dt+UX: DESIGN THINKING FOR USER EXPERIENCE DESIGN + PROTOTYPING + EVALUATION

CS 147 Introduction & Course Overview

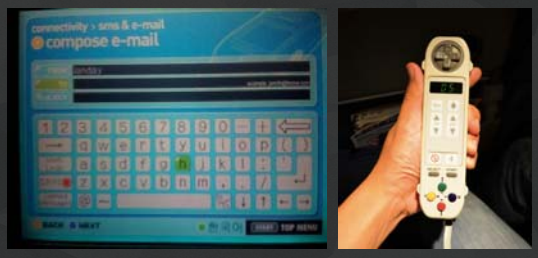
Design Thinking for User Experience Design, Prototyping & Evaluation

Prof. James A. Landay
Computer Science Department
Stanford University

Autumn 2016

September 27, 2016

Hall of Fame or Shame?



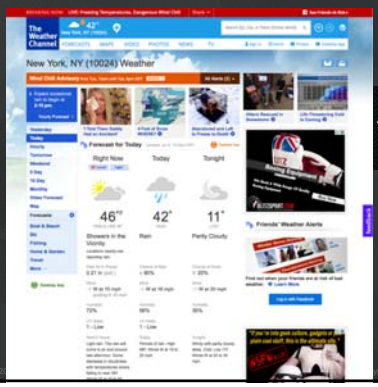
Asiana Airlines interface for sending email or SMS from plane

Hall of Shame!

Asiana Airlines interface for sending email or SMS from plane

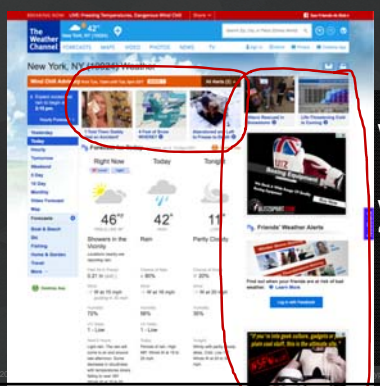
- Cool, but
  - text entry using this input device is tedious
  - crashes often
- Lost the strong brand value for me

Hall of Fame or Shame?



weather.com

Hall of Shame!



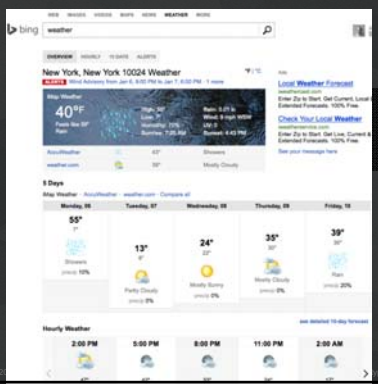
weather.com

what is the "first read"?

- videos
- advertisements

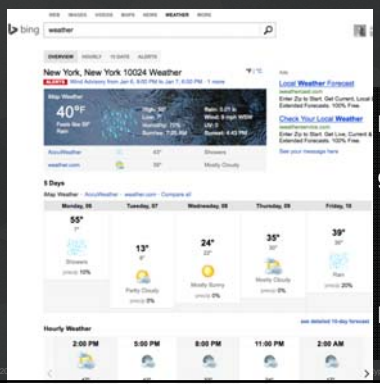
not weather!

Hall of Fame or Shame?



bing.com/weather

Hall of Fame!



bing.com/weather

good!
- less clutter
- eye drawn to current weather

bad!
- feels boring

Hall of Fame or Shame?

weather.yahoo.com

Hall of Fame!

weather.yahoo.com

good!
- aesthetic
- clean typography & icons

bad!
- image is 1st read

Hall of Fame!

iOS yahoo weather

good!
- aesthetic
- clean typography & icons
- image recedes to background w/ flick

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Who are We?

