# Inclusive Design

## [Develop]

# There is no average user

# Inclusive Design

- Create products that understand and enable people of all backgrounds and abilities
  - Example, early on for selecting race: it would be radio buttons, and didn't include South Asia

- Similar terms:
  - Universal design (more for tangible environments)
  - Accessible design (physical abilities)

## Elements for variations

- Physical measure of static human dimensions
- Measures of dynamic actions
  - Reach, speed of finger presses
- Human perceptual abilities
  - Vision
  - Tactile perception
  - Audible cues and tones
- Culture, language, norms
- Environment of use
- Cognitive styles
- …

# People vary physically by size and ability

**Logitech MX 610 Laser Cordless Mouse**

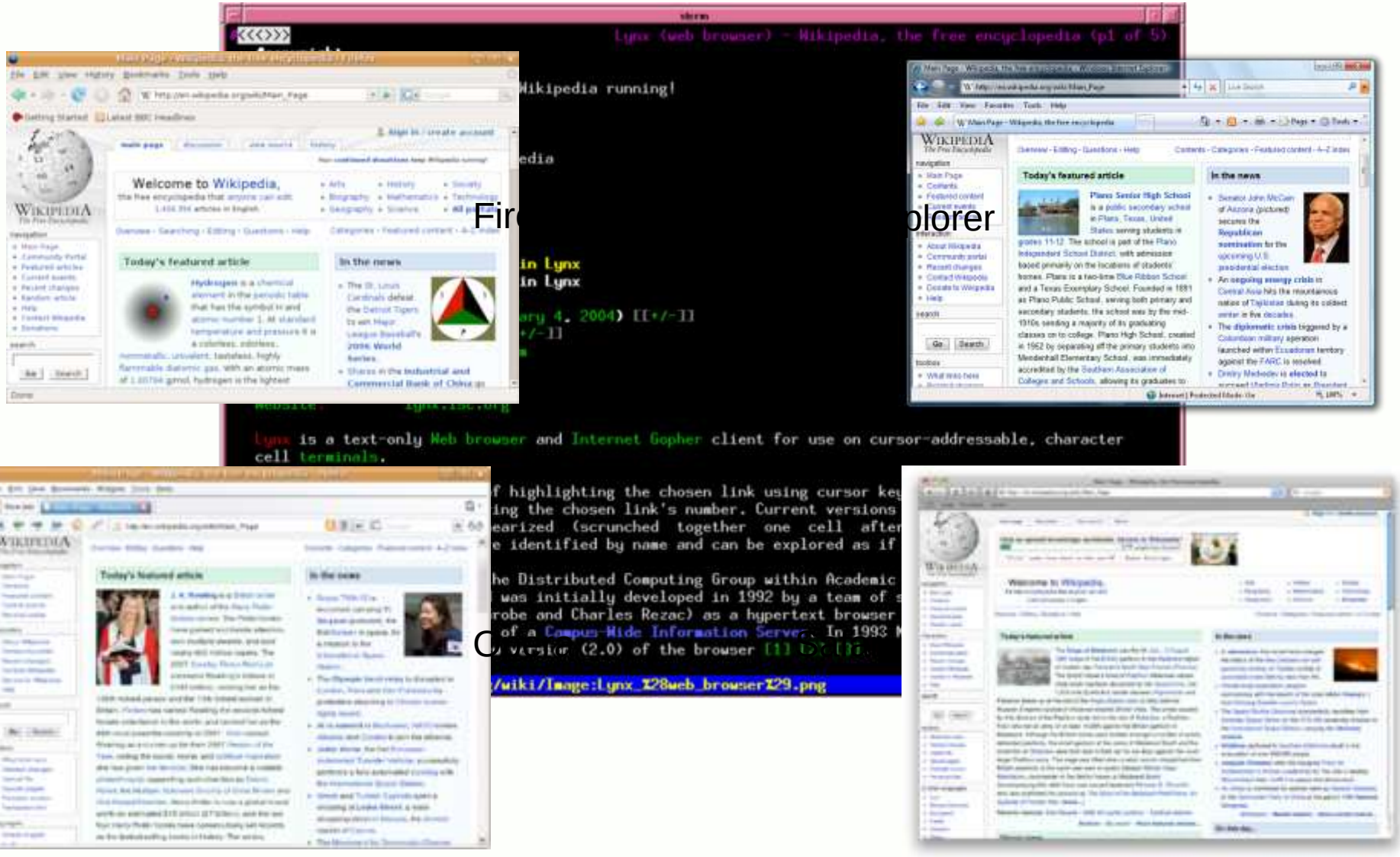
# Universal Design Goal

- Make your application usable to as broad an audience as possible

# hardware/software diversity

- Designers must also cope with both hardware and software differences
  - IPhone apps on Ipad
  - Microsoft applications on Mac

# Browsers do not render all pages identically



# Inclusive Design Goal

- Take a target market & maximize the product performance indicators' for that target market

- What are some of the inclusivity dimensions?

# Here, we cover

- Gender
- Culture
- Age
- Physical ability
- Cognitive diversity

# Gender differences ?

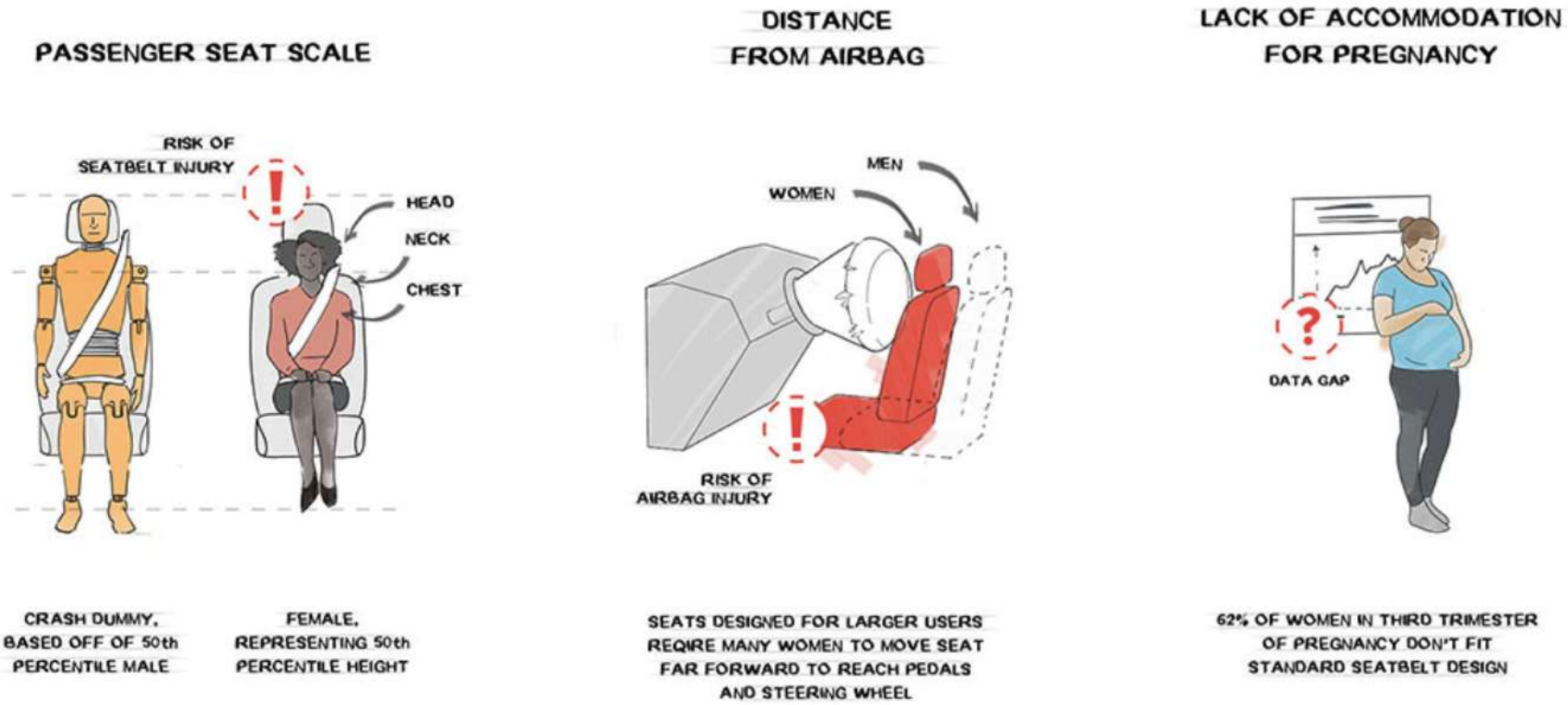
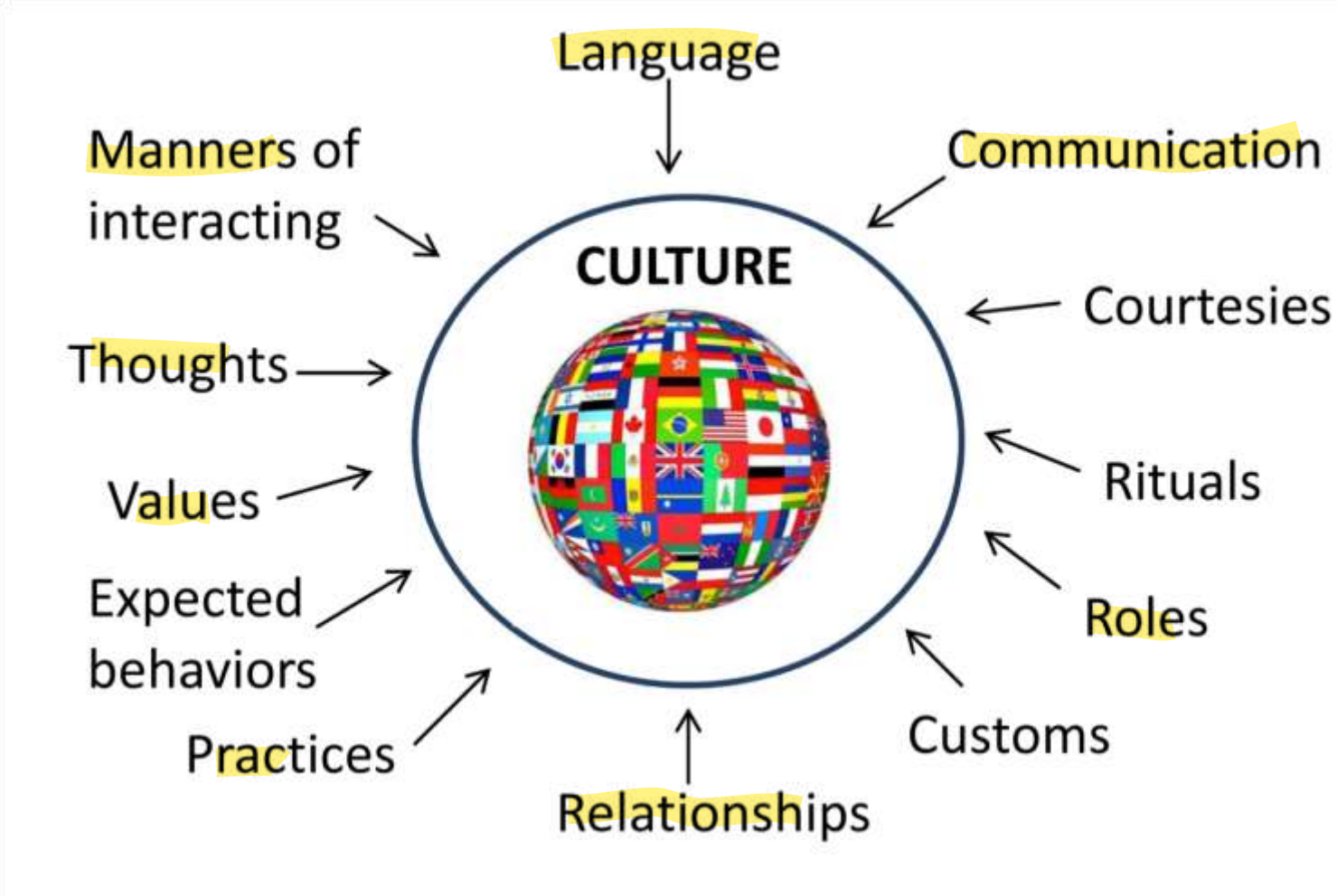


