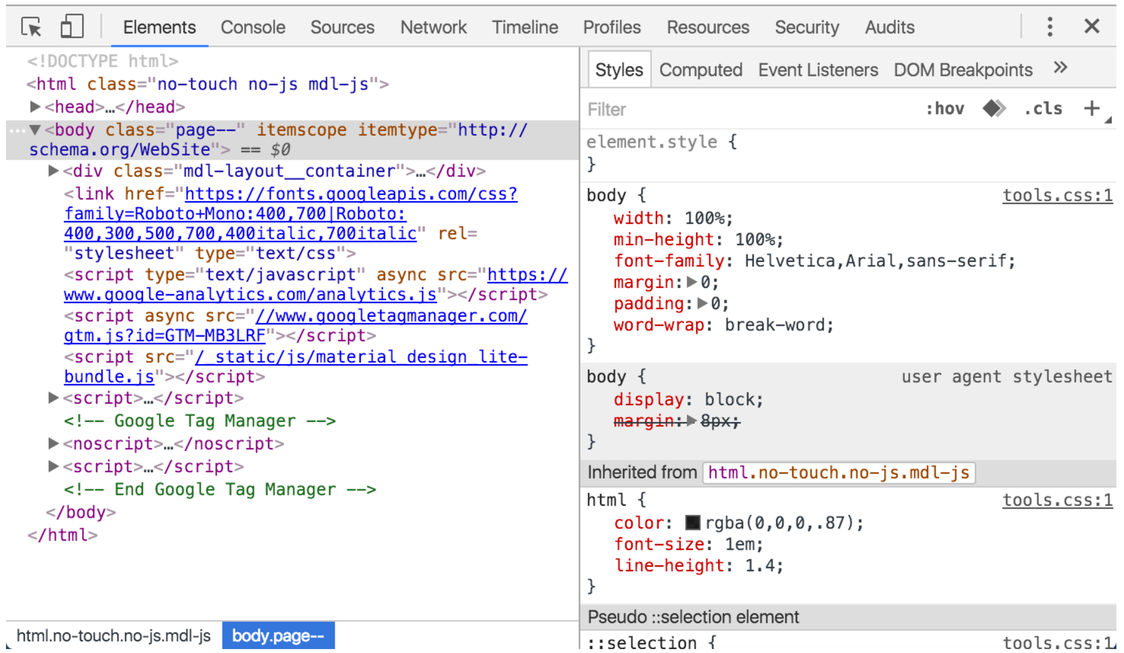
Take away messages from the course

Search before you build

- Do not reinvent the wheel!
- Use interfaces, algorithms, animations, etc. that have been created by other people

