Designing for Diversity

Human Computer Interaction

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POLITECNICO DI TORINO

e-Lite

What we (should) know…

- It is important to design for the user, to follow a human-centered process

- *"People are a mess"*
  - they have different abilities and weaknesses
  - they come from different backgrounds and cultures
  - they have different interests, viewpoints, and experiences
  - they are of different ages and sizes
  - …

- All these things have an impact on the way in which a person use a software application and, indeed, on whether they can use it at all

Are We Designing For People Like Us?

- If we use our own abilities as a starting point…

- … we make things that are easy for some people to use, but difficult for everyone else

- … we end up with systems designed for people like us
  - specific gender, age, language ability, tech literacy, physical ability, specific access to money, time, etc.

"Normal"... Who?

- The interactions we design with technology depend heavily on what we can understand/remember, see, hear, say, <u>and</u> touch

- Assuming all those senses and abilities are fully enabled all the time means ignoring several people
  - it also reflects how people really are, as "life happens"

- We want our designs to reflect that diversity

	Permanent	Temporary	Situational
Touch	One arm	Arm injury	New parent
See	Blind	Cataract	Distracted driver
Hear	Deaf	Ear infection	Bartender
Speak	Non-verbal	Laryngitis	Heavy accent

Inclusive Design

- A design methodology that enables and draws on the full range of human diversity
  - i.e., including and learning from people with a range of perspectives

- Designing a diversity of ways to participate so that everyone has a sense of belonging

- It not a "one size fits all" approach, but a "*one size fits one*"
  - it is more designing a system, a portion of it, or an application for a specific use case and extending this to others

- **Beware:** there is no "standard" and shared definitions, principles, and practices
  - here, we rely on a recent definition and practices by Microsoft Design (https://www.microsoft.com/design/inclusive/)

Three Principles of Inclusive Design

1. **Recognize exclusion**
   - it means examining what you are building, and recognizing who would be excluded from using it
   - sometimes exclusion happens when we do not pay attention to our biases, and it could be temporary or situational

2. **Learn from diversity**
   - put people at the center of the design process from day zero
   - we can try to imagine how a person with a given set of abilities would use a system
   - we cannot imagine her various contexts, being them situational, emotional, or what gives her joy or frustration

3. **Solve for one, extend to many**

The Beauty of Constraints

- Designing for people with permanent disabilities can seem like a significant constraint…

- …but the resulting designs can benefit a much larger number of people

- Examples
  - closed captioning was created for the hard of hearing community, but they are useful for reading in a crowded airport or to teach children how to read
  - remote controls, automatic door openers, audiobooks, …

Hard of hearing

Reading airport captions

Teaching a child to read

Example: Creating a Video Game

- It can require fine motor skills to compete (jump, run, drive, …)
  - o who are you excluding?

- Possible follow-up questions
  - o what if you have limited mobility?
  - o or if you never played a video game before?
  - o which contexts should you consider?
  - o which of them can you observe?
  - o …

Example: Creating a Video Game

- A possible solution: a co-pilot mode
  - allows two game controllers to work together, so that two people can control the same character, or car, or…
  - in this way, an advanced or skilled player can play alongside someone who might need more assistance