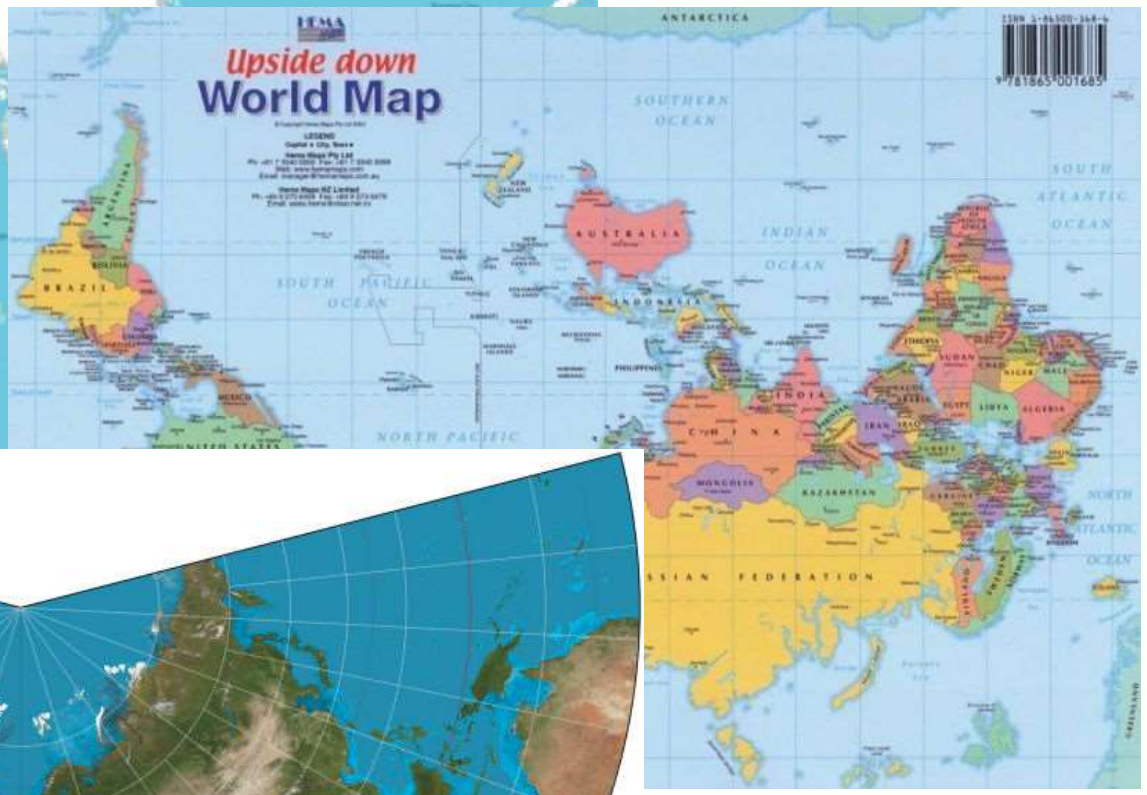

Illustration by Andrew Jernberg, **Evoke**

https://www.userinterviews.com/blog/design-failure-examples-caused-by-bias-noninclusive-ux-research#:~:text=4.,are%20largely%20tailored%20to%20men.&text=Many%20women%20have%20to%20move,injured%20in%20a%20car%20crash.

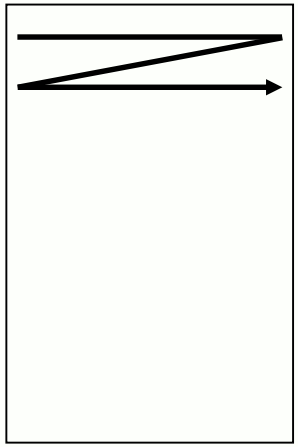
# Culture


Language
Manners of interacting
Communication
CULTURE
Courtesies
Thoughts
Rituals
Values
Roles
Expected behaviors
Customs
Practices
Relationships

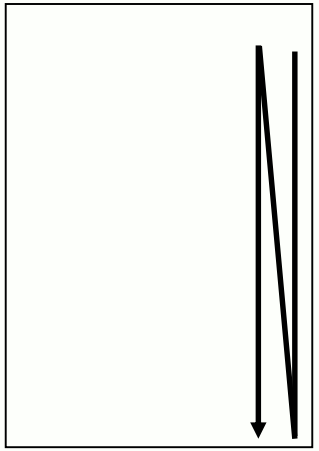

Canada
United States


Upside down
World Map
ANTARCTICA
SOUTHERN OCEAN
AUSTRALIA
INDIAN OCEAN
SOUTH PACIFIC OCEAN
BRAZIL
INDONESIA
INDIA
CHINA
MONGOLIA
KAZAKHSTAN
NORTH PACIFIC
SOUTH ATLANTIC OCEAN
NORTH ATLANTIC OCEAN

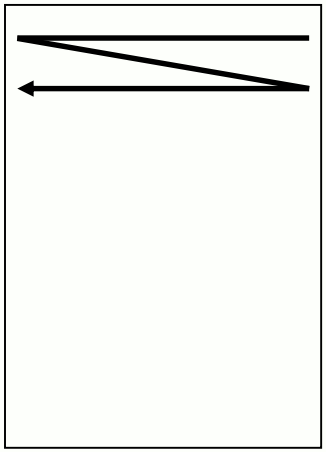
# How will a user's eye scan the page?



English, French readers



Chinese, Japanese readers



Arabic, Hebrew readers

# Algorithmic Photo Checkers

✕ The photo you want to upload does not meet our criteria because:

- Subject eyes are closed

**Please refer to the technical requirements.**
**You have 9 attempts left.**

Check the photo requirements.

Read more about common photo problems and how to resolve them.

After your tenth attempt you will need to start again and re-enter the CAPTCHA security check.

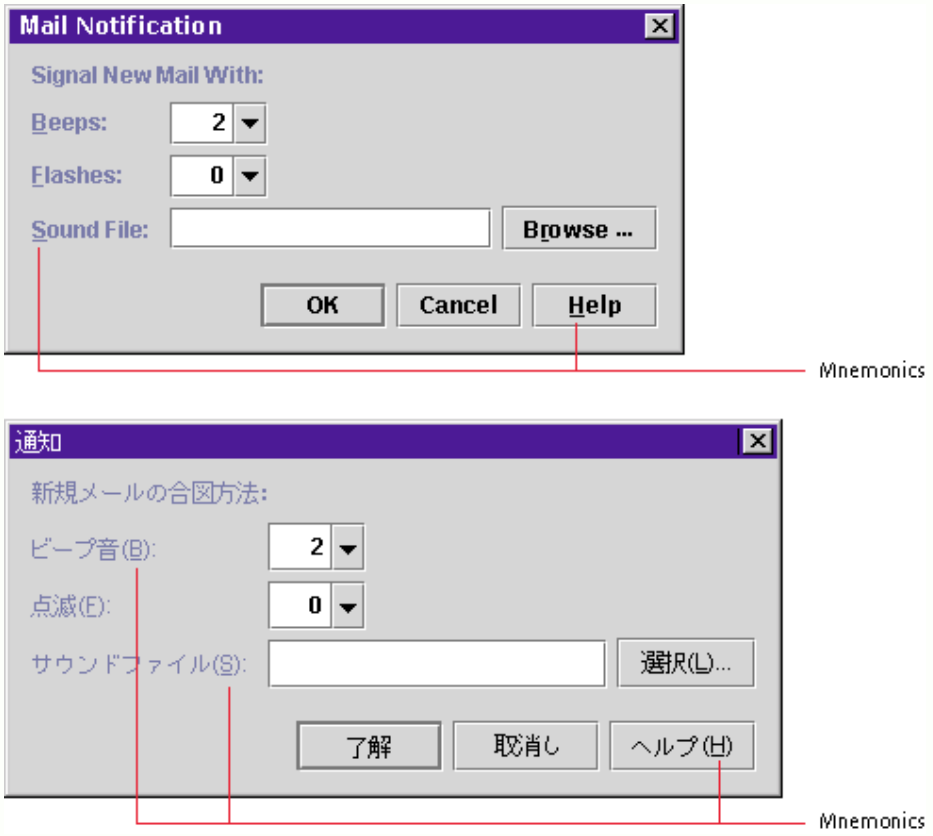
**Reference number: 20161206-81**

Filename: Untitled.jpg

If you wish to contact us about the photo, you must provide us with the reference number given above.