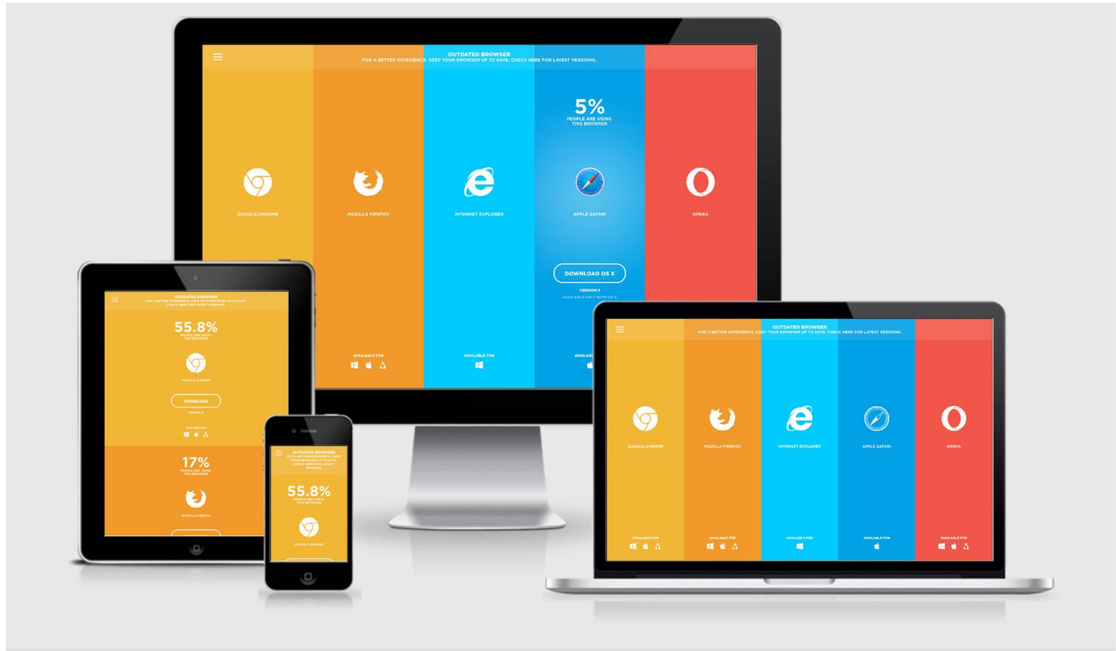
Build by example

- Learn from others (you did a great job this quarter!)
- Read source code on webpages, GitHub, StackOverflow
- Use the element inspector in your browser to see someone's design or implementation



Build for accessibility

- Keep in mind who you are designing for!
- Make sure your app works for:
  - All users
  - All browsers
  - All devices



Build with caution

- Use version control!
- Test while you build
- Iteratively refine and debug

Build on a solid foundation

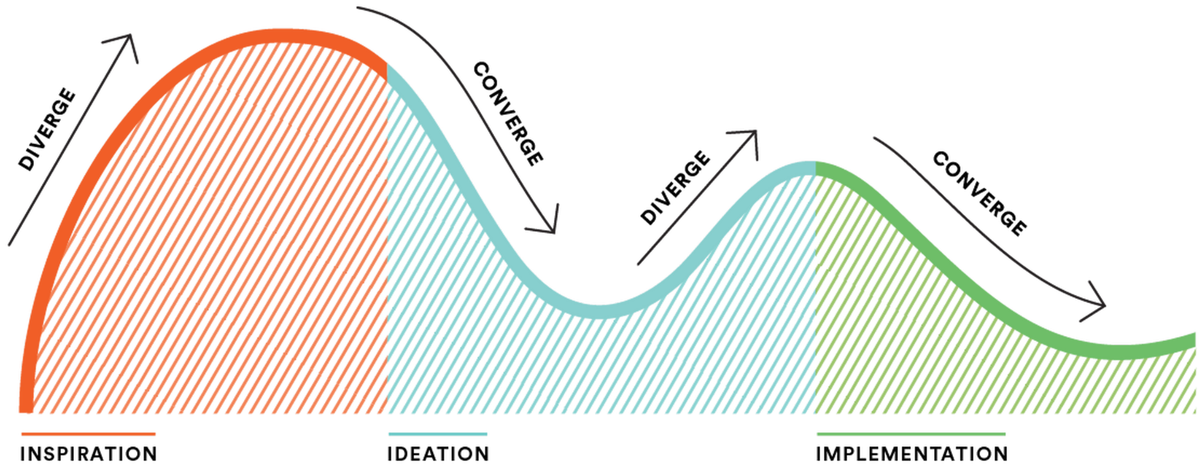
- A new framework will come out next year
  - Or next month or next week
- But some fundamental principles unite them all
  - Separating interface from data and interaction, for example