- This opens gaming to various kinds of people
  - people with disabilities or temporary injuries
  - novice gamers
  - kids
  - people who just want to play together without competing
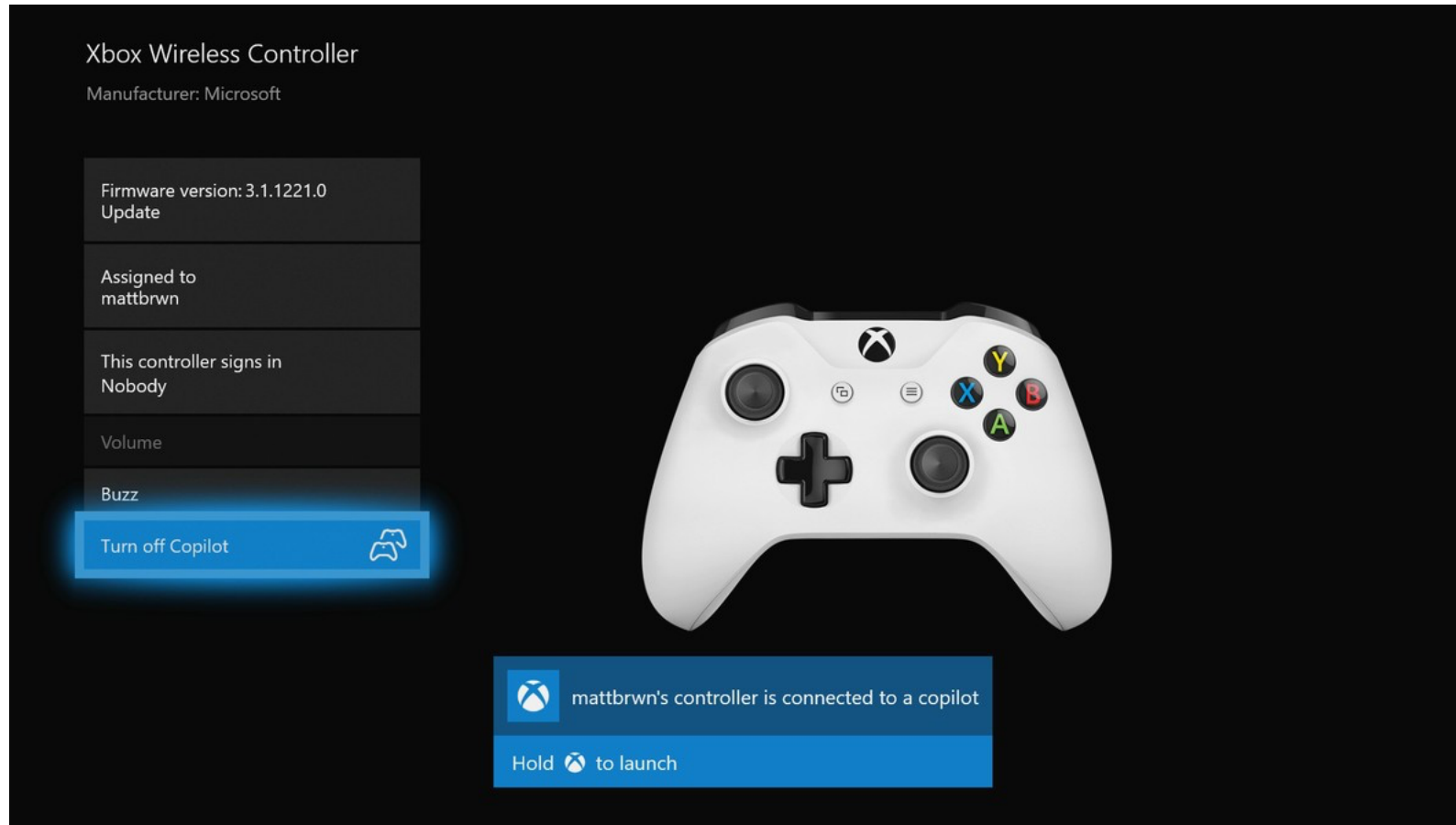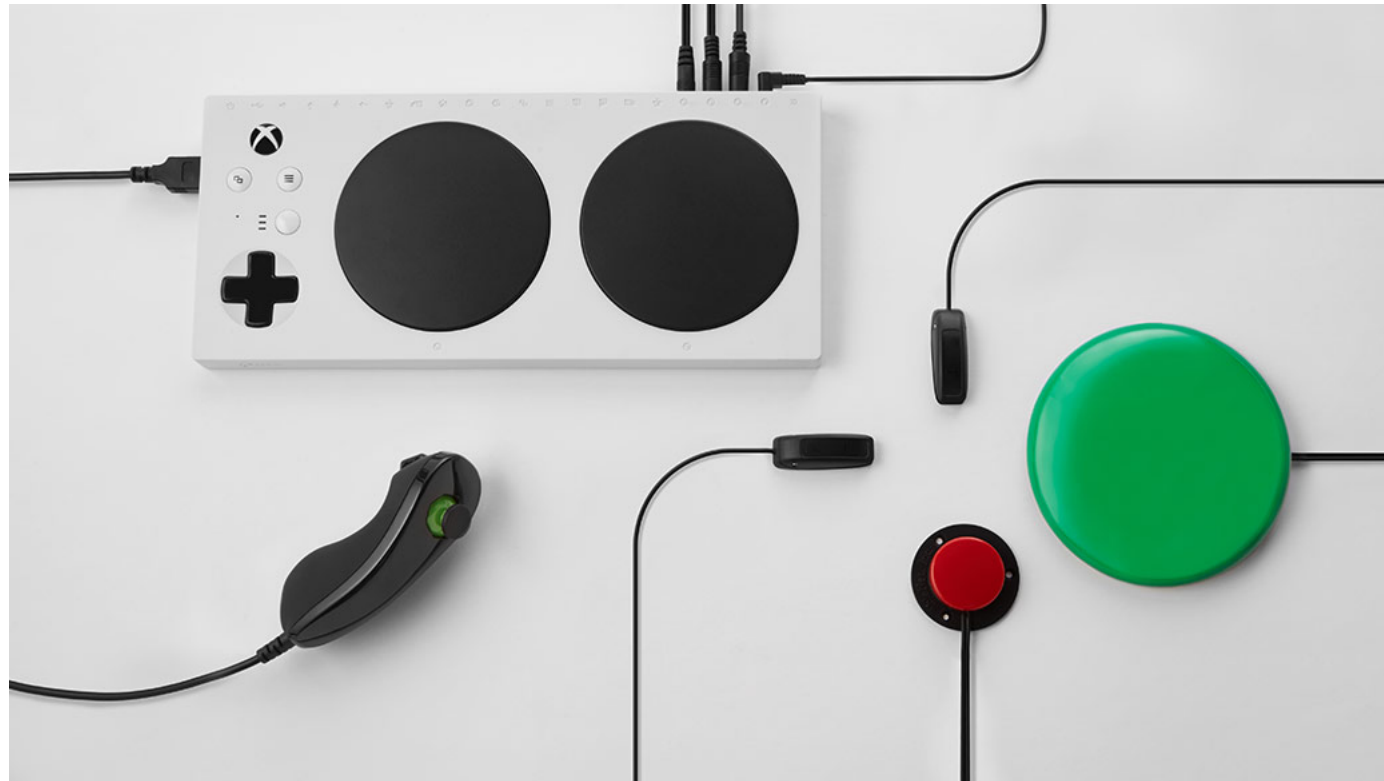
Copilot Mode – Xbox One

