CMPT 363: User Interface Design
Summer 2021

Week 2: Introduction to HCI/UX

Instructor: Victor Cheung, PhD

School of Computing Science, Simon Fraser University

Let's Begin with a Video

https://www.youtube.com/watch?v=otiMil1kt1Y

Poor Interface Designs Lead to User Frustration

- Hard to learn
- Hard to understand
- Hard to remember
- Error prone

= unhappy user ☹

Another Example –
The Kegworth Air Disaster 1989

- The pilots shut down the wrong engine, 47 died and 74 sustained serious injuries

  - The LED pointers in Engine Instrument System were criticized for being

    - "too small" and "lacking in visual impact"

  - Pilots did not remember seeing indications of high vibration on the display

Poor Interface Designs Can Have Dire Consequences

Different interfaces for vibration gauges: Left typical 737-400, Right the 737-400 variant

Source: http://www.aaib.gov.uk/cms_resources.cfm?file=/4-1990%20G-OBME%20Append.pdf

How Can We Make Technologies Better?

- Usable
  - Easy to learn, operate, and remember
- Useful
  - Gets the job done, effectively and efficiently
- Meaningful
 - Adds value, engaging, and empowering

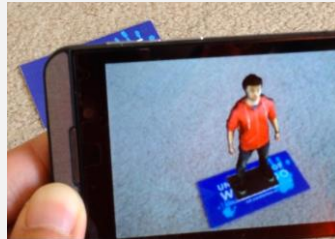**Human-Computer Interaction (HCI)**
&
User Experience (UX)

Lecture Overview

- Logistics

- Objectives

- Expectations

- What is HCI & UX?

- Evaluating Interfaces with Users

About Your Course Instructor

- Victor Cheung

  - PhD in System Design Engineering, University of Waterloo

  - Research in interaction & interface design, tangible systems, emerging technologies

  - v_cheung@sfu.ca
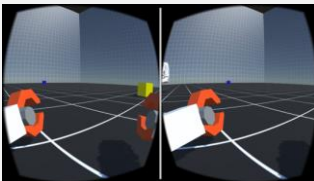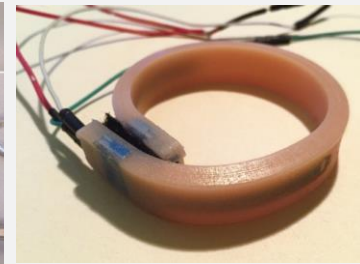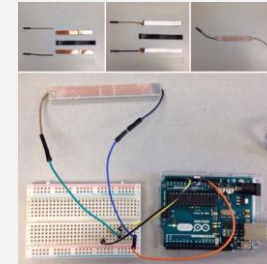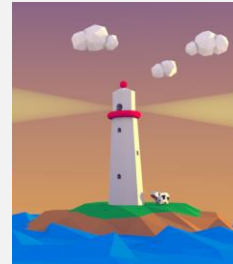
Logistics – Course Info

- Lectures: Tuesdays 5:30p – 8:20p
  - SFU Canvas (https://canvas.sfu.ca/courses/63144)
- Office Hours: TBA (details in the Teaching Team page)
- Teaching Personnel (details in the Teaching Team page)
  - Instructor: Victor Cheung, PhD | Email: v_cheung@sfu.ca
  - Teaching Assistants:
    - Gayatri Ganapathy | Email: gganapat@sfu.ca
    - Xinyi Zhong | Email: xza248@sfu.ca
  - Help email that reaches the whole teaching team: cmpt-363-help@sfu.ca

When sending your email:
- Use your SFU email
- In the subject line begin with "CMPT 363 D100:" and then topic of your message. For example, CMPT 363 D100: Missed Quiz 1
- In the body of your message, include your name, SFU ID, 9-digit student number and section number

Logistics – Readings

- Mostly from one textbook, and a collection of online readings

- Preece, J., Rogers, Y., Sharp, H., & EBSCOhost. (2019). Interaction design : Beyond human-computer interaction / Helen Sharp, Yvonne Rogers, Jennifer Preece. (Fifth ed.). Wiley.
  Online access (requires SFU login): https://sfu-primo.hosted.exlibrisgroup.com/permalink/f/15tu09f/01SFUL_ALMA5132340202000361l

- Recommended readings

  - Martin, B., & Hanington, B. (2012). Universal methods of design : 100 ways to research complex problems, develop innovative ideas, and design effective solutions / Bella Martin, Bruce Hanington. (Digital ed.). Beverly, Mass.: Rockport.
    Online access (requires SFU login): https://sfu-primo.hosted.exlibrisgroup.com/permalink/f/usv8m3/01SFUL_ALMA2117407141000361l

  - Norman, D. (2013). The design of everyday things / Don Norman. (Revised and expanded ed.). Basic Books.

Logistics – Course Materials

- All materials (or links to them) are on Canvas (https://canvas.sfu.ca/courses/63144)
  - We might use CourSys (https://coursys.sfu.ca), if so we'll let you know
- Use the Discussion forums to ask questions or give suggestions
  - We will be monitoring them to give you answers in a timely manner
  - We might remove your post if it has solutions or anything that might lead to plagiarism or cheating
- Software tools
  - Productivity tools – MS Office or equivalent (you'll have to submit documents in PDFs), screen capture and video editor
  - Collaboration tools – any kind video conferencing software that can share your screen
  - Prototyping tools – Balsamiq, Adobe XD

Logistics – Assignments/Exams

- Tentative:
  - Assignment 1 (15%): The Good, The Bad, and The Interesting UI + Heuristic Evaluation | due June 4
  - Assignment 2 (15%): Potential Final Exam Questions | due July 23
  - Group Project (max. 5 students) (10%, 15%, 25%) | due June 18, July 16, August 6
  - Final Exam/Essay (20%) | on TBA
- Assignment late penalty: 10% per calendar day (each 0 to 24 hour period past due), max 2 days late.
- The instructor will do his best to accommodate within reason, but will have the final say.
- More details as the due dates approach