James Landay

- Professor in Computer Science at Stanford
  - formerly professor at Cornell Tech, University of Washington & Berkeley
  - spent 3 years as Director of Intel Labs Seattle
  - Dec 2011 finished 2.5 year sabbatical at Microsoft Research Asia
- PhD in CS from Carnegie Mellon '96
- HCI w/ focus on informal input (pens, speech, etc.), crowdwork, web design (tools, patterns, etc.) & Ubiquitous Computing
- Founded NetRaker, 1st in web experience management (sold to Keynote)
- Co-authored *The Design of Sites* with Doug van Duyne & Jason Hong
- Office Hours: Tue. 4-5 PM / Thur 10-11 AM in 390 Gates (starting next week)
  - we will also monitor CS147 Piazza site (signup @ piazza.com/stanford/fall2016/cs147)
- Email: landay@[insert usual Stanford email domain]

Sherman Leung (Head CA)

- CS Undergrad, CS/MS&E Masters
- Interested in the intersection of healthcare and technology. Involved with digital health
- I play jazz piano, ping pong, and basketball
- Office Hours
  - Tues 11-12pm @NVIDIA Lobby
  - Weds 4:30-5:30pm @Old Union
- **Thurs 5PM-6:50PM @Gates 392**

Health

Enable healthier lifestyles and outcomes

Digital and mobile health are some of the fastest growing industries of our day. As the gap between healthcare and technology is closing, patients and physicians alike are turning to technology-based products to enable more accessible and effective healthcare. From mobile apps that help patients manage their medications to tools that help resource-constrained clinics manage patient pipelines, this intersection of health and technology is ripe with opportunity!

Thurs 5PM-6:50PM

Emily Tang

- CS & Psychology Undergrad, CS Masters
- Interested in human behavior, educational equity, and diversity in STEM
- I like corgis
- Office Hours
  - Wednesday 2:15-3:15pm @Lathrop Tech Lounge
  - Thursday 4:30-5:30pm @NVIDIA Lobby
- **Friday 9:30AM-11:20AM @380-381T**
- **Friday 1:30PM-3:20PM @160-319**

Learning

Design next generation learning experiences

We are constantly learning by acquiring new skills, knowledge, and behaviors. In this studio, we will think about how technology can enable, supplement, or support learning. How can we use technology to support under-resourced demographics or accommodate different learning styles and needs? What kinds of challenges can we solve to help teachers focus on teaching? Feel free to look at and beyond your own learning environment for inspiration.

Friday 9:30AM-11:20AM, 1:30PM-3:20PM

Shubha Raghvendra

- HumBio Undergrad, CS Masters
- Interested in product management, diversity and inclusion in STEM, computational biology
- I like museums and ice cream
- Office Hours:
  - Monday 3:30-4:30pm @Huang Coupa
  - Thursday 12:30-1:30pm @Lathrop Tech Lounge
- **Fri 8:30-10:20AM @160-317**
- **Fri 10:30AM-12:20PM @200-124**

Slide 14

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1 why is there a photo of mango health here? should we post the TA photos instead?
Emily Tang, 9/27/2016

1 +1
Shubha Raghvendra, 9/27/2016

Digital Democracy
Technology-enabled democracy

Dialogue is the oxygen of democracy, and today, much of that dialogue dwells online. How might we leverage technological tools to broaden the reach of that dialogue to marginalized groups? To enrich the online conversation with fact-checking? To present complex information to our end-users -- voters -- in clear, meaningful ways? As the presidential election draws nearer, these questions are pressing and high-impact. Apart from the election cycle, we might also consider technology-enabled strategies to help citizens engage with local governments, or trawl the voting records of elected officials, for example.

Fri 8:30-10:20AM, 10:30AM-12:20PM

Kevin Zhai

- Art Studio Undergrad, CS Masters
- I like to make things
- Office Hours
  - Monday 4:30-5:30pm @Huang Coupa
  - Thursday 3:00-4:00pm @GSB Coupa
- **Fri 12:30-2:20pm, 2:30-4:20pm**

Inclusive Design
Products that benefit everyone

- Gaining insights from communities and individuals that might be overlooked by the general population
  - blind, deaf, dyslexic, etc
  - under-represented individuals e.g., women & people of color
- What can we learn when we design specifically for a single person instead of for the "average" person?
- Hopefully, we can improve not only their lives but the lives of everyone around them

- **Fri 12:30-2:20pm, 2:30-4:20pm**

Will Kim

- SymSys Undergrad, CS Masters
- Interested in knowledge management
- I like making pots

- Office Hours:
  - Monday 12:30-1:30pm @Lathrop Tech Lounge
  - Friday 12:30-1:30pm @Lathrop Tech Lounge
- **Fri 10:30-12:20AM &**
  Fri 1:30PM-3:20PM @100-101K

Food
Redesigning food, from the field to leftovers

- How can we improve the experience around food?
- Burgeoning ecosystem around "revolutionizing food"
  - source (Hampton Creek, Beyond Meat)
  - delivery (DoorDash, GoodEggs, etc.)
  - consumption (Soylent)
  - leftovers (Too Good To Go)
- In this studio, students will focus on learning from the producers to the consumers and everyone in between to cook up valuable ideas
- Ripe with opportunity!

