

Introduction to UX & UI

Embedded Interface Design

with **Bruce Montgomery**



Learning Objectives

Students will be able to...

- Recognize base UX/UI definitions
- Understand the history and professional support behind modern UX practice
- Learn the key aspects of usability



Warning to Engineers

- Usability/UX design isn't a hard science like Chemistry or Electronics, it is a soft collection of methods and principles...
 - There is no single right answer
 - Often answers are fuzzy and qualitative (although quantitative methods exist)
- However, there are best practices and established processes to help you succeed in making usable and useful products for your users



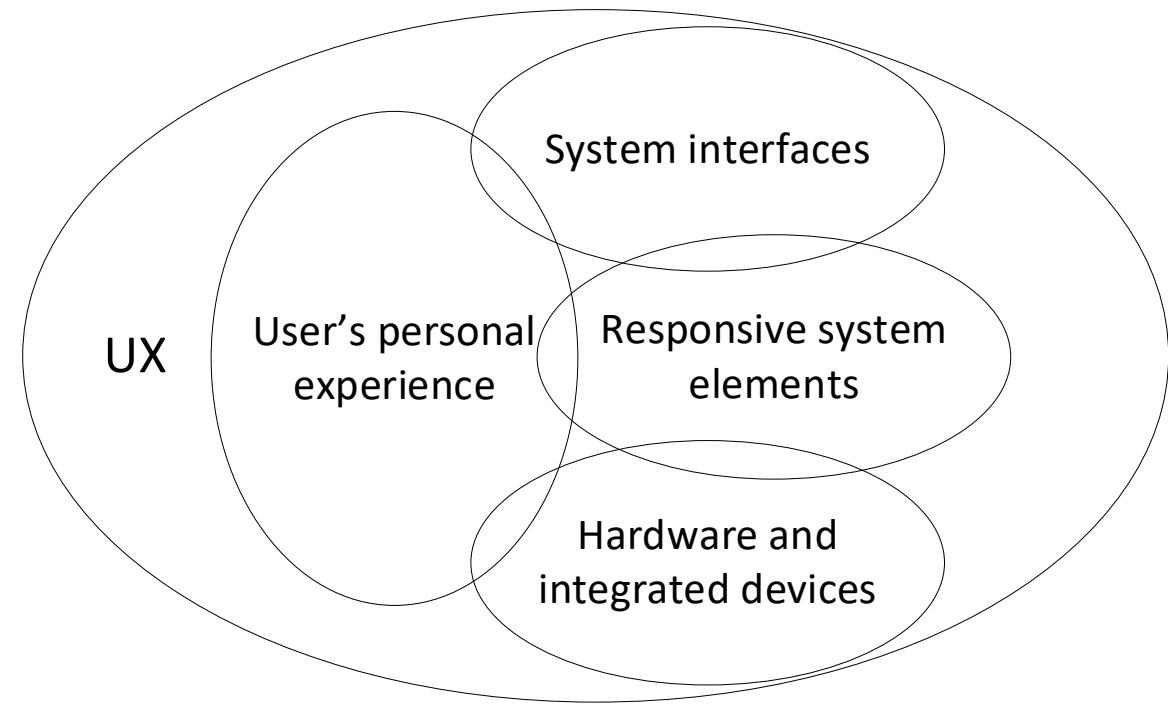
Selecting methods and iterating

- Should you find yourself in a UX/UI design cycle, you will need to determine which of the methods you'll learn are best suited to your design
- As you'll see, the key is to iterate with actual users
 - Assess the design, change the design, repeat
 - Give yourself every chance to find key UX issues and make them better



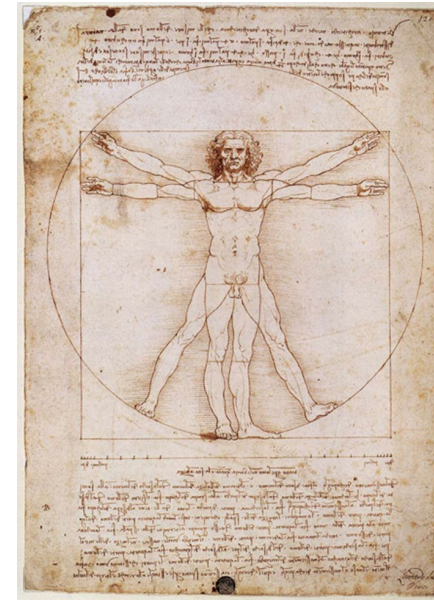
UX 101

- **User Experience (UX)**
 - Overall effect of interactions and perceptions someone has when using a product or service (or embedded device)
 - The cumulative effect of many factors, some you can control, some you can't [1]
- **User Experience Design**
 - Set of methods and techniques for researching what users want and need, to provide products and services (and embedded devices) for them
- **User Friendly**
 - How easy or difficult to use a given device or perform an interaction



UX Pre-History

- Vitruvius (1st Century BC)
- Three core design principles
 - Firmitas – Strength and durability of Design
 - Utilitas – Design usefulness and suitability to task
 - Venustas – Beauty of the design
- Vitruvian Man –
Leonardo da Vinci circa 1487
 - Reference [2]



UX History

- 1911 – Taylor publishes Principles of Scientific Management; Taylorism – aka scientific management, looking at analysis and synthesis of workflows, and the efficiency of workers and tools
- 1916 – World War 1 – Gilbreth work step breakdowns applied to assembly/disassembly of weapons in the dark
- 1940s – World War 2 (***typically cited as Usability starting point***)
 - Human factors studies into aircraft cockpits to reduce pilot error (Lt. Alphonse Chapanis)
- Toyota Production System (begins 1948);
Paul Fitts' paper on math model for predicting time to move to target based on the target distance and size (1954, becomes Fitts' Law);
Designing for People by Dreyfuss (1955)
- Reference [3]