Logistics – General Etiquette

- Be on time (check your camera & mic when you join the remote classroom)
- Use the chat panel if you have a question during class
  - Instructor might not be able to address it immediate during class
- Treat all messaging platforms (e.g., remote classroom chats, discussion forums) professionally
- Email using your SFU account, put "CMPT 363" in the title
  - Include your full name and student ID in your signature
  - Full sentences and no textisms like "b4", "w8", "that's gr8", "thx 4 BN aQr8"
    - Fun read: An Analysis of Language in University Students' Text Messages by Lyddy et al. 2013 https://doi.org/10.1111/jcc4.12045

Something about You

- Poll
  - Done any UI designs?

- Do the "Tell Us about You" survey by the end of week
  - https://canvas.sfu.ca/courses/60307/quizzes/154610

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Should You Take This Course?

SHOULD

- If you want to learn about the exciting and emerging areas of HCI, UX, interaction design
- If you enjoy challenging problem solving, working with people and teams
- If you believe that there is something more than just efficiency and functionality in computers

SHOULD NOT

- If you do not like working in teams
- If you do not like reading cases and writing reports
- If you do not enjoy subjective reasoning where there isn't a clear right or wrong answer
- You are looking for an easy A

Who Will Do Well in This Course?

- Attend classes and pay attention

- Participate in discussions

- Make progress on assignments regularly

- Get advice from the instructor/TAs when needed

- Follow instructions carefully on assignments

- Regularly review readings / course notes

- Think outside the box and ask questions

- Good team player and contribute

- For grading policies refer to the Course Policies page on Canvas

Academic Integrity

- No plagiarism
  - All referenced work in reports and presentations must be appropriately cited, including websites, images, figures, and graphs
  - Never directly copy & paste and treat it as yours
  - In most cases you will also have to add you own interpretation or descriptions, or paraphrase
- No cheating
  - All assignments/exams must be your own work (team's work if it is a team project)
  - It is ok to discuss with others, but you have to write your own work. Mention whom you have talked to if necessary
- All incidents will be reported according to SFU policy
  - http://www.sfu.ca/policies/gazette/student/s10-01.html

You Are An Adult Now

- You are not a child anymore and you are responsible to your own decisions & actions
  - Manage your time
    - Plan ahead for deadlines, get enough rests, do stuff that you enjoy
  - Be proactive
    - Look up information beyond what's in the slides, ask questions when in doubt
    - We might not answer your questions if we have already provided answers to them
  - Do honest work
    - All the academic integrity information are available and you can't claim you don't know about them

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Objectives

- Explain and justify the benefits and drawbacks of user-centred design

- Describe guidelines and models that can be applied to interface design

- Apply a variety of methods to involve the people who use an application in the design process

- Evaluate the usability of an interface

Expectations

- Maintain professional attitude
  - questions in class, email, discussions
- Attend all lectures
  - if missed, get notes from classmates (or watch recordings, if available)
- Participate in discussions and activities
  - don't be afraid to share or make mistakes

Questions?

Let's also take a 10min break here

Let's Get Started!

Welcome to <u>User Interface</u> <u>Design</u>

What Is "User Interface"?

- Everything the user encounters

  - Functionality & usefulness, content, labels, presentation, layout, navigation, speed of response, emotional impact, documentation & help

- You, as the designer, are NOT the user

  - Don't use what you value to determine how to design a user interface

  - Make the effort to know the user

Why Do We Need to "Design" an User Interface?

- Having a good user interface is not trivial

- It takes time and effort to get the design right (or the right design)

  - Useful read: Getting the right design and the design right
    https://uxdesign.cc/getting-the-right-design-and-the-design-right-fd7ab2d2e508
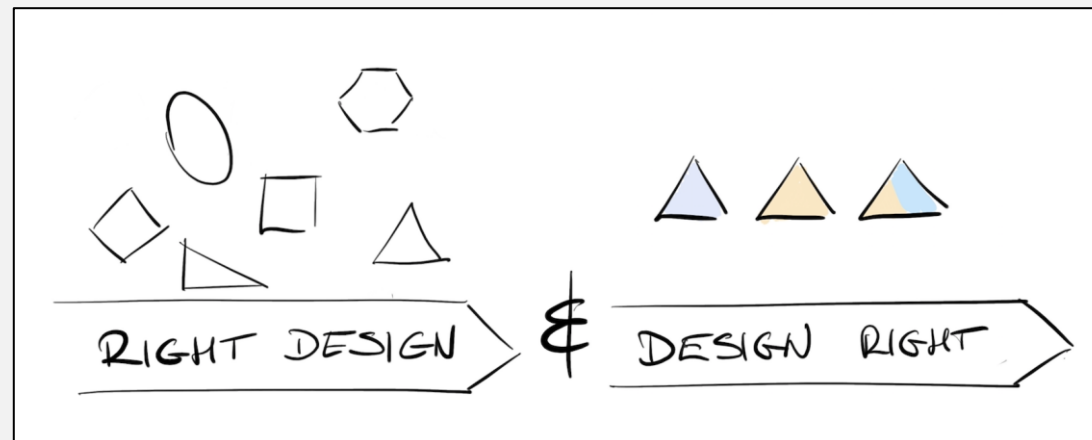
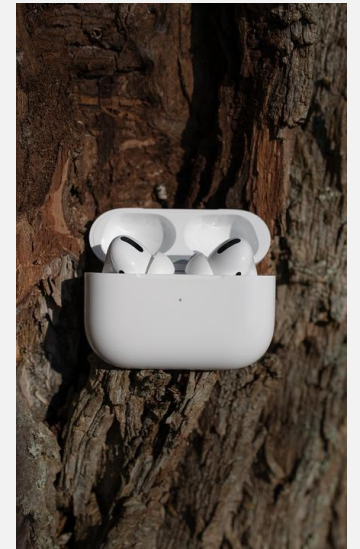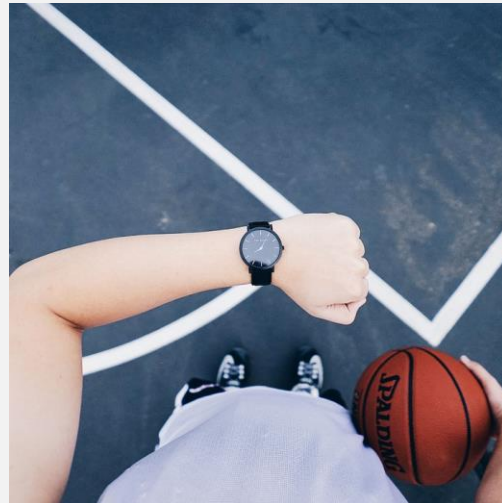# It Is Not Just about Traditional Computers