- **Fri 10:30-12:20AM &**
  Fri 1:30PM-3:20PM @100-101K

Edwin Park

- CS Undergrad, CS Masters in AI & HCI
- Interested in designing better user experiences for artificial intelligence
- I like sports, especially speedskating
- Office Hours
  - Monday 2:30-3:30PM @Lathrop Tech Lounge
  - Wednesday 4:30-5:30pm @Lathrop Tech Lounge
- **Friday 9:30-11:20AM @ 320-107**
- **Friday 1:30-3:20PM @ 160-321**

Home

Making homes accessible from anywhere

The Internet of Things (IoT) is starting to integrate into our everyday lives, allowing us to control many physical devices, such as thermostats, refrigerators, and even sprinklers from our wrists or phones. How can you use technology to make homes more accessible? What are some daily tasks at home that could be automated and more efficient?

Friday 9:30AM-11:20AM, 1:30PM-3:20PM

Ash Ngu

- CS Undergrad + Art Studio Minor, CS Masters in HCI
- Interested in the intersection of art, media & technology
- I take photographs and cut hair
- Office Hours:
  - Tues 4:30-5:30p @ Huang Basement
  - Weds 3-4p @ Huang Basement
- **Friday 12:30p-2:20p & 2:30p-4p @ 160-321**

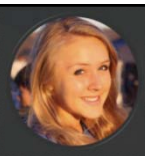
Art and Culture

Bringing creativity to our communities

Art and culture are integral to a vibrant, diverse, and cooperative community. Appreciation and engagement with art and culture spurs personal growth through self-expression and response, and brings people together over common values and shared experiences.

In this studio, we will build technology that enables people as creators, communicators, and empathetic citizens through engagement with arts and culture. We will seek opportunities where technology can complement our engagement with topics like literature, design, performance, music, journalism, visual arts, and with public spaces like community centers and organizations, libraries, museums, and historical sites.

Friday 12:30p-2:20p & 2:30p-4p @ 160-321



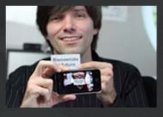
Kat Gregory

- CS Undergrad + CS Masters in AI/HCI
- Currently in a French Rural Village
- I run marathons and love travelling!
- Office Hours:
  - Tu/Th 12:30-1:30pm @Lathrop
- **Friday 8:30-10:20p @ 160-314**
  Friday 10:30am-12:20pm @ 160-325

[Micro]Adventure

Help people get out there and adventure

Life's about the journey, not the destination, yet too often the potential for adventure inherent in this journey is lost. The hunger to discover is easily forgotten in the clockwork tedium of commutes and errands that powers the hamster wheel of the every day. Even when actively pursued, the delight of exploring is often overwhelmed by a sea of stressful details regarding metro transfers and language barriers. How can we create opportunities for discovery and lower the barrier to exploration? The section seeks design solutions that rekindle playfulness, inspire wonder, and awaken wanderlust, both at home and abroad, to invite users to live more adventurously. "Get out there, take off your shoes, and Bilbo it up!"



Friday 8:30-10:20p @ 160-314
Friday 10:30am-12:20pm @ 160-325

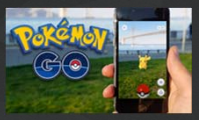
John Yang-Sammataro (YS)

- BS CS Systems + MS CS HCI
- Spent last year in Asia, a warzone, and an entourage
- I like doing right, building teams, and exploring paths less traveled
- Office Hours: (May change)
  - Weds 3:00pm-4:00pm @ Huang Basement
  - Thurs 12:30pm-1:30pm @ Lathrop Tech Lounge
- **Friday: 12:30pm-2:20pm @ 120-59**
  2:30pm-3:50pm @ 200-219

Mixed Reality
Merging Real and Digital Worlds

How can we leverage mixed reality - the merging of real and digital worlds through AR/VR to solve current needs? Pokemon Go took the world by storm this summer, but mixed reality spans far more than just games: Have you navigated with Waze recently? Did you know you can virtually try out your IKEA furniture? Mixed reality is even used to build houses. Have you used a Snapchat filter lately?