# Internationalization (i18n) issues

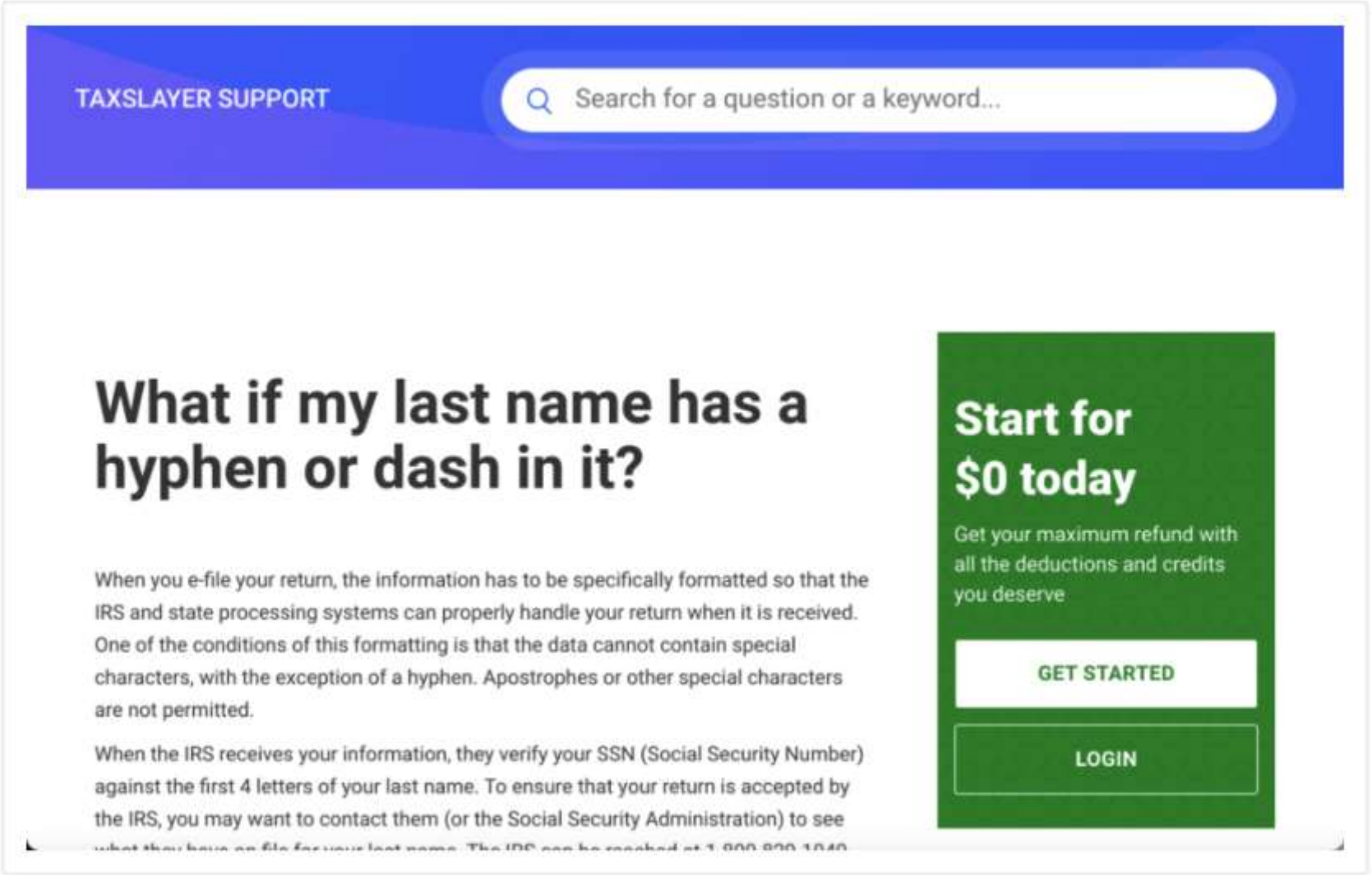
- Internationalization of UI, docs, …
- Date & time representation
  - 3/14/2013 vs. 14.3.2013
  - 2:32pm vs. 14:00
- Weights and measures
  - Pound vs. Kg
  - Miles vs. Km



# Many other internationalization (i18n) issues

- Currency (what's on your keyboard)
  - $, €, £
- Numbers conventions
  - $10.50 USA
  - 10,50 € Most Europe
  - £10.50 UK
  - €10.50 Ireland
  - R$ 5.100,50 Brazil
  - INR 1,32,768.50 India
- …

# What about names?




*TaxSlayer's support page communicated* Last Name *field limitations, which were due to IRS formatting requirements.*

# Age


https://blog.logrocket.com/ux-design/age-inclusive-design-web-interfaces/#:~:text=This%20is%20the%20approach%20of,unique%20user%20needs%20and%20goals.

# Designing for children

# Designing for children: Communication

- Simple terms, provide explanations
- Multiple media: text, images, video/ audio

**DID YOU KNOW?**

- A Venus day is the equivalent of 243 Earth days, although a year is roughly 225 Earth days.
- Venus rotates in the opposite direction—called retrograde rotation—of most planets.
- Venus has more volcanoes (more than 1,600) than any other planet in the solar system. Most lie dormant.

**SPACE VIDEOS**


*Source: National Geographic Kids*

# Designing for children: Interactivity

- Allows kids to engage deeper, play around
  - Interaction/animation
  - Multiple senses: colorful graphics, music/sound effects, tactile feedback, but…
  - Keep controls easy to execute