Take away messages

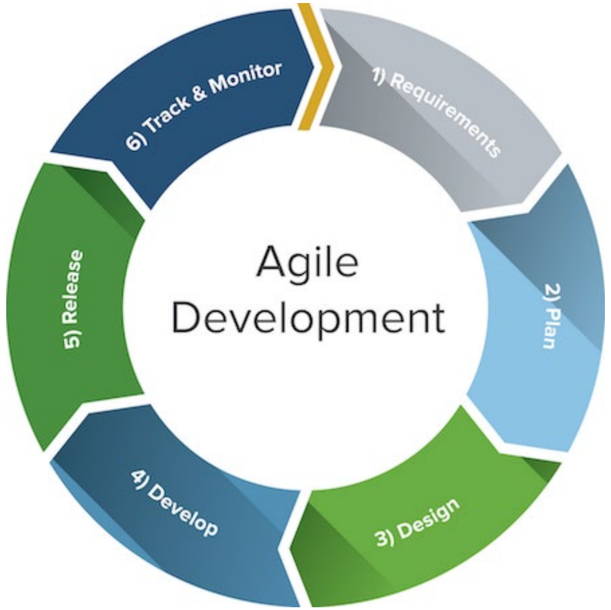
- Search before you build
- Build by example
- Build for accessibility
- Build with caution
- Build on a solid foundation

Applying this course in practice

Product design process

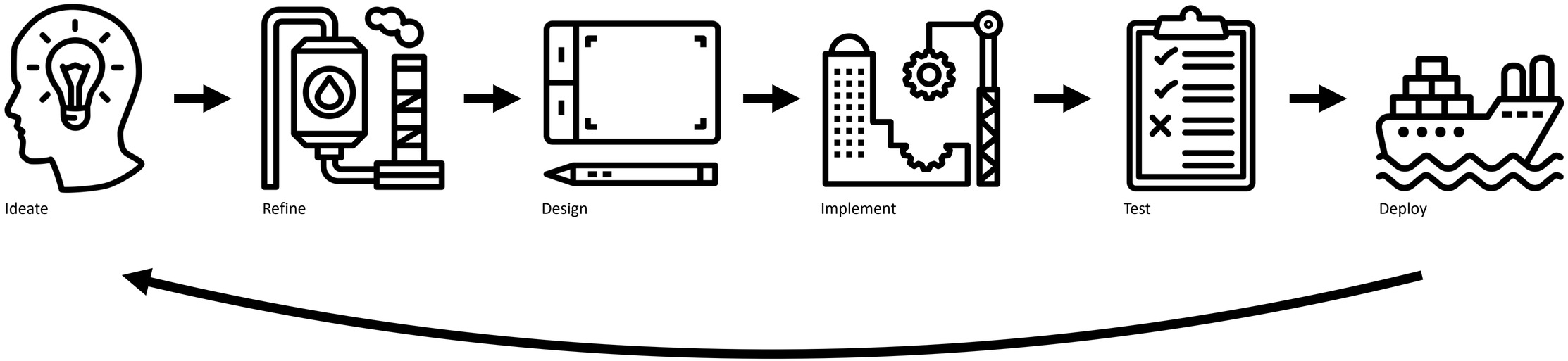


Human-Centered Design, IDEO



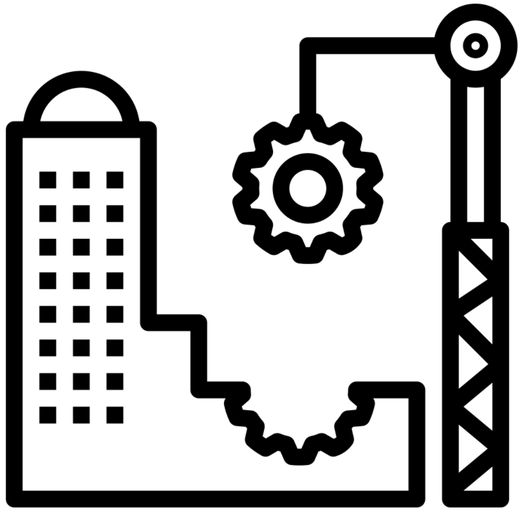
Agile Development, Agile Manifesto

Product design process, simplified



User interface implementation

- Has the power to turn ideas into reality
- Often dictates design decisions and timelines, for better or for worse
- Either you will be implementing, or you will need to communicate with your colleagues who are



What job might you get when you graduate?