How many "user interfaces" can you find in this image?
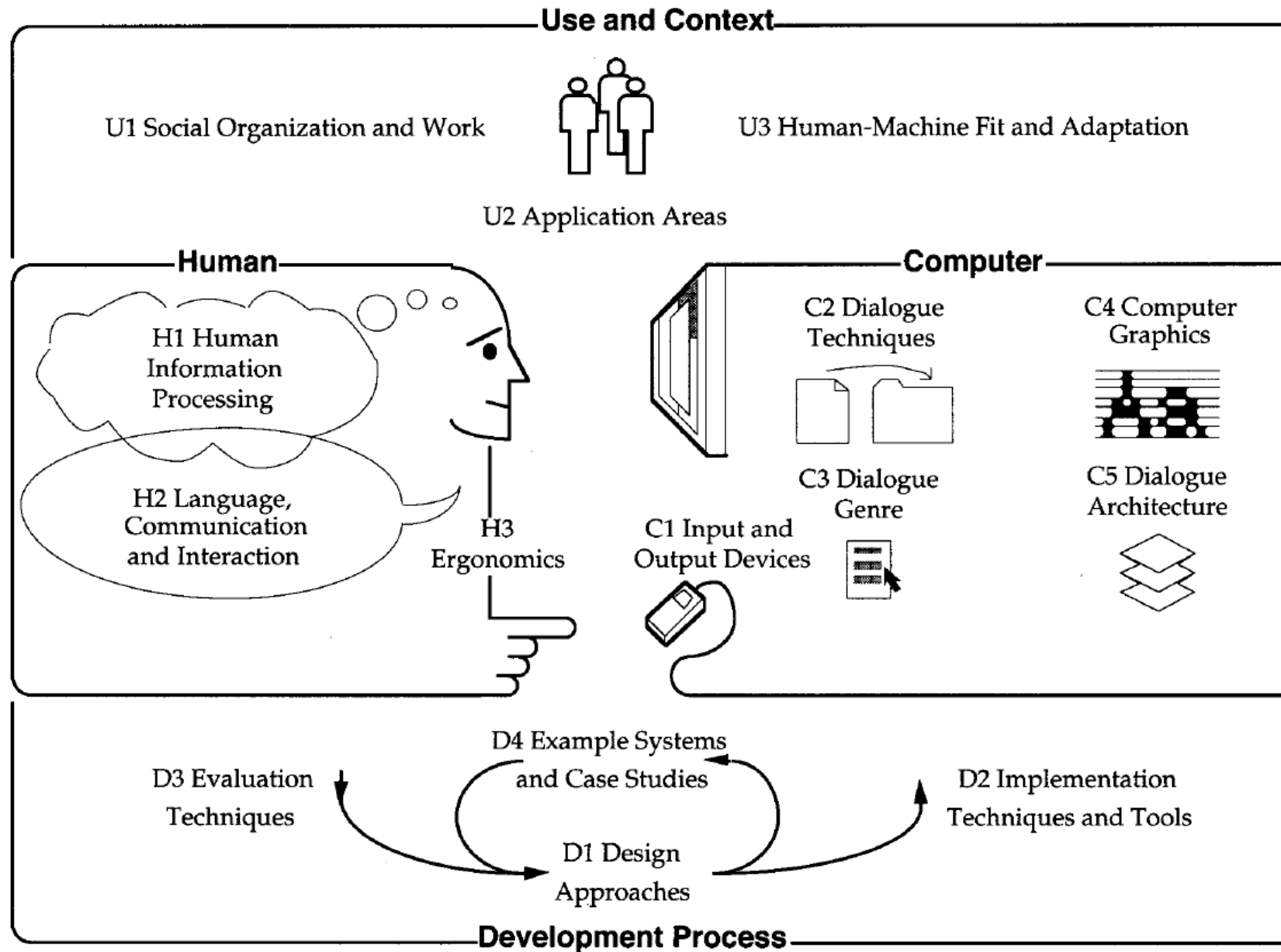
It Is Not Just about The Traditional Computers

How many "user interfaces" can you find in this image?

Computer User Interfaces Are Everywhere

What is HCI & UX?

- Human-Computer Interaction (HCI) is defined as (Hewett et al. 1992, p.5)
  - a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them

- User Experience (UX) is defined as (Norman & Nielsen)
  - a topic that encompasses all aspects of the end-user's interaction with the company, its services, and its products

- User Interface (UI) is only one element of HCI as well as UX!