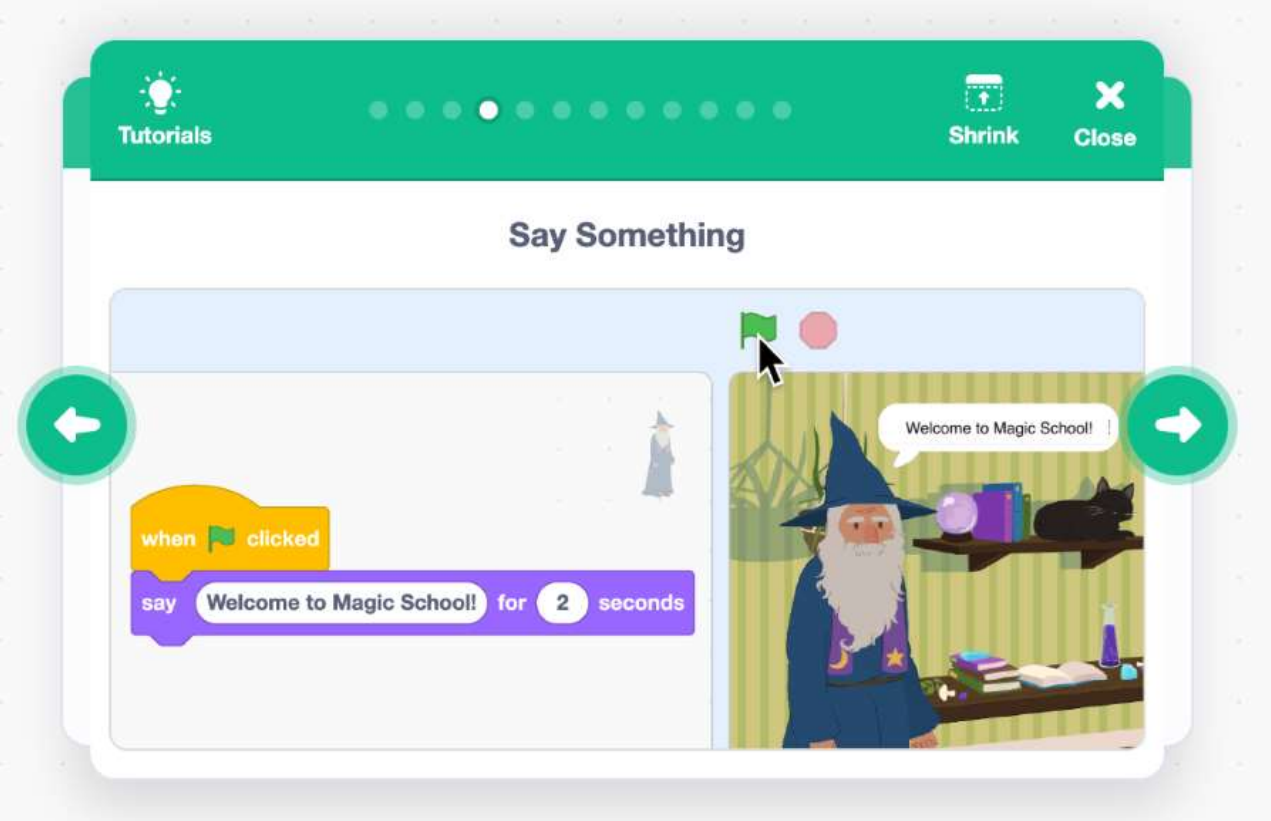
Source: *Duolingo*

# Designing for children: Feedback

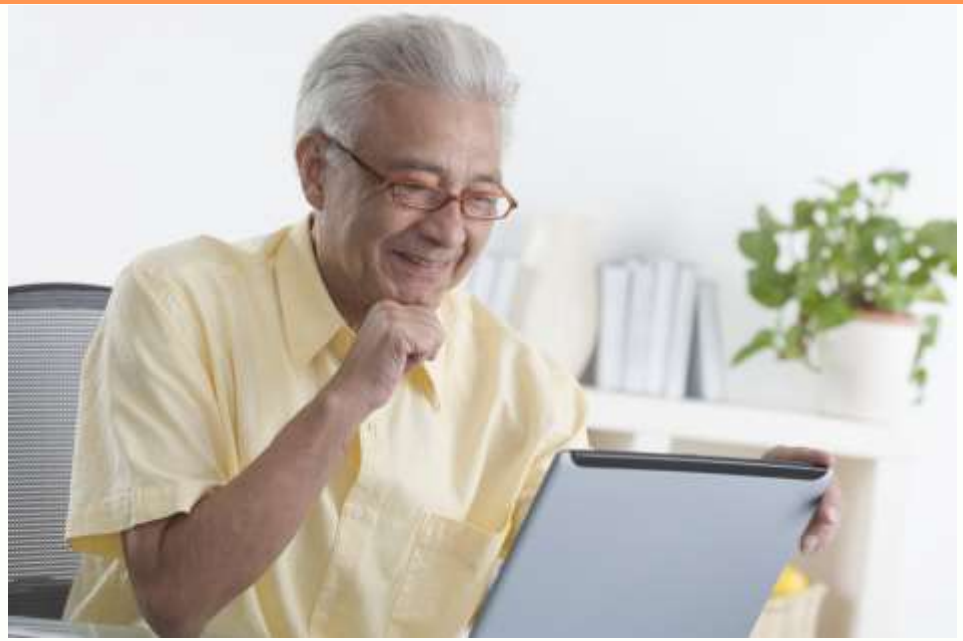
- Provide positive reinforcement: rewards, messages, sounds to engage/motivate them
  - Gamification, but…
- Allow self-exploration, but also provide instructions

# Designing for children: Storytelling

- Narrative where they can face challenges that can lead to rewards to improves engagement



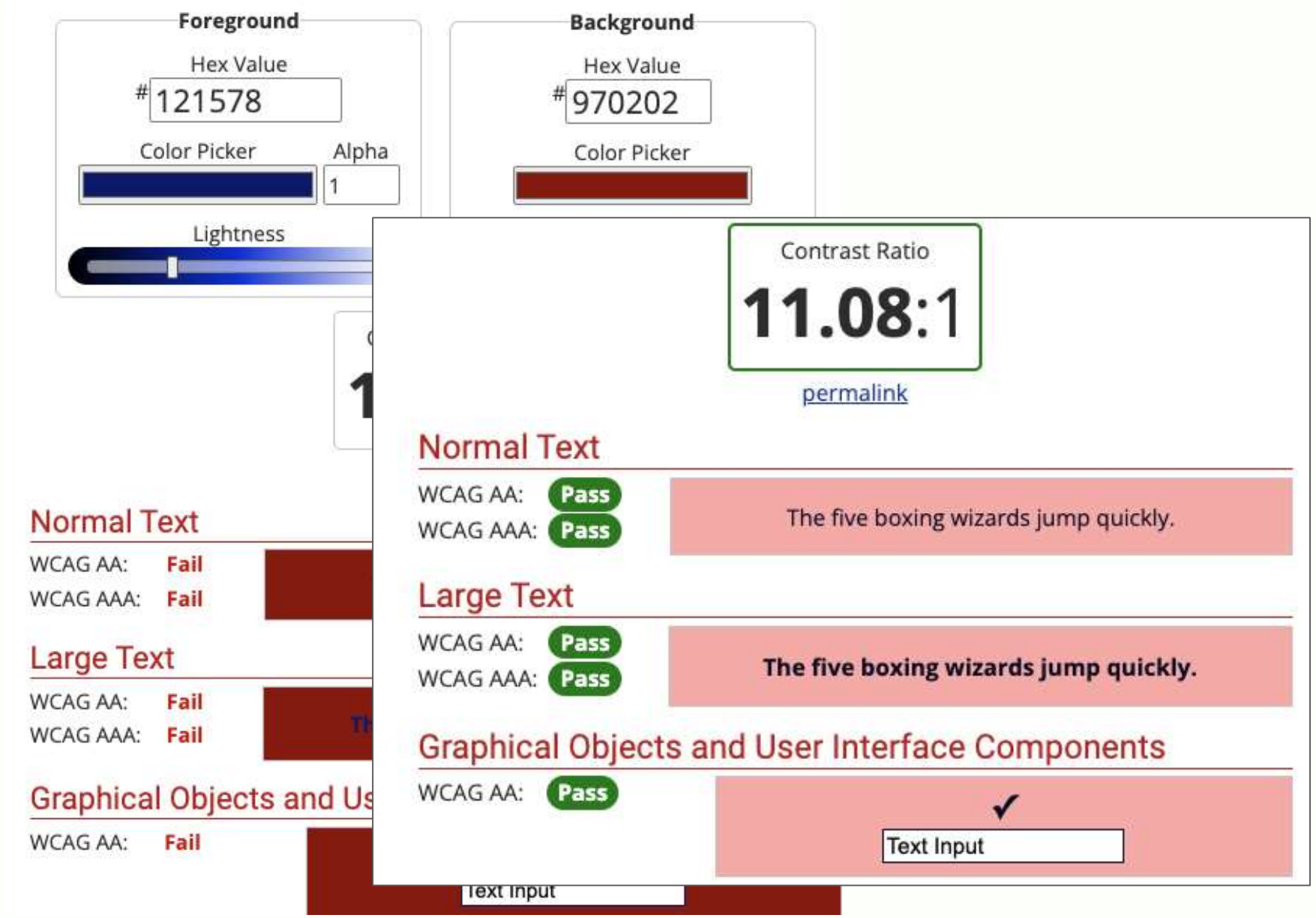
# Seniors



When working on designs inclusive to older users, we need to be aware of the facts that **hearing, vision, memory, attention, and manual dexterity decline with age**. All of these factors affect how older users use and interact with our designs.

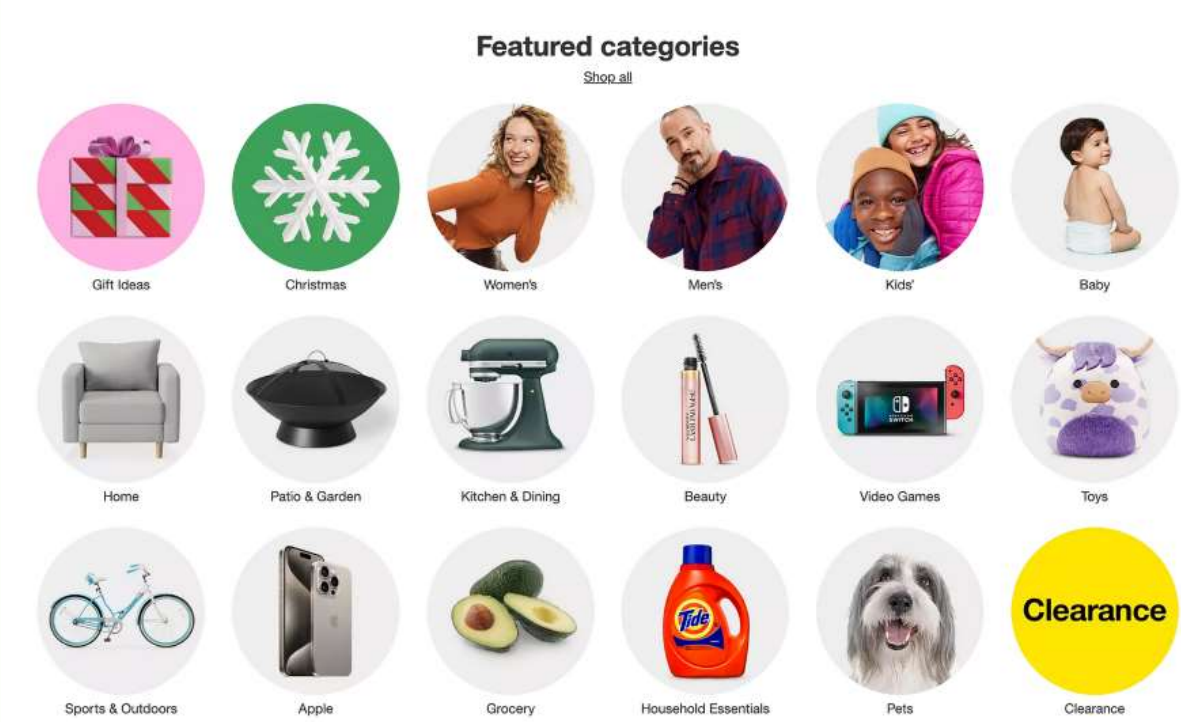
# Designing for older adults: low vision

- Readability:
  - Font size : 16 px
  - Font type
  - Contrast
    - Use Contrast checker: https://webaim.org/resources/contrastchecker/


Foreground
Hex Value
#121578
Color Picker
Alpha
1
Lightness
Background
Hex Value
#970202
Color Picker
Contrast Ratio
11.08:1
permalink
Normal Text
WCAG AA: Pass
WCAG AAA: Pass
The five boxing wizards jump quickly.
Large Text
WCAG AA: Pass
WCAG AAA: Pass
The five boxing wizards jump quickly.
Graphical Objects and User Interface Components
WCAG AA: Pass
Text Input
Normal Text
WCAG AA: Fail
WCAG AAA: Fail
Large Text
WCAG AA: Fail
WCAG AAA: Fail
Graphical Objects and Us
WCAG AA: Fail
Text Input