image from https://www.windowscentral.com/xbox-one-copilot

Xbox Adaptive Controller

source: https://xbox.com/adaptive-controller

Are We Speaking About Accessibility?

- Not only
  - accessibility is an attribute, inclusive design is a method

- Accessibility focuses primarily on people with disabilities
  - ensuring that there are no barriers to serving them
  - via testable accommodations able to solve a technical, design, physical, or cognitive barrier to engaging with a system or product

- Inclusive design will make your systems and products more accessible, but it is not a process for meeting all accessibility standards

- Accessibility and inclusive design work together to make experiences that are not only compliant with some standards, but usable and open to all

Universal Design

- Designing interactive systems that are usable by anyone, with any range of abilities, using any technology platform

- A "one size fits all" approach, less prone to consider very specific cases
  - it is strongest at describing the qualities and nature of a final design
  - it might not involve the participation of some excluded communities

- Born for the physical world, then adopted in the digital one

The Principles of Universal Design

The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.
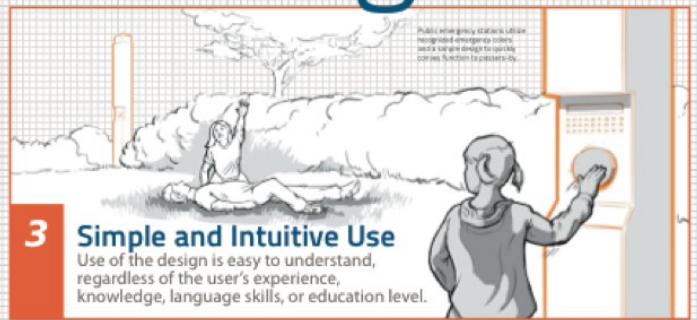
1 Equitable Use
The design is useful and marketable to people with diverse abilities.