Thomas T. Hewett, Ronald Baecker, Stuart Card, Tom Carey, Jean Gasen, Marilyn Mantei, Gary Perlman, Gary Strong, and William Verplank. 1992. ACM SIGCHI Curricula for Human-Computer Interaction. Technical Report. Association for Computing Machinery, New York, NY, USA.

Thomas T. Hewett, Ronald Baecker, Stuart Card, Tom Carey, Jean Gasen, Marilyn Mantei, Gary Perlman, Gary Strong, and William Verplank. 1992.
ACM SIGCHI Curricula for Human-Computer Interaction. Technical Report. Association for Computing Machinery, New York, NY, USA.

Computer Performance VS Human Performance

- Human performance is more or less constant
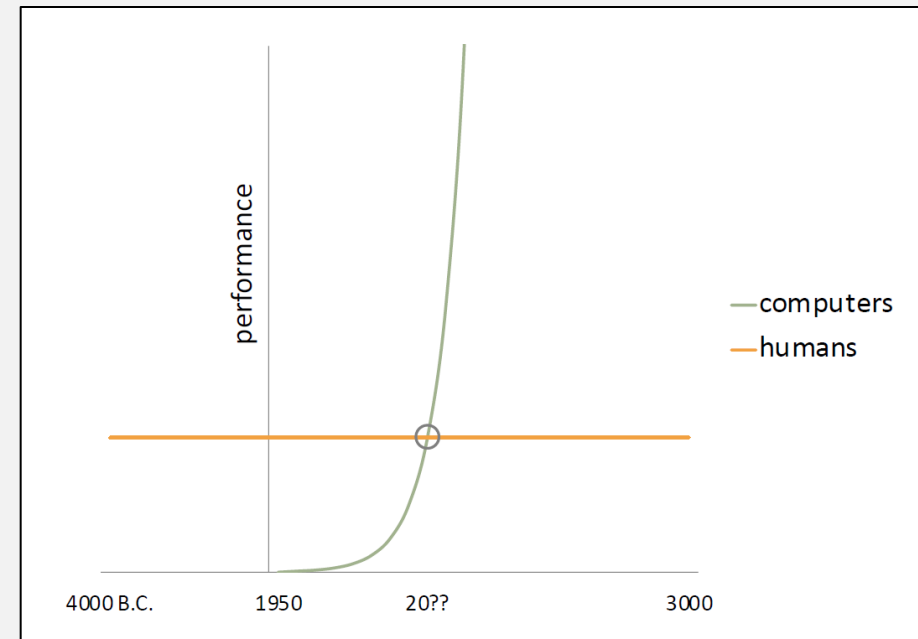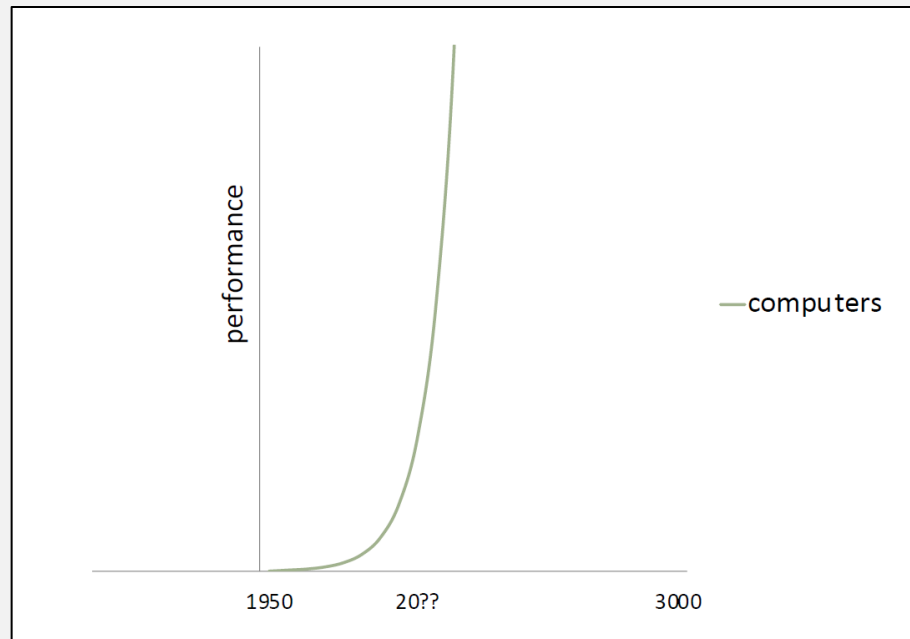

Slide idea by Bill Buxton

What About UX?

- Historically, HCI was concerned primarily with usability, focusing on utility (getting the job done)

- UX covers a wider range of emotions and felt experiences

  - Also covers more than just computers

  - Watch Steve Jobs talked about customer experience https://www.youtube.com/watch?v=r2O5qKZII50

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Source: ID-Book Ch 1
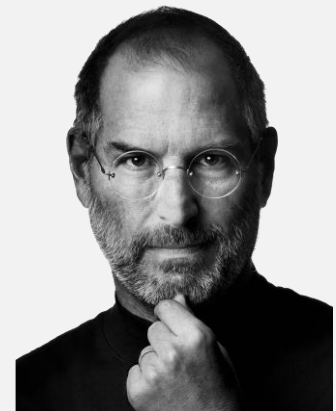
A User-Centered Design (UCD) Approach