We will work at the bleeding edge of mixed reality in human computer interaction design. This will be an opportunity to use some of the latest software tools and hardware. It will also require focus and discipline to design and prototype solutions to real world problems and needs at a scope that can be accomplished within the quarter.



Friday: 12:30pm-2:20pm @ 120-59
2:30pm-3:50pm @ 200-219

B A L A N C E

DESIGN TECHNOLOGY

Human-Computer Interaction (HCI) Approach to UX Design

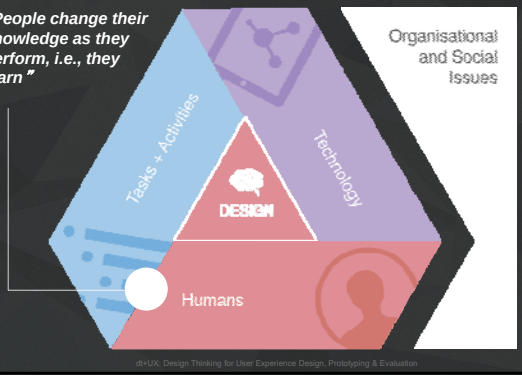
Human
- the end-user of a program
- *the others they work or communicate with*

Computer
- the machine the program runs on
- *split between clients & servers*

Interaction
- user tells the computer what they want
- computer communicates results

HCI Approach to UX Design

"People change their knowledge as they perform, i.e., they learn"



Why is HCI Important?

- Major part of work for "real" programs
  - approximately 50%
- Bad user interfaces cost
  - money
    - 5%↑ satisfaction → up to 85%↑profits
    - finding problems early makes them easier to fix
  - reputation of organization (e.g., brand loyalty)
  - lives (Therac-25)
- User interfaces hard to get right
  - people are unpredictable
  - intuition of designers often wrong

Who Creates UIs?

A team of specialists (ideally)

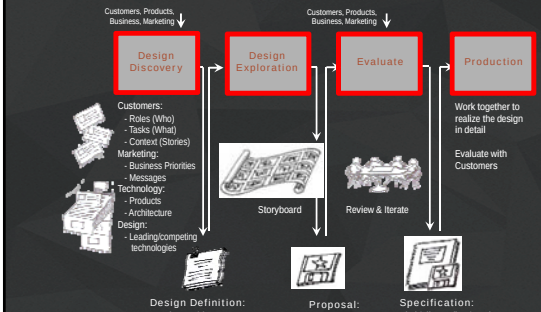
- graphic designers
- interaction / interface designers
- information architects
- technical writers
- marketers
- program managers
- test engineers
- usability engineers
- researchers (ethnographers, etc.)
- software engineers
- hardware engineers
- industrial designers
- customers

How to Design and Build Good UIs

- Iterative development process
- Usability goals
- User-centered design
- Design discovery
- Rapid prototyping
- Evaluation
- *Programming*

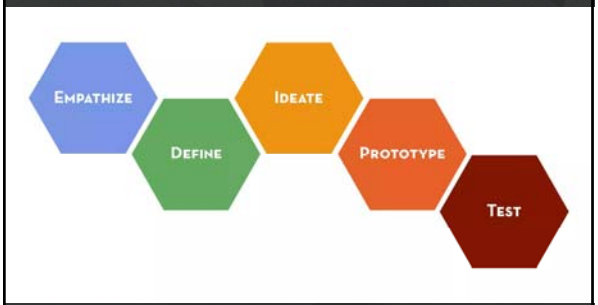
BREAK

User Interface Development Process



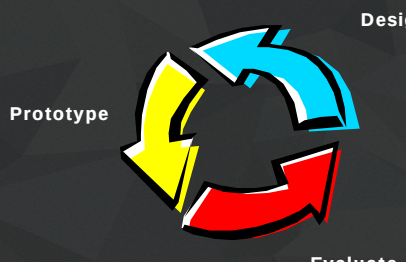
based on slide by Sara Redpath, IBM & Thyra Trauch, Tivoli

Design Thinking Process



Iteration

At every stage!



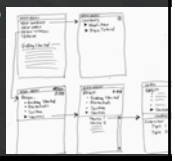
Design

Design is driven by requirements

- what the artifact is for
- not how it is to be implemented
- e.g., phone not as important as *mobile* app

A design represents the artifact

- for UIs these representations include (?)
  - screen sketches or storyboards
  - flow diagrams/outline showing task structure
  - executable prototypes
- representations *simplify*



Usability(?)