2 Flexibility in Use
The design accommodates a wide range of individual preferences and abilities.
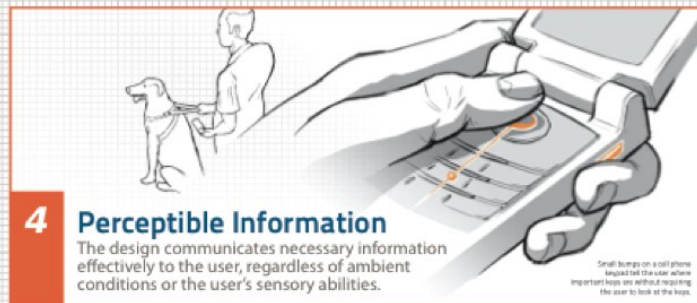
3 Simple and Intuitive Use
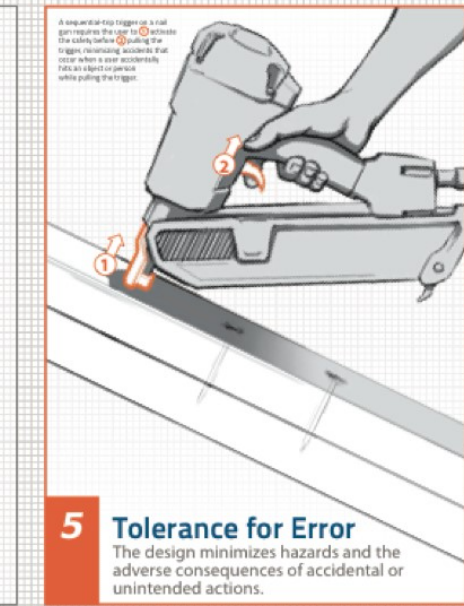Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or education level.

4 Perceptible Information
The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

5 Tolerance for Error
The design minimizes hazards and the adverse consequences of accidental or unintended actions.

6 Low Physical Effort
The design can be used efficiently and comfortably and with a minimum of fatigue.

7 Size and Space for Approach and Use
Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

Center for Universal Design at NC State

https://www.interaction-design.org/literature/article/learn-to-create-accessible-websites-with-the-principles-of-universal-design

Universal and Inclusive Design: Examples

https://www.youtube.com/watch?v=pqdbabk-ohk

Accessibility... and the Web

- Despite the great potential that the Web might have for people with disabilities, this potential is still largely unrealized
  - some sites can only be navigated using a mouse
  - only a very small percentage of video or multimedia content has been captioned
  - very few websites are fully usable by people who are blind

- Web accessibility encompasses all disabilities that affect access to the Web: auditory, cognitive, neurological, physical, speech, visual
  - also situational or temporary impairments

Web Accessibility Relies on Several Components

- Web content
  - text, images, forms, multimedia, scripts, etc.

- User agents
  - browsers, voice browsers, mobile browsers, …, and some assistive technologies

- Authoring tools
  - code editors, content management systems, database scripts, etc.

W3C Web Accessibility Initiative

- The W3C Web Accessibility Initiative (WAI) provides a set of **guidelines** that are internationally recognized as standards
  - [Web Content Accessibility Guidelines (WCAG)](#)
  - [User Agent Accessibility Guidelines (UAAG)](#)
  - [Authoring Tool Accessibility Guidelines (ATAG)](#)
  - [Accessible Rich Internet Applications (WAI-ARIA)](#)

- and adopted in laws, e.g., the Italian's Stanca Act that promotes the accessibility of information technology

WCAG 2.0: Example

Principles	Guidelines	Level A	Level AA	Level AAA
1. Perceivable	1.1 Text Alternatives	1.1.1		
	1.2 Time-based Media	1.2.1 – 1.2.3	1.2.4 – 1.2.5	1.2.6 – 1.2.9
	1.3 Adaptable	1.3.1 – 1.3.3		
	1.4 Distinguishable	1.4.1 – 1.4.2	1.4.3 – 1.4.5	1.4.6 – 1.4.9
2. Operable	2.1 Keyboard Accessible	2.1.1 – 2.1.2		2.1.3
	2.2 Enough Time	2.2.1 – 2.2.2		2.2.3 – 2.2.5
	2.3 Seizures	2.3.1		2.3.2
	2.4 Navigable	2.4.1 – 2.4.4	2.4.5 – 2.4.7	2.4.8 – 2.4.10
3. Understandable	3.1 Readable	3.1.1	3.1.2	3.1.3 – 3.1.6
	3.2 Predictable	3.2.1 – 3.2.2	3.2.3 – 3.2.4	3.2.5
	3.3 Input Assistance	3.3.1 – 3.3.2	3.3.3 – 3.3.4	3.3.5 – 3.3.6
4. Robust	4.1 Compatible	4.1.1 – 4.1.2		

References

- Microsoft's Inclusive Design 101 Toolkit
  - https://www.microsoft.com/design/inclusive/

- Blog post on "Inclusive Design Principles"
  - https://medium.com/microsoft-design/inclusive-design-principles-77f7c5f639da

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale: Human Computer Interaction, 3rd Edition
  - Chapter 10

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