Some job options

- User experience designer
- User experience researcher
- Front-end software engineer
- Back-end software engineer
- Academic researcher (graduate student)
- Software consultant
- Something unrelated to technology
- … others?

If you’re going into UX, you can now…

- Follow principles of web, mobile, AR design
  - Responsive design! Error prevention! Give clear instruction!
- Be conversational in web and mobile programming
  - Be able to understand what tasks are easy and what are hard
  - And understand when a developer is BSing you about how long something will take
- Style a webpage
  - Use CSS and SASS to change a design and even add animations

Front-end software engineering…

- Build a webpage in plain HTML
  - Make it responsive with Bootstrap
- Use a framework to build a richer application
  - Angular for a web frontend
  - Ionic for a mobile frontend
- Style a webpage
  - Use CSS and SASS to change a design and even add animations

Back-end software engineering…

- Build a web server
  - Allow it to respond to requests from a front-end interface
  - Allow it to make requests to APIs made by other developers
- Follow authentication and authorization protocols
  - Enable users to sign on
- Use a database
  - Data can persist between sessions

Academic research…

- Explain some key problems in a couple of areas
  - Ubiquitous computing
  - Human performance
  - Mixed reality design
  - Smartphone systems security
  - Wearable computing
  - Augmented and virtual reality

Software consultancy…

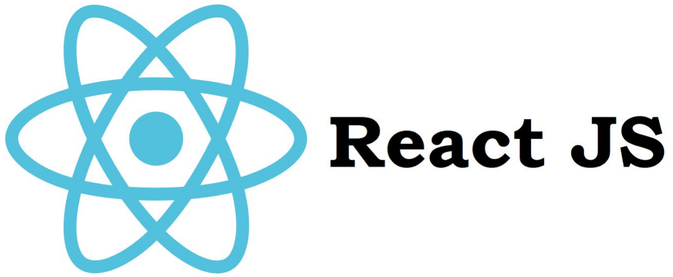
- Process and analyze data
  - Retrieve it from an API
  - Parse and process it to answer your question
- Visualize data
  - Use an appropriate tool for the task

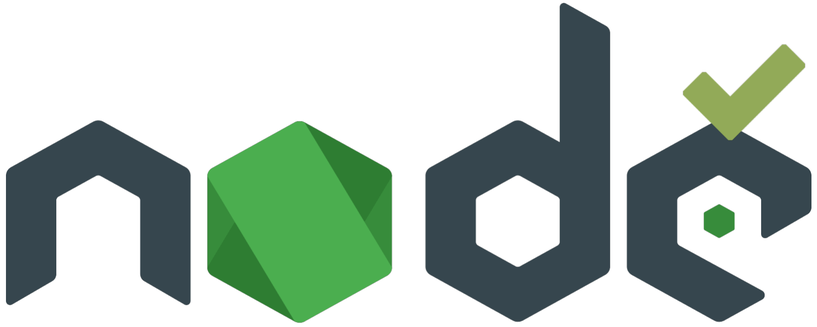
Something unrelated…

- Make a portfolio to show off your skills
  - Selling yourself is key
- Judge new devices and apps that come along
  - Is this solving a real problem?
  - Is this well designed?

What is interface implementation today?

Often HTML, CSS, and JavaScript





Assignments

- A1: Personal web portfolio
- A2: Programming on the web
- A3: Web frameworks
- A4: Mobile development
- A5: Alternative Interaction



Other skills

- Git and GitHub
- Package management in npm
- Visualization in Vega-Lite
- Gestural control

Congratulations!

- We said this class would be challenging
- You have risen to the challenge and worked hard (and still are)
- You have created impressive work as a result

It’s been an honor
to be able to teach you.
(No, seriously, I learned a lot!)

I look forward to seeing what you do next!