According to the ISO:
The *effectiveness*, *efficiency*, and *satisfaction* with which specified users achieve specified *goals* in particular environments

This doesn't mean you have to create a "dry" design

Usability/User Experience Goals

- Set goals early & later use to measure progress
- Goals often have tradeoffs, so prioritize
- Example goals(?)
  - Learnable
    - faster the 2nd time & so on
  - Memorable
    - from session to session
  - Flexible
    - multiple ways to do tasks
  - Efficient
    - perform tasks quickly
  - Robust
    - minimal error rates
    - good feedback so user can recover
  - Discoverable
    - learn new features over time
  - Pleasing
    - high user satisfaction
  - Fun

User-centered Design

"Know thy User"

- Cognitive abilities
  - perception
  - physical manipulation
  - memory
- Organizational / educational job abilities
- Keep users involved throughout
  - developers working with target customers
  - think of the world in users' terms

Design Discovery

Needfinding, Contextual Inquiry & Task Analysis

Observe existing practices for inspiration

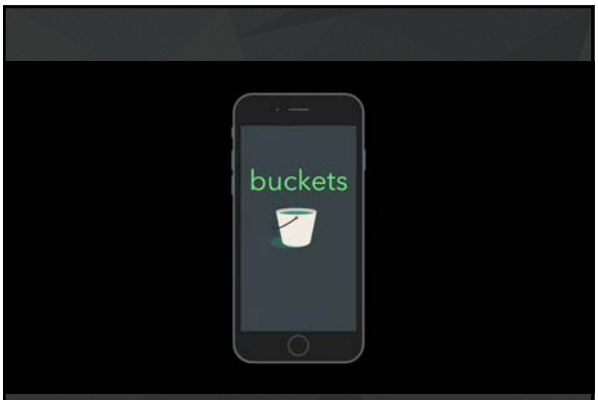
Make sure key questions answered

Tuned CI participant

Tuned field work in record store

Concept Videos

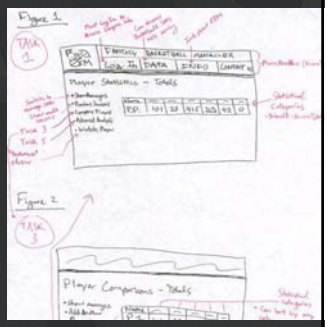
- Illustrate context of use rather than specific UI
- Quick to build
- Inexpensive
- Forces designers to consider details of how users will react to the design
- More important when context is not traditional work scenario



Rapid Prototyping

- Build a mock-up of design so you can test it
- Low fidelity techniques
  - paper sketches
  - cut, copy, paste
- Interactive prototyping tools
  - HTML, SketchFlow, Balsamiq, Axure, proto.io, Sketch+Marvel, etc.
- UI builders
  - Expression Blend + Visual Studio, Xcode Interface Builder, etc.

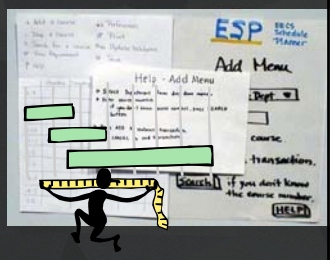
Fantasy Basketball



Evaluation

- Test with real customers (participants)
  - w/ interactive prototype
  - low-fi with paper "computer"
- Low-cost techniques
  - expert evaluation
  - walkthroughs
  - online testing

ESP



Goals of the Course

1) Learn to design, prototype, & ***evaluate*** UIs
   - the *needs & tasks* of prospective customers
   - *cognitive/perceptual* constraints that affect design
   - technology & techniques used *to prototype* UIs
   - techniques for *evaluating* a user interface design
   - importance of *iterative design* for usability
   - how to work together on a *team* project
   - *communicate* your results to a group
     key to your future success
2) Understand where technology is ***going*** & what UIs of ***the future*** might be like

Course Format

- Interactive lectures ➔ you speak!
- Each week
  - 2 lectures on techniques & background
    - reserved 20-30 minutes team meeting each lecture ➔ you need to be here to work with your team
  - 1 studio hands-on activity or team presentation
- Quarter-long project
- Readings
- Course material will be online
  - slides, exercises, readings, schedule
  - no lecture video (a few from 2014 you an watch if needed)
- Have fun & participate!