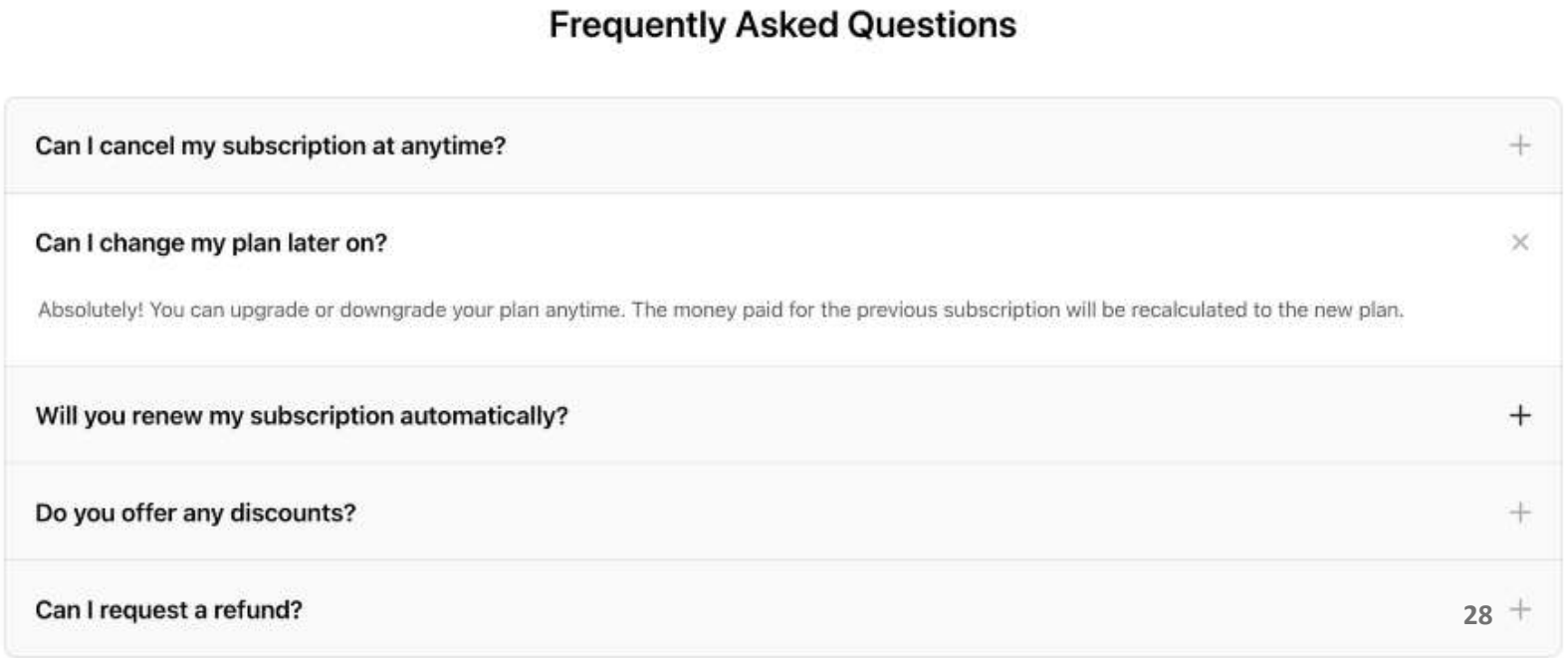
# Designing for older adults: Cognitive Load

- Simple navigation
  - Back button on every page
  - Wizards, audio input
  - Visuals in a navigation menu



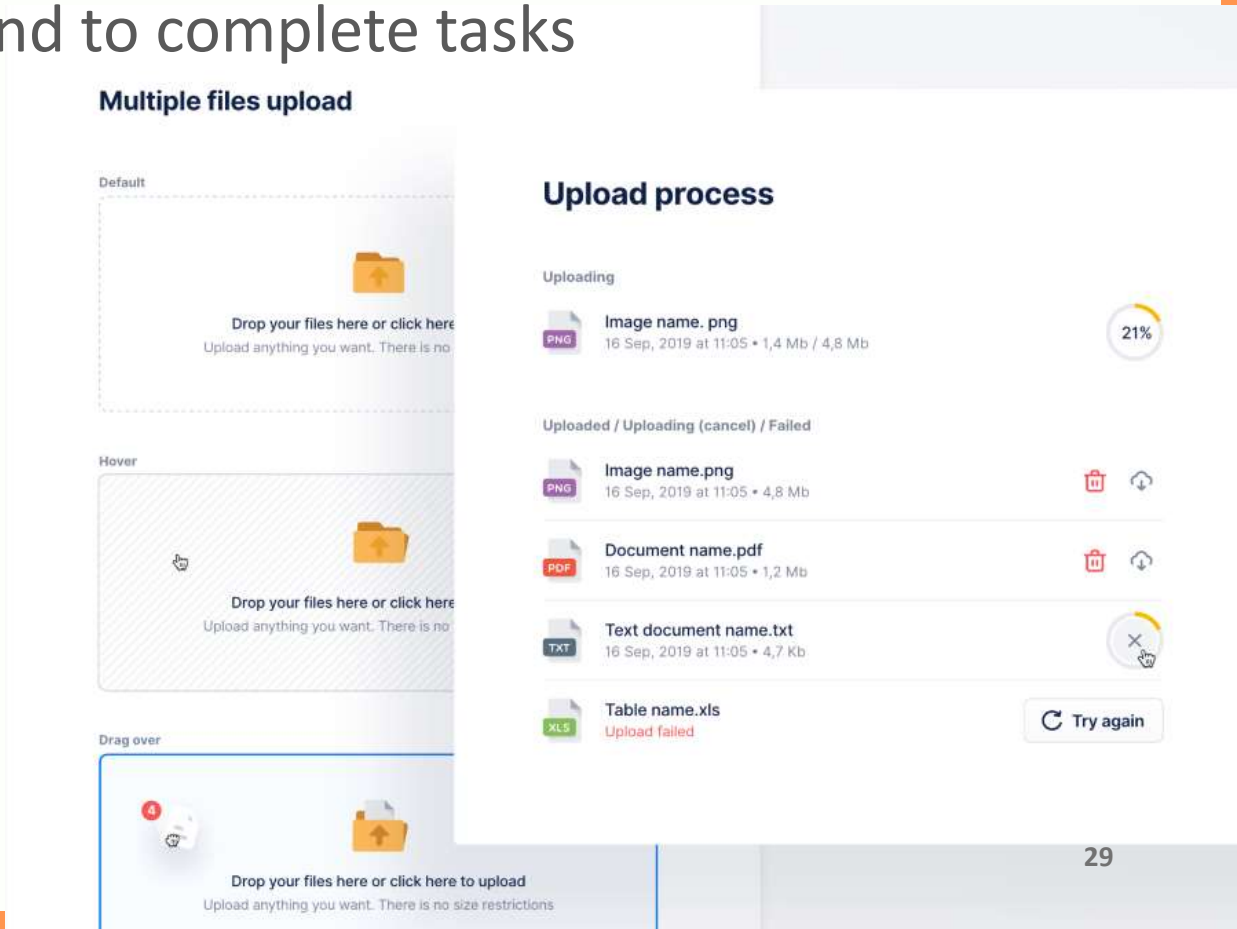
# Designing for older adults: Cognitive Load

- Simple navigation
  - Back button on every page
  - Wizards
  - Visuals in a navigation menu
- Progressive disclosure



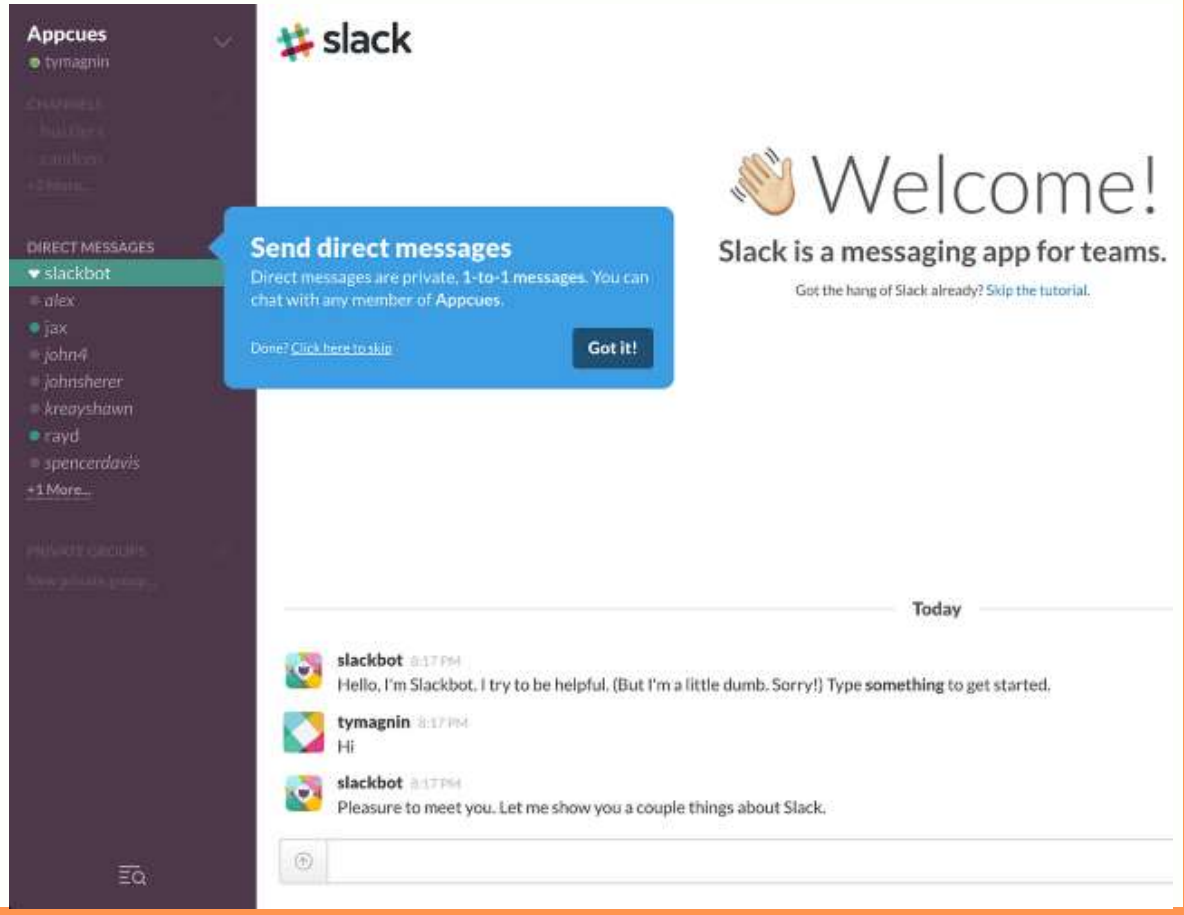
# Designing for older adults: Memory

- Easily recognizable icons, use (real world) metaphors
- Include colors (stronger memory connection)
- Assistance to remind to complete tasks
  - When success/fail