- A systematic way of understanding and designing for end users

- An iterative process

- End users are involved in every step

- More on this approach later
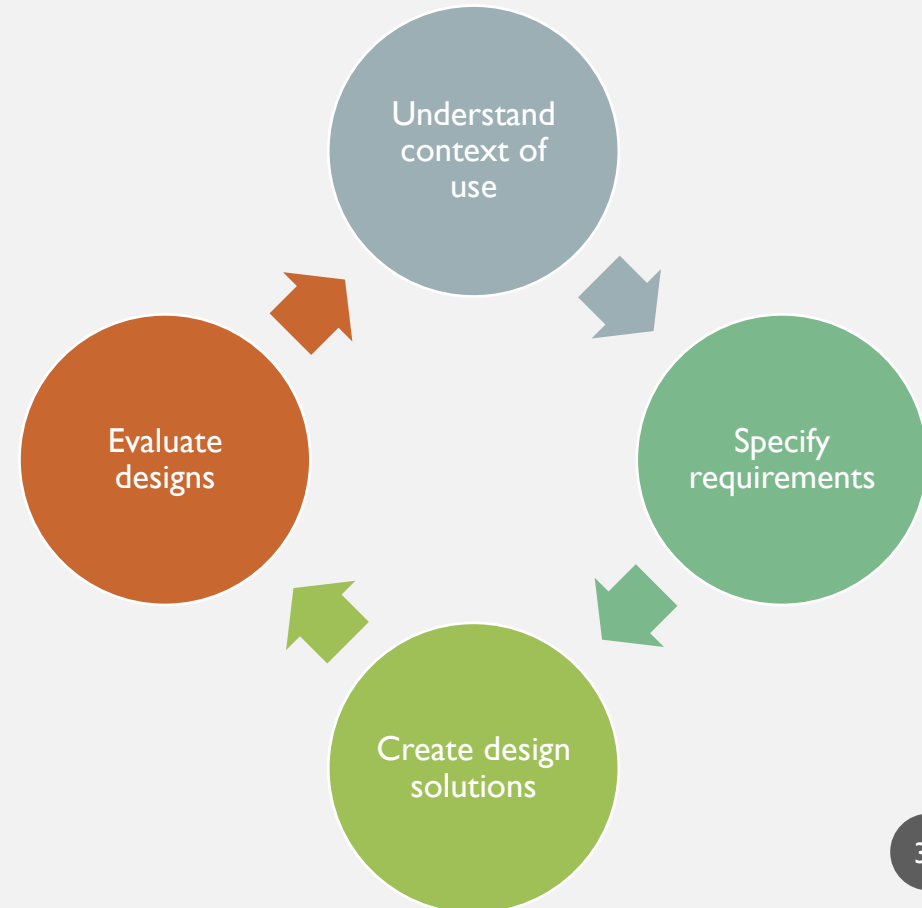
Why Are User Interfaces Important?

- Help people to do things faster and more accurate
  - There are well-defined methods and techniques to make interfaces like that
- Many people don't read user manual and just use the system
  - Fun read: Novick & Ward. 2006. Why don't people read the manual? https://scholarworks.utep.edu/cs_papers/15/
- Usability of the interface is critical to sales
  - People want "user friendly" products
  - "accessible", "comprehensive", …etc
    - Fun watch: Jony Ive's adjectives https://www.youtube.com/watch?v=fHphFfv14wc

Consider This Elevator Control Design

What's wrong? Hint: where will you press?

Bad Designs Confuse People

- Elevator controls and labels on the bottom row all look the same
  - so it is easy to push a label by mistake instead of a control button

- How would you redesign the interface to make it clear?

Source: http://www.id-book.com

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Funny Bits: Myth about USB

- In general it takes **3** trials to correctly plug a USB to a socket

- How would you redesign the interface to make it clear?

Source: https://www.starecat.com
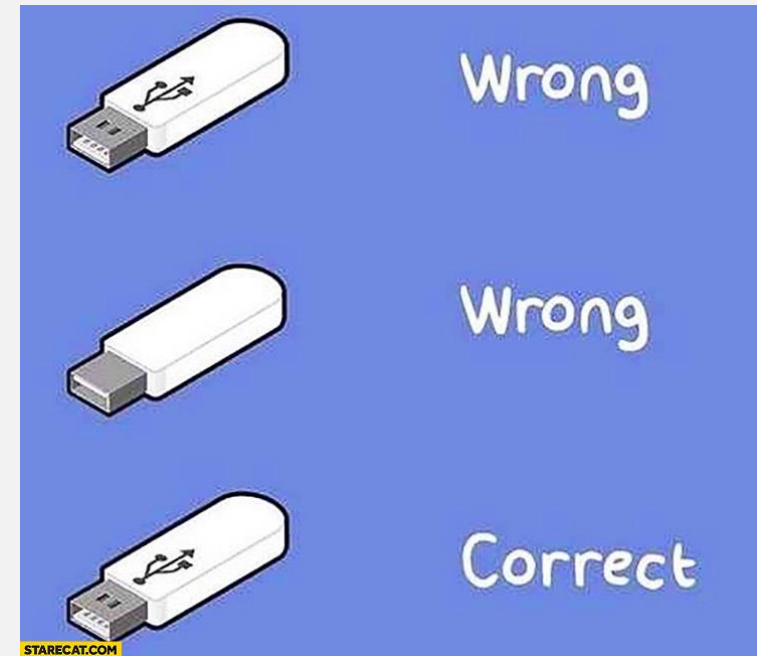
Many Examples (Both Good & Bad) in The World

http://www.usabilitymatters.org

To Park or Not to Park? by Nikki Sylianteng

How Should We Design?

- Take these into consideration:
  - Who is using the design
    - Different people have different needs and capabilities
  - What activities are being carried out (or what does the user want to accomplish)
    - Criteria vary depending on the activities (e.g., policy, requirements)
  - Where & How the interaction is taking place
    - Constraints exist (e.g., need to make little noise, distractions)

Good Designs Address All Three

- They optimize the interactions to match with user's activities and needs, at the right place at the right time

- Examples:
  - Smartphones for seniors
  - Gas machine interfaces in Canada
  - Electronic recipes in kitchens

Practical Steps to Take Who, What, What & How into Consideration

1 Consider what people (users) are good and bad at

2 Consider what might help them with the way they currently do things

3 Think through what might provide quality user experiences

4 Listen to what they want and get them involved in the design

5 Use user-centered design techniques during the design process

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Based on Sharp, Rogers & Preece (2019), Ch. 1.2

5min Break

- Think about one example of a hard design problem that you encountered (e.g., building hardware/software)

  - Talk about what made the problem hard

  - And whether you found a solution

How about Interaction Design?