How dt+UX Fits into CS Curriculum

- Most courses for learning technology
  - compilers, operating systems, databases, etc.
- dt+UX concerned w/ *design & evaluation*
  - technology as a tool to evaluate via prototyping
  - skills will become very important upon graduation
    - complex systems, large teams
    - don't look for large immediate impact in other CS courses

Projects

- Each team will propose a UI-oriented project idea / team
  - fixing something you don't like or completely new idea
  - based on team needfinding
- Theme
  - each Friday studio has a theme
  - all projects mobile/wearable
- Groups
  - 3-4 students to a group
  - work with students w/ different skills/interests
  - groups meet in class & studio weekly
- Cumulative
  - apply several HCI methods to one interface

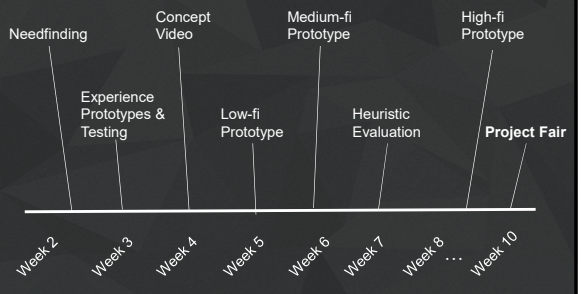
Project Process (10 weeks)

- Break into teams (Fri)
- Needfinding
  - In studio presentations & critiques
- Experience prototypes
  - In studio presentations & project selection
- Concept videos
  - In studio viewing & critiques
- Low fidelity prototyping & user tests
  - In studio presentations & critiques

Project Process (10 weeks)

- Medium-fi prototype (using tools)
  - In studio presentations & critiques
- Heuristic Evaluation of medium-fi prototype
  - In studio group merge exercise
- High-fi prototype (code on target platform)
  - Half-way in studio presentations & critiques
- Poster presentations & demos at project fair with industry guests
  - Friday 12/9 6-9 PM
  - your participation is required