# Designing for older adults: Additional Guidance

- Onboarding experience
  - Carousal slides explain features
  - Tooltip walkthroughs
- Easy access to help
  - FAQ
  - Documentation



## Other design guidelines for older adults

- Make software configurable
  - e.g. “Sticky” keys  make it easier to hit multiple keys at once
- Provide large clickable areas
- Give them more time to complete tasks
- Don’t force them to explore

# Design for impaired human capabilities

Businesses must comply with the "Americans With Disabilities" Act for some applications

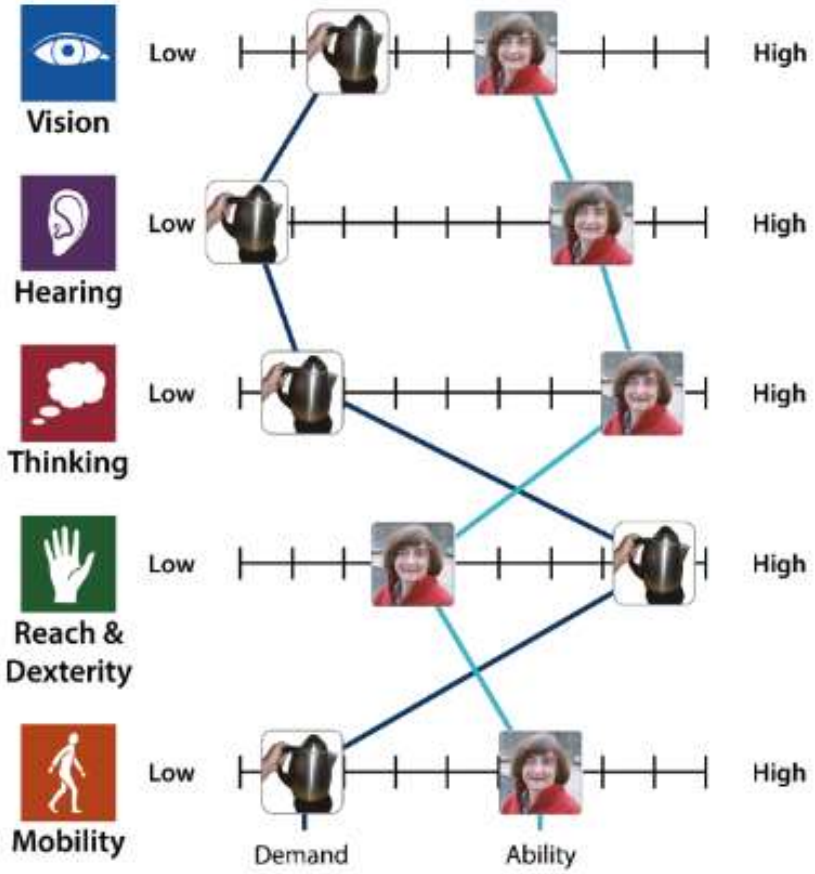

Section 508
www.section508.gov

## Introduction to assessing demand

An initial assessment can be made by rating the demand on each capability on a scale from Low to High. To do this, there are various factors that should be considered:

- For **Vision**, consider the size, shape, contrast, colour and placement of the graphical and text elements.
- For **Hearing**, consider the volume, pitch, clarity and location of sounds produced by the product.
- For **Thinking**, consider how much demand the product places on a user's memory, how much it helps the user to interpret its interface, how much attention it demands, and how much prior experience it assumes.
- For **Reach and Dexterity**, consider the forces, movements and types of grip required to use the product. The demands will increase if tasks have to be performed with the hands reached above the head or below the waist.
- For **Mobility**, consider whether the product requires the user to move around. If designing an environment or service, consider whether it provides suitable features to assist balance and support mobility aids.

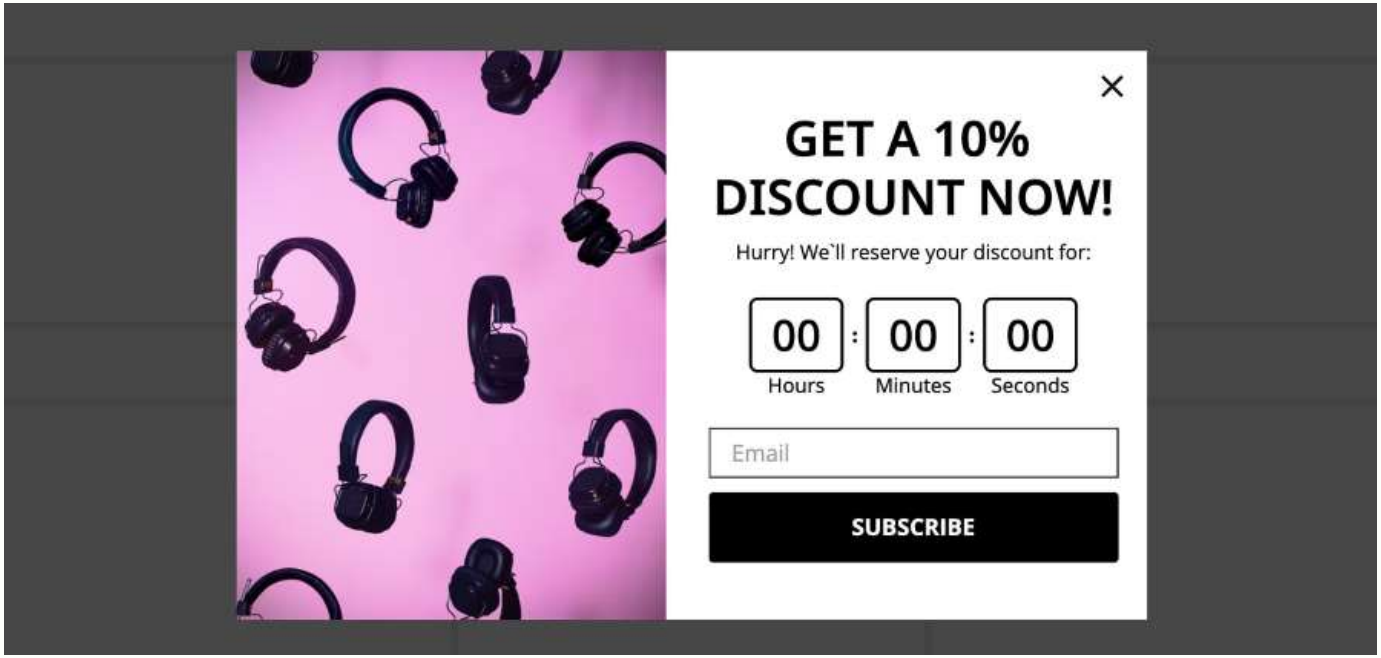
More information about each of these factors can be found by following the links above.




The level of demand that a product places on various capabilities can be assessed. This can be compared with the ability of the users in the target population. In this example, the product demand for reach and dexterity is higher than the ability of the example user.

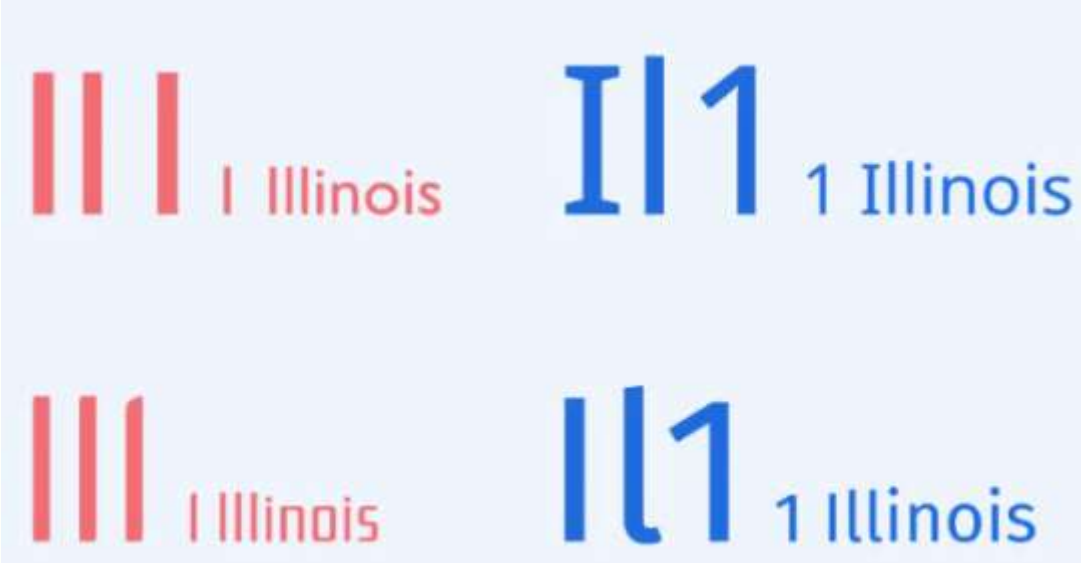
# Overall inclusive design principles

- Clarity
- Simplicity
  - Avoid pop ups/count down timers
- Avoid “dark patterns” (trick users)
  - Ads without clear cancellation take advantage of users