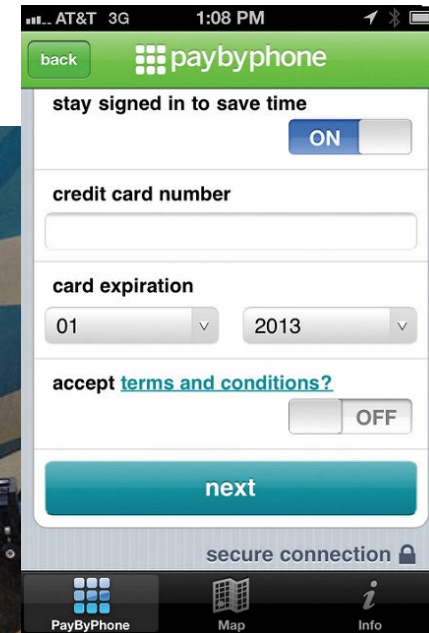
UX History

- HCI as a discipline (1975-1980)
- PCs (late 1970s)
- Internet launch (1983)
- Donald Norman – first User Experience Architect? – at Apple, 1993
- Web (1990s)
- Mobile Phones (1983 – 1st commercial phone, iPhone in 2008)
- IoT (coined in 1985, popular in 1999)
- Reference [3]



UX vs UI

- UI = User Interface
= screen or other method of interacting with a device
- UX = UI +
hardware +
context of use +
user goals/
motivation + ...
- UX > UI
- Reference [4]



UX vs. Usability – a quick exercise

- You likely see the overall User Experience is broader than just Usability
- What do you think specific aspects of Usability might be?
- Get a partner and take the next 5 minutes or so to brainstorm on what some aspects or components of usability might be
- Write the list down and pick your top 3
- Please try to resist using the Internet or other sources to come up with answers... Just use what comes to mind



Go to www.menti.com and use the code **94 38 86**

Please enter up to three aspects of usability

 Mentimeter

 **0**

Usability and Five Typical Aspects

Usability – Ease of access or use of a product; level is defined by combining with context of the user (goals and environment) [5]

1. Learnability – how quickly can I learn to use the interface
2. Visibility – how easy are interface elements to see or find
3. Efficiency – how many steps does it take to do tasks
4. Errors and Error Handling – what can cause errors, and how does the interface handle them
5. Satisfaction – how does the user feel about using the interface



UX Professionals come from...

- Engineering (all disciplines)
- Web/software design/development
- Editing, journalism, copywriting, technical writers
- Graphic or print design
- Research, sociology, anthropology, psychology
- Product management and business analysis



UX Roles

- Can be a UX Architect or Interface Designer
- Common roles
 - Interaction Design/Information Architecture
 - Visual Design
 - User Research
 - Content Strategy/Copywriting
- Also adjacent professions
 - Industrial Design
 - Product Management
 - Design Engineering
 - Embedded Device Engineer :-)



Getting Started...

- Review UX models and processes
- Typical UX process phases include:
 - Analysis/Planning
 - Research
 - Design
 - Verification and Validation
- Great variations in formality and depth of UX processes



Getting Started – Core UX Library

- Authors: Tufte, Norman, Cooper, Nielsen, Buxton, Krug, Buley



Getting Started – Core UX Library

- We'll look specifically at some of the Sketching discussion in Buxton (and a companion workbook)
- The Cooper book (Cooper is known as the “father of Visual Basic”) provides a detailed usability process called Goal-Directed Design
- The Krug and Buley books are distilled, abbreviated, discount usability approach that can be very useful (focus is web development, but generally applicable)
- Don Norman (along with the inventor of usability heuristics Jakob Nielsen) have a usability firm NN/g (Nielsen Norman Group) that has a superb usability website with articles and topics
- Edward Tufte is famous for his work on information visualization, his books are works of art



Buley's UX Principles

- Base Process
 - Understand work to be done
 - Get to know the users
 - Start designing
- Key Principles:
 - #1 Invite People In
 - #2 Make Things Together
 - #3 Truly Listen
 - #4 Know When It's Good Enough
- Reference [1]



Professional Resources

- Professional Societies (ACM SIGCHI, IxDA, UXPA)
- Discussion Lists
- LinkedIn Groups
- Meetups
- Mentors
- Continuing Education
- Online Resources
- Books
- Conferences
- Classes
- Degree Programs



Summary

- Definitions
- History
- Usability Aspects
- Roles
- Books and Resources



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Quick Usability Assessment Exercise

- Find a partner...
- Answer these questions on paper or text editor about the device:
 - How hard to learn? Is re-learning needed?
 - Is the way to operate the device visible?
 - Is the operation efficient? How long does an interaction take?
 - What errors occur, and what is the result?
 - What satisfies a user?
 - Are there any users that would have problems using the device? Why?
 - Is there any other version of the device you prefer? How would you improve it?



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References

- [1] User Experience Team of One, Buley, 2013, Rosenfeld
- [2] <https://www.smashingmagazine.com/2012/05/the-history-of-usability-from-simplicity-to-complexity/>
- [3] <http://measuringu.com/usability-history/>
- [4] <https://www.paybyphone.com/>
- [5] <https://www.interaction-design.org/literature/topics/usability>