- Covers more than just the user interface

Designing interactive products to support the way people communicate and interact in their everyday and working lives – Sharp, Rogers & Preece

Designing spaces for human communication and interaction – Terry Winograd

The why as well as the how of our daily interactions using computers – John Thackara

The art of facilitating interactions between humans through products and services – Dan Saffer

HCI, UX (Design), & Interaction Design
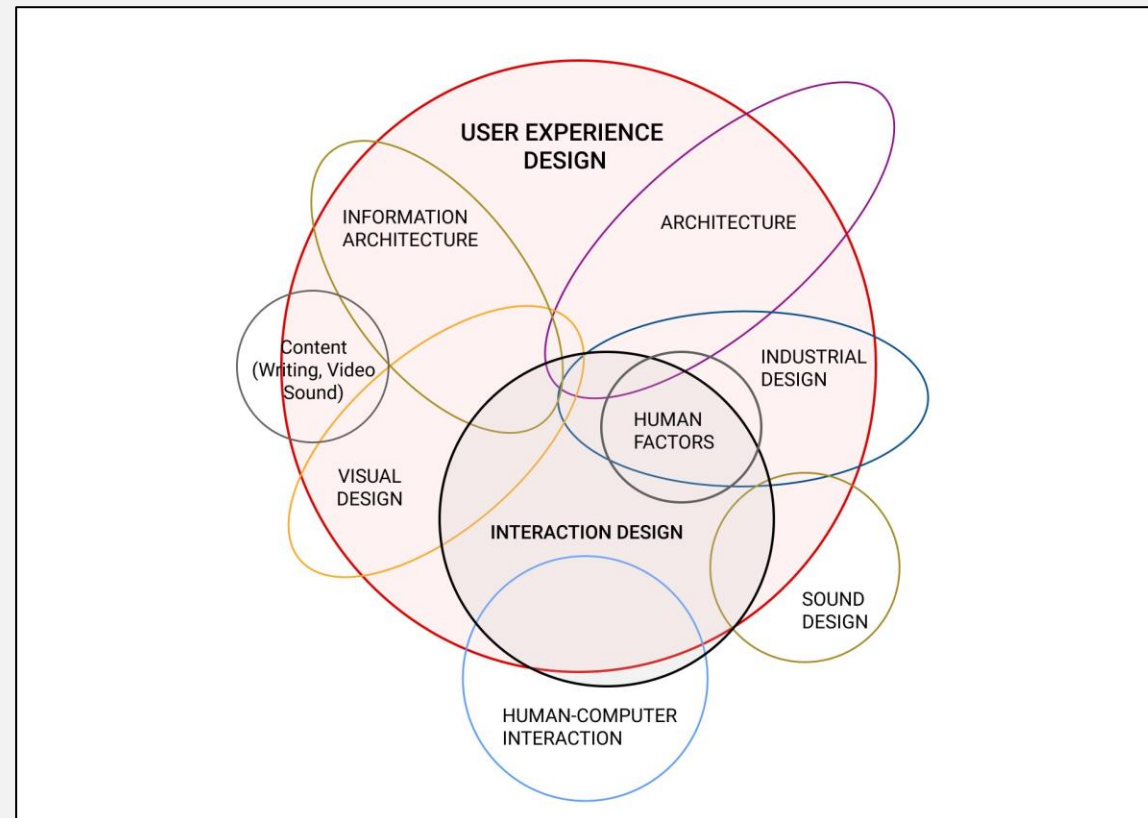
UX Design on Venn Diagram. Image by Dan Saffer.

Source: https://uxplanet.org/the-brief-understanding-of-ux-design-4b4078488dfa

Usability

- An important term/metric often used between interaction designers

The characteristic of being easy to use, usually applied to software, but relevant to almost any human artifact – http://www.usabilityfirst.com

The ease with which people can employ a particular tool or other human-made object in order to achieve a particular goal – http://en.wikipedia.org

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Usability Goals

- Learnability
  - How easy is it for users to accomplish basic tasks the first time they encounter the design?
- Efficiency
  - Once users have learned the design, how quickly can they perform tasks?
- Memorability
  - When users return to the design after a period of not using it, how easily can they reestablish proficiency?
- Errors
  - How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
- Satisfaction
  - How pleasant is it to use the design?

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Source: https://www.nngroup.com/articles/usability-101-introduction-to-usability/

Design Principles

- Used by interaction designers to aid their thinking when designing for user experience

- Generalizable abstractions that applies to different aspects of the design

- Derived from a mix of theory-based knowledge, experience, and common-sense

- Most common ones are:

 - Visibility, feedback, constraints, consistency, and affordance

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Source: http://www.id-book.com