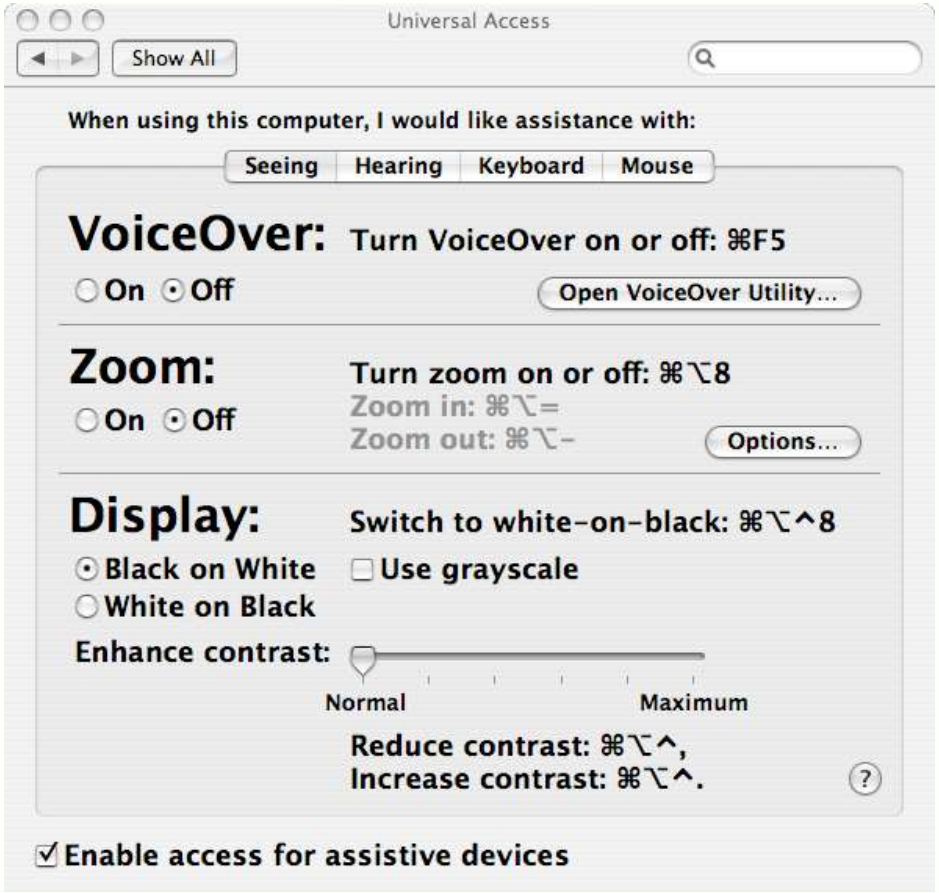


## Overall inclusive design principles

- Clarity
- Simplicity
  - Avoid pop ups/count down timers/animation
- Avoid “dark patterns”
  - Ads without clear cancellation take advantage
- Readability
  - At least 16 px text
  - Serif over Sans Serif



# Support customization

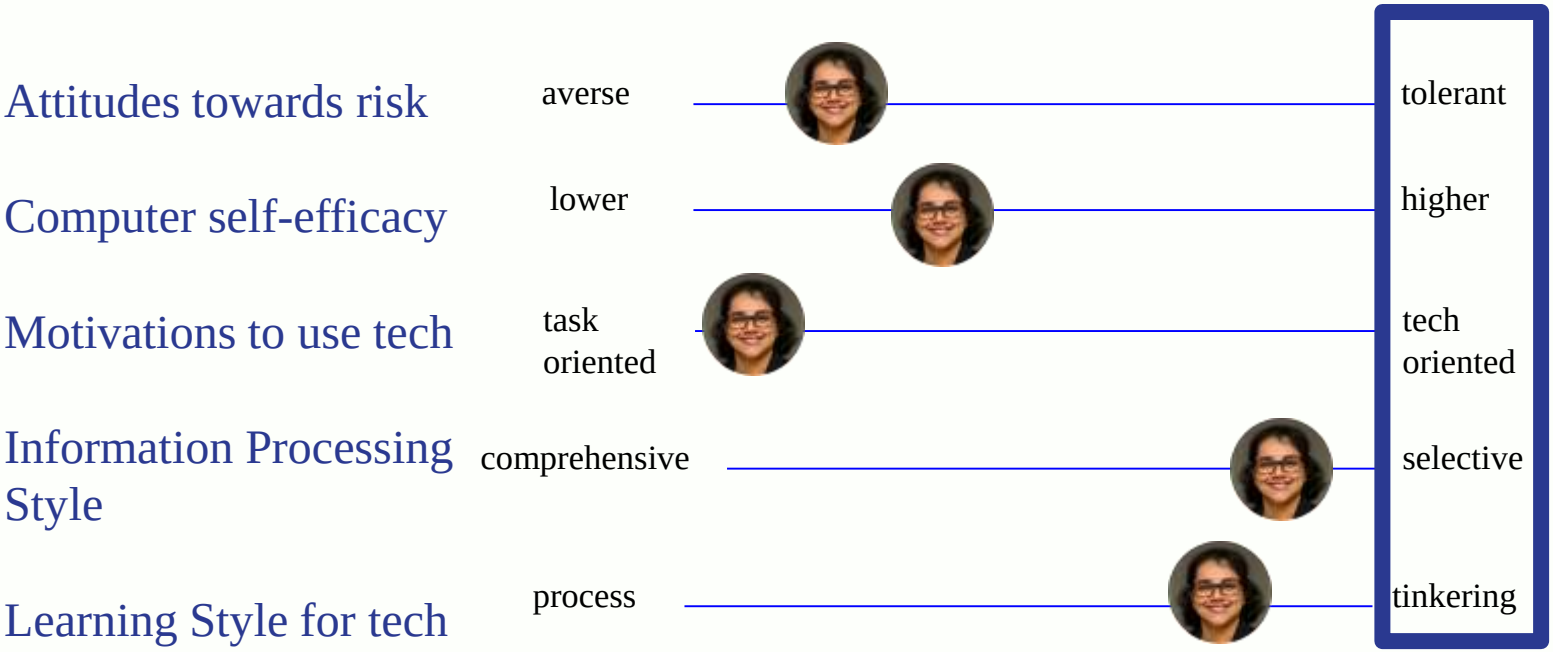




Apple

# Inclusive Technology: cognitive styles

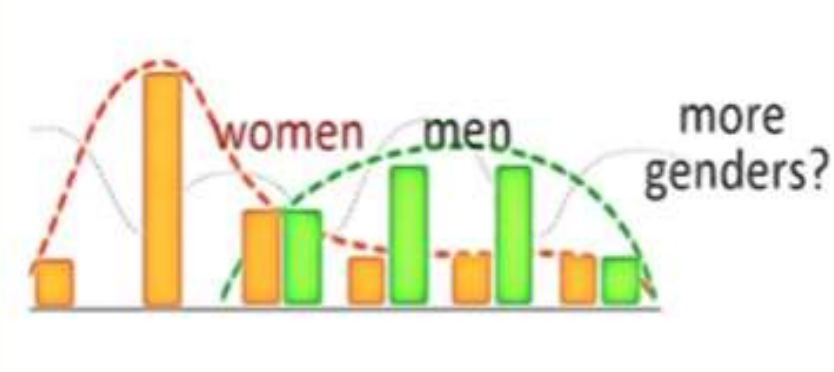
## Cognitive Diversity, *i.e. variations in cognitive styles*

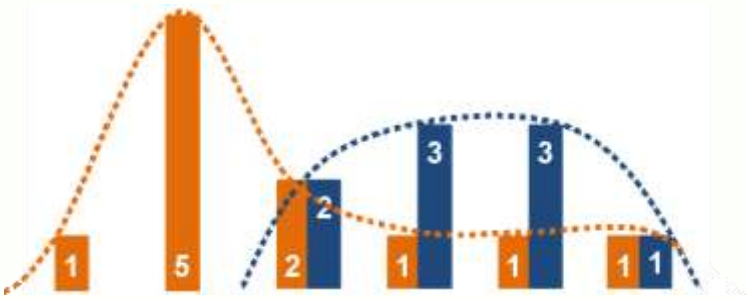
***diverse ways users perceive, process, and interact with information & technology, as well as their approach to problem-solving***




Burnett, M., Stumpf, S., Macbeth, J., Makri, S., Beckwith, L., Kwan, I., ... & Jernigan, W. (2016). GenderMag: A method for evaluating software's gender inclusiveness. *Interacting with computers*, *28*(6), 760-787.