Project Process Timeline

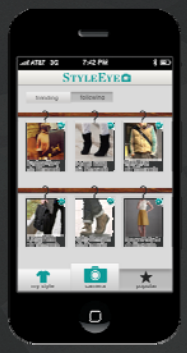


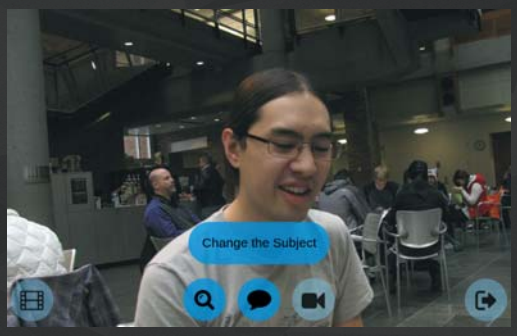
Swickr

GreenBean

CarbonShopper

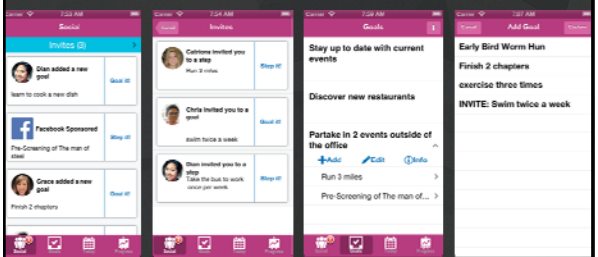
StyleEye



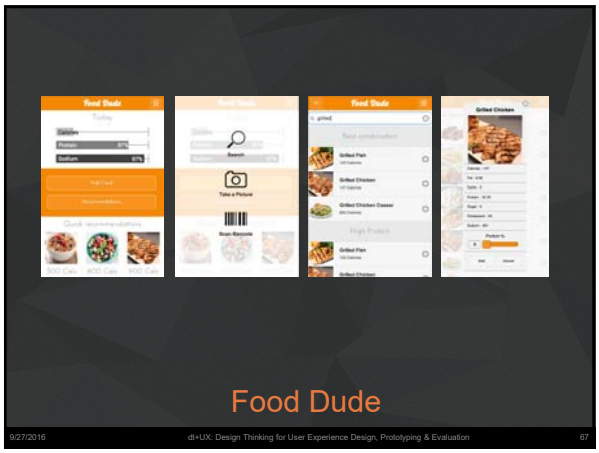


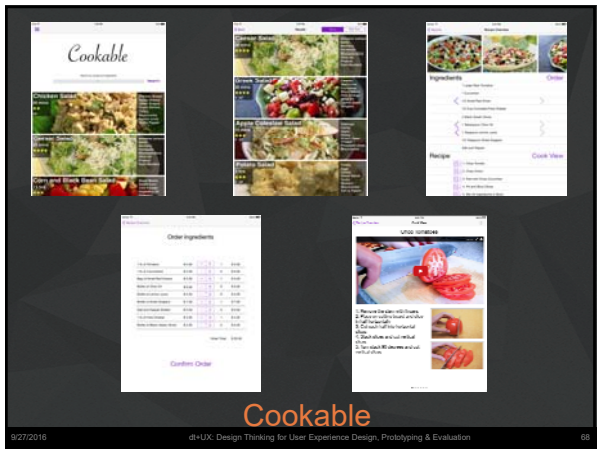
ProjectHarmony

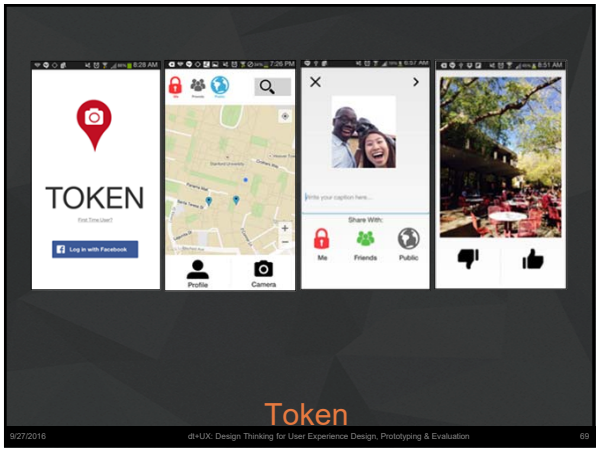
Musistantat

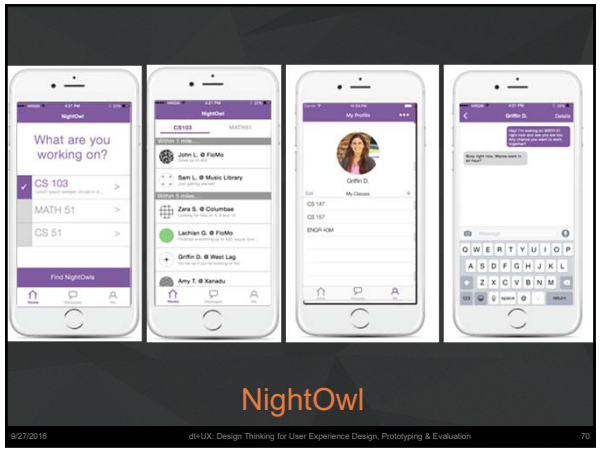


Balancer









Books

- *The Design of Sites* by van Duyne, Landay, & Hong
  - online copies of the 3-4 chapters we will use
- We will also hand out other papers, give you web links, & refer to lecture slides
- Recommended textbook
  - *Designing the User Interface: Strategies for Effective Human-Computer Interaction* by Shneiderman et. al, 6th edition (2016)

Assignments

- Individual
  - 1-2 presentations each
  - 1-2 written (handed in online)
  - ***class & studio participation (graded)***
- Group
  - 10 assignments
    - 5-6 presentations with 3 write-ups + video + poster
  - all group work handed in online
    - team web site & online submission site

Grading

- A combination of
  - individual assignments & presentation (10%)
  - class/studio participation (10%)
  - midterm (20%)
  - group project (60%)
    - presentations/poster (group component)
    - project write-ups
- No final
  - must present at project fair on Fri., 12/9 instead

Tidbits

- Late Policy
  - no lates on group assignments
  - individual assignments lose one letter grade/day
- Course web site
  - http://hci.stanford.edu/courses/cs147/2016/au/
- Studio preferences & team signups
  - https://goo.gl/RNKzJb
  - due Wed at 5 PM

Summary

- UX design is an important part of most of today's software
- Getting the interface right is hard, but…
- Solution in *Iterative Design* including repeated cycles of
  - Design
  - Prototyping
  - Evaluation

Next Time

- Design Discovery
- Read
  - Tom Kelley, The Perfect Brainstorm, Excerpt from The Art of Innovation (pw: hcid)
  - Holtzblatt & Beyer, Ch. 3 from Contextual Design