Design Principle – Visibility

- Make relevant parts, their meaning, and what needs to be done obvious
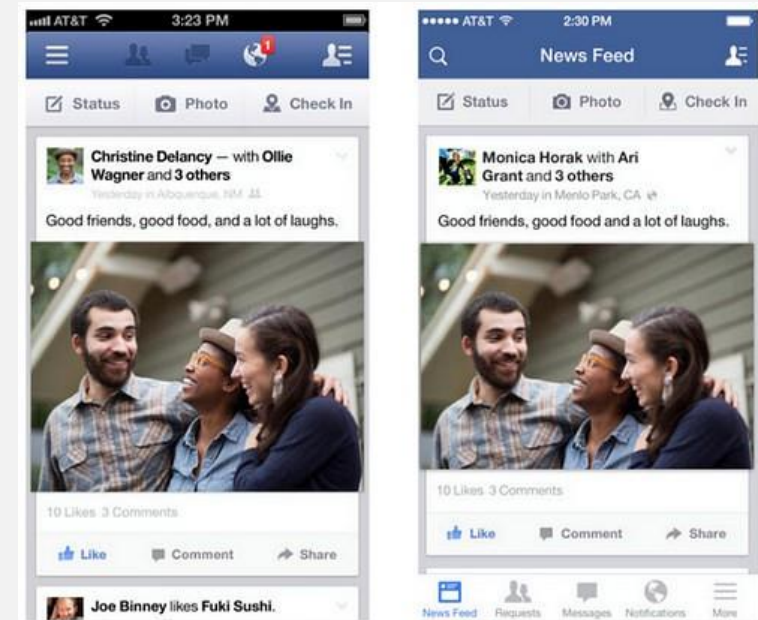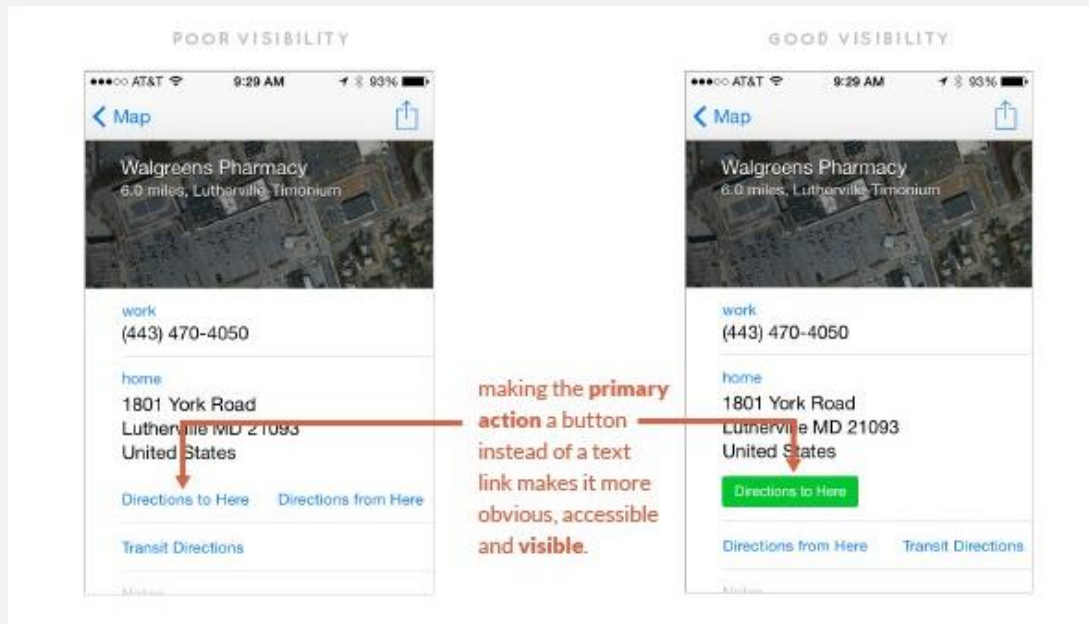
Design Principle – Feedback

- Tell user their action caused something in a timely manner and what has been done
  - Can be provided in many ways, e.g., sound, highlight, animation, …etc., or any combination of them
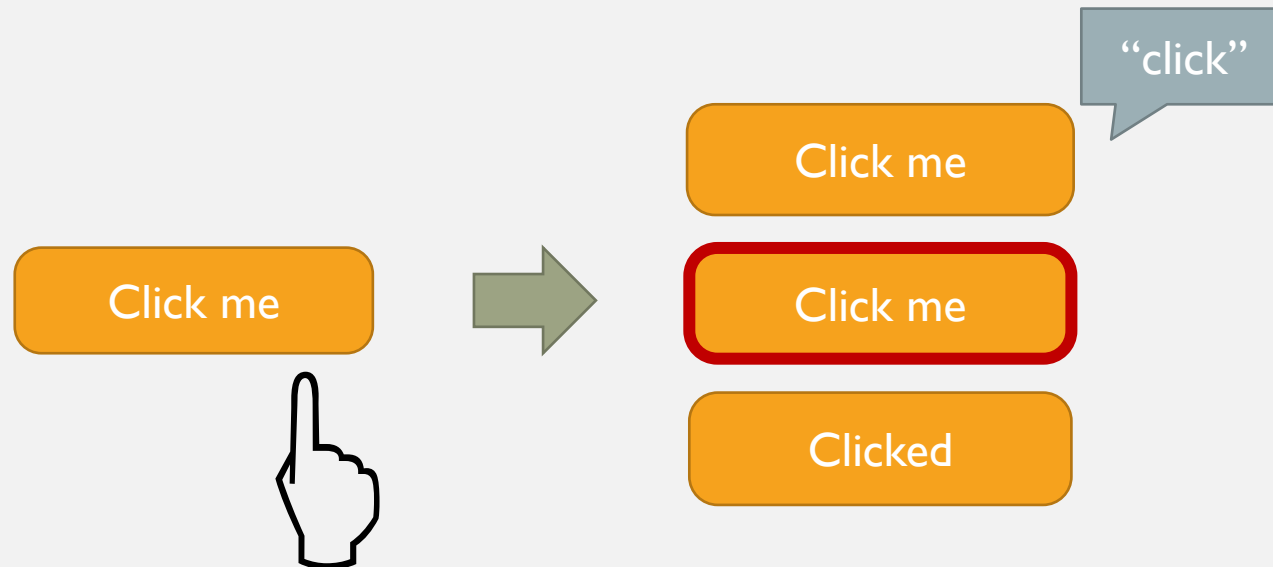
Design Principle – Constraints