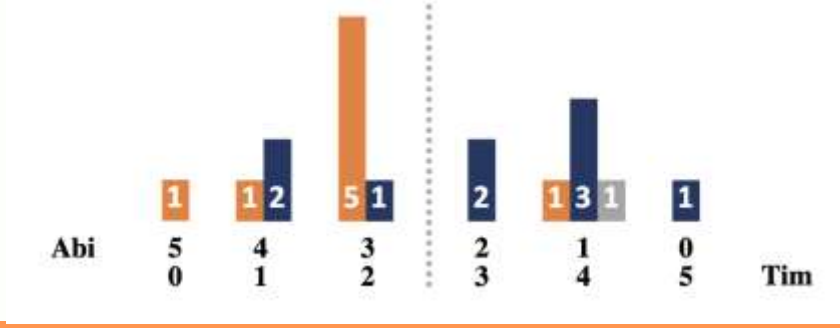
# Becomes a Gender Bias Problem

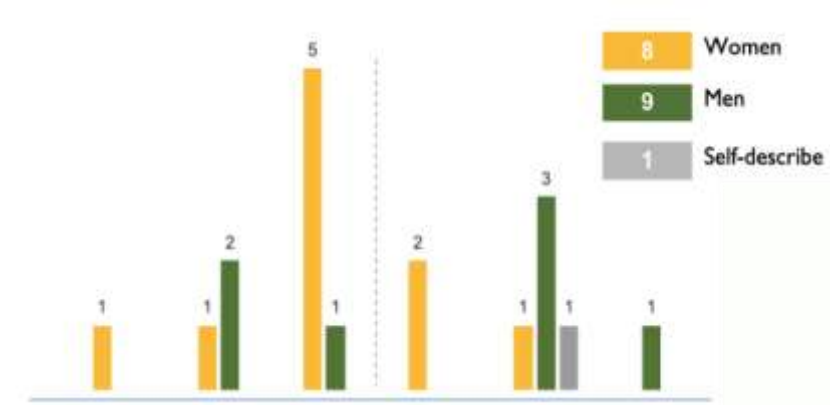



**Individual differences in cognitive style values statistically cluster by gender;**

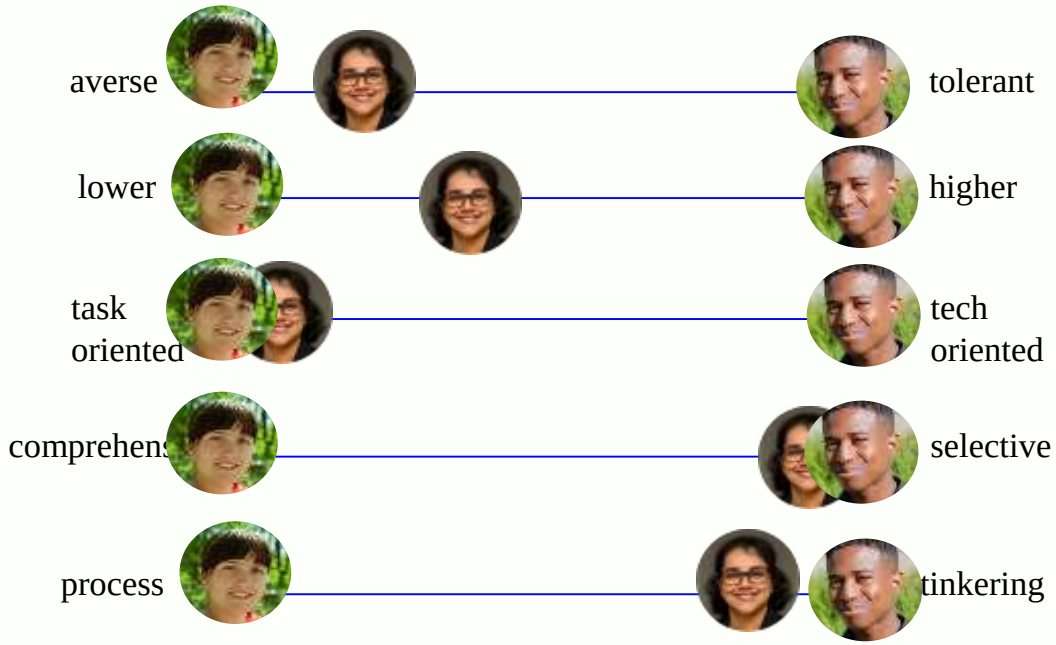
***Hence it becomes a Gender Bias problem***



# Cognitive Diversity + gender

***diverse ways users perceive, process, and interact with information & technology, as well as their approach to problem-solving***

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# Gender differences in preferred cognitive styles

# Abi (Abigail/Abishek)

- 55 years old
- Employed as a Instructor
- Lives in Eugene, OR

Abi has always liked music. When she is on her way to work in the morning, she listens to music that spans a wide variety of styles. But when she arrives at work, she turns it off, and begins her day by *scanning all her emails first to get an overall picture before answering any of them.* (This extra pass takes time but seems worth it.) Some nights she exercises or stretches, and sometimes she likes to play computer puzzle games like Sudoku.

## Background and Skills

Abi works as a part-time instructor. She is comfortable with the technologies she uses regularly, but she just moved to this employer 1 week ago, andthe software systems are new to her.

Abi has never taught using Canvas before or have experience in flipped classroom She likes Math and knows how to think with numbers. She is confident making slides in power point and paper-based grading.

In her free time, she also enjoys working with numbers and logic. she especially likes working out puzzles and puzzle games, either on paper or on the computer.

## Motivations and Attitudes

- ***Motivations***: Abi uses technologies to accomplish her tasks. She learns new technologies if and when she needs to, but prefers to use methods she is already familiar and comfortable with, to keep her focus on the tasks she cares about.
- ***Computer Self-Efficacy***: Abi has lower self confidence than her peers about doing unfamiliar computing tasks. If problems arise with her technology, she often blames herself for these problems. This affects whether and how she will persevere with a task if technology problems have arisen.
- ***Attitude toward Risk***: Abi's life is a little complicated and she rarely has spare time. So she is risk averse about using unfamiliar technologies that might need her to spend extra time on them, even if the new features might be relevant. She instead performs tasks using familiar features, because they're more predictable about what she will get from them and how much time they will take.

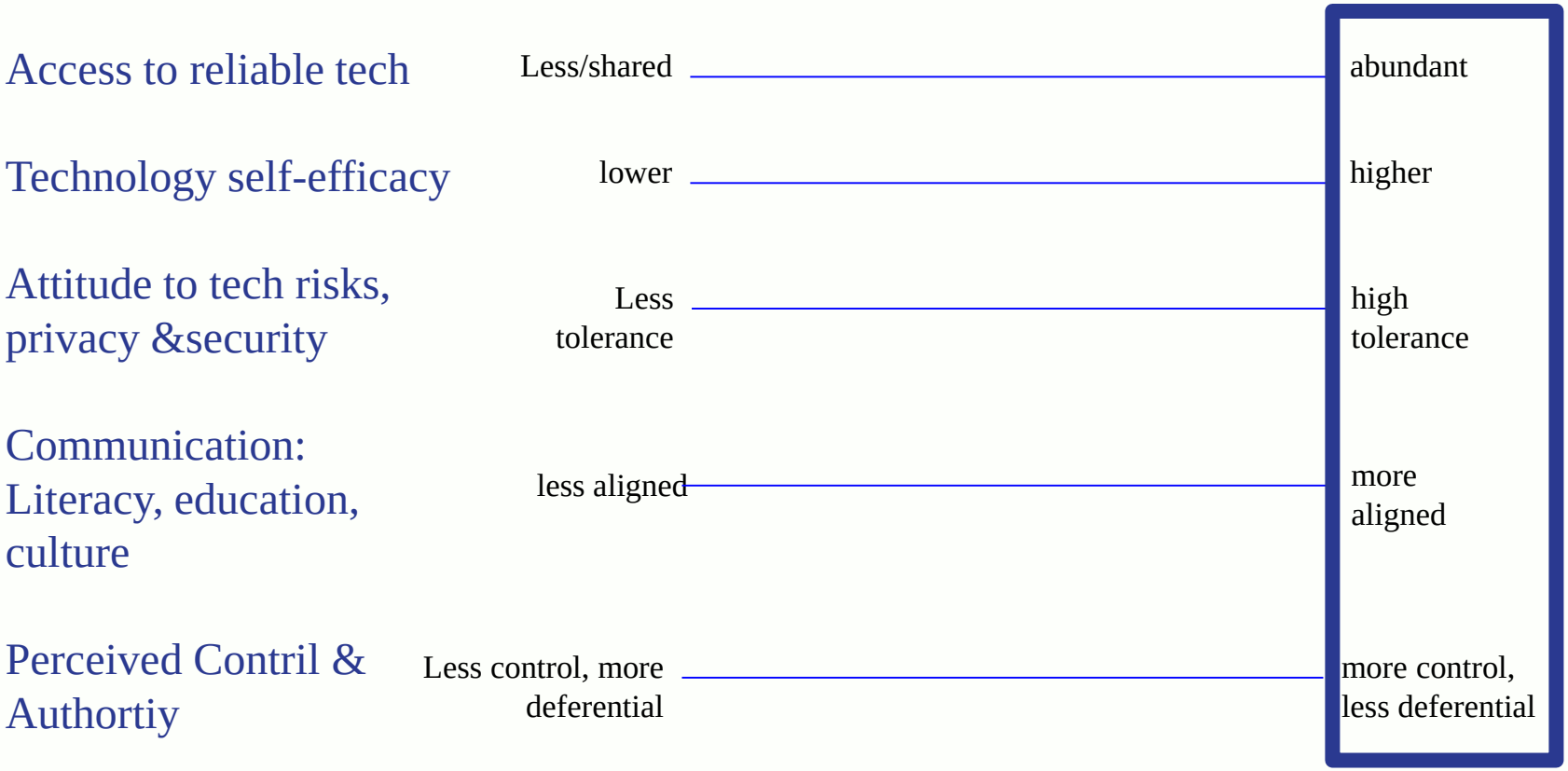
## Attitude to Technology

- ***Information Processing Style***: Abi tends towards a comprehensive information processing style when she needs to gather more information. So, instead of acting upon the first option that seems promising, she gathers information comprehensively to try to form a complete understanding of the problem before trying to solve it. Thus, her style is "burst-y"; first she reads a lot, then she acts on it in a batch of activity.
- ***Learning: by Process vs. by Tinkering*** : When learning new technology, Abi leans toward process-oriented learning, e.g., tutorials, step-by-step processes, wizards, online how-to videos, etc. She doesn't particularly like learning by tinkering with software (i.e., just trying out new features or commands to see what they do), but when she does tinker, it has positive effects on her understanding of the software.

[1]Abi represents users with motivations/attitudes and information/learning styles similar to hers. For data on people similar to and different from Abi, see http://gendermag.org/Foundations.html

# Cognitive Diversity + Socio Economic Status

***diverse ways users perceive, process, and interact with information & technology, as well as their approach to problem-solving***



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