- Restrict possible actions that can be performed
  - Can be provided visibly or physically

Source: http://www.baddesigns.com
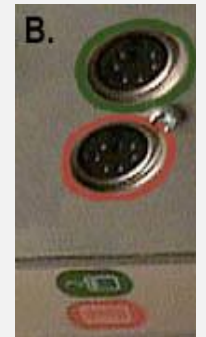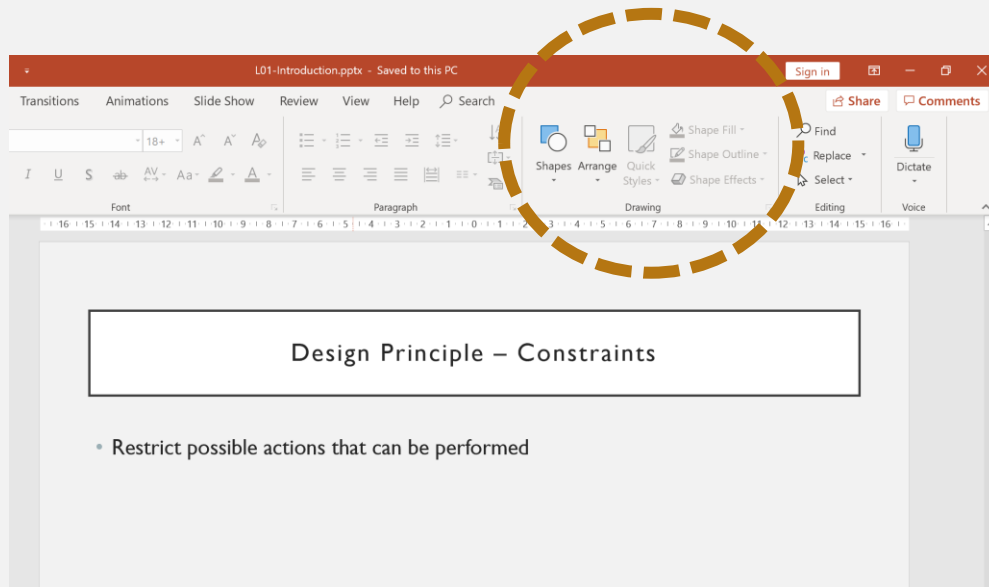
Design Principle – Consistency

- Design interfaces to have similar operations and use similar elements for similar tasks, for example:
  - Use "ctrl" plus first initial of the command (e.g., ctrl+C, ctrl+S, ctrl+O)
  - Layouts and colour schemes are similar across devices

- Internal & external consistency about operations & interfaces
  - Behave the same within an application (gets harder when becoming more complex)
  - Behave the same across applications (gets harder when becoming more varied)
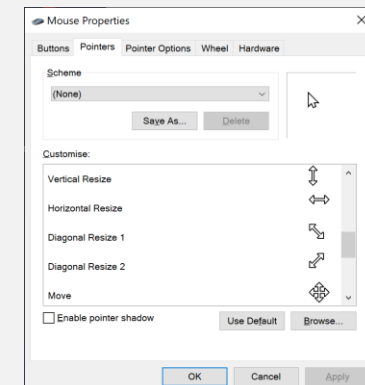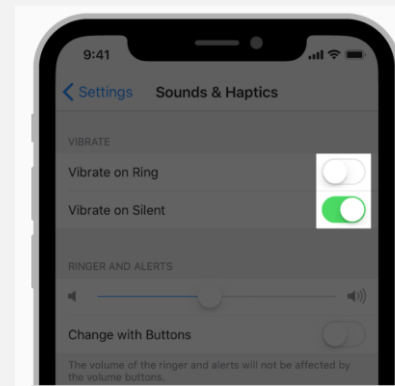
Design Principle – Affordance

- Display attributes that allow people know how it is used, for example:
  - Handles for holding
  - Doors for pushing/pulling
  - Buttons for pressing

Real VS Perceived Affordance

- Computer interfaces are typically virtual and do not have affordances like physical objects

    - Norman argues it does not make sense to talk about interfaces in terms of real affordances (https://jnd.org/affordance_conventions_and_design_part_2/)

- Affordance for interfaces is instead better conceptualized as perceived affordances

    - learned conventions of arbitrary mappings between action and effect at the interface

    - some mappings are better than others

Image source: left- https://developer.apple.com/design/human-interface-guidelines/

Summary

- User Interface Design
  - What are user interfaces
  - Why do we need to design them and its more than just the interface
- HCI & UX
- Importance of good user interfaces
- How do we design good user interfaces
  - Usability
  - Design principles
- Affordances for computer interfaces

What Is Happening with The Upcoming Lectures

- 3 hours of lectures are too long ☹ !

  - But we do have 3 hours worth of materials each week

- We will do the following:

  - ~ 2 hours of materials + rest of the time Q&A/office hour (optional, you can also choose to leave)

  - ~ 1 hour of materials will be recorded (typically on the same day)

- …and will constantly review to see if it works

  - feel free to suggest other ways to make the classes more engaged and enjoyable!

Post-Lecture Activity

- Read these
  - Chapter 1 of ID-Book: What is Interaction Design?
  - Usability 101: Introduction to Usability
    https://www.nngroup.com/articles/usability-101-introduction-to-usability/
  - An Introduction to Usability Design
    https://blog.marvelapp.com/introduction-user-experience-design/

- Think about what makes a design bad? And what makes a design good?
  - What words (qualities) would you use to measure how good/bad a design is?
- For each of the 5 design principles, find 1 example from real objects, then find 1 example from computer interfaces (different from those given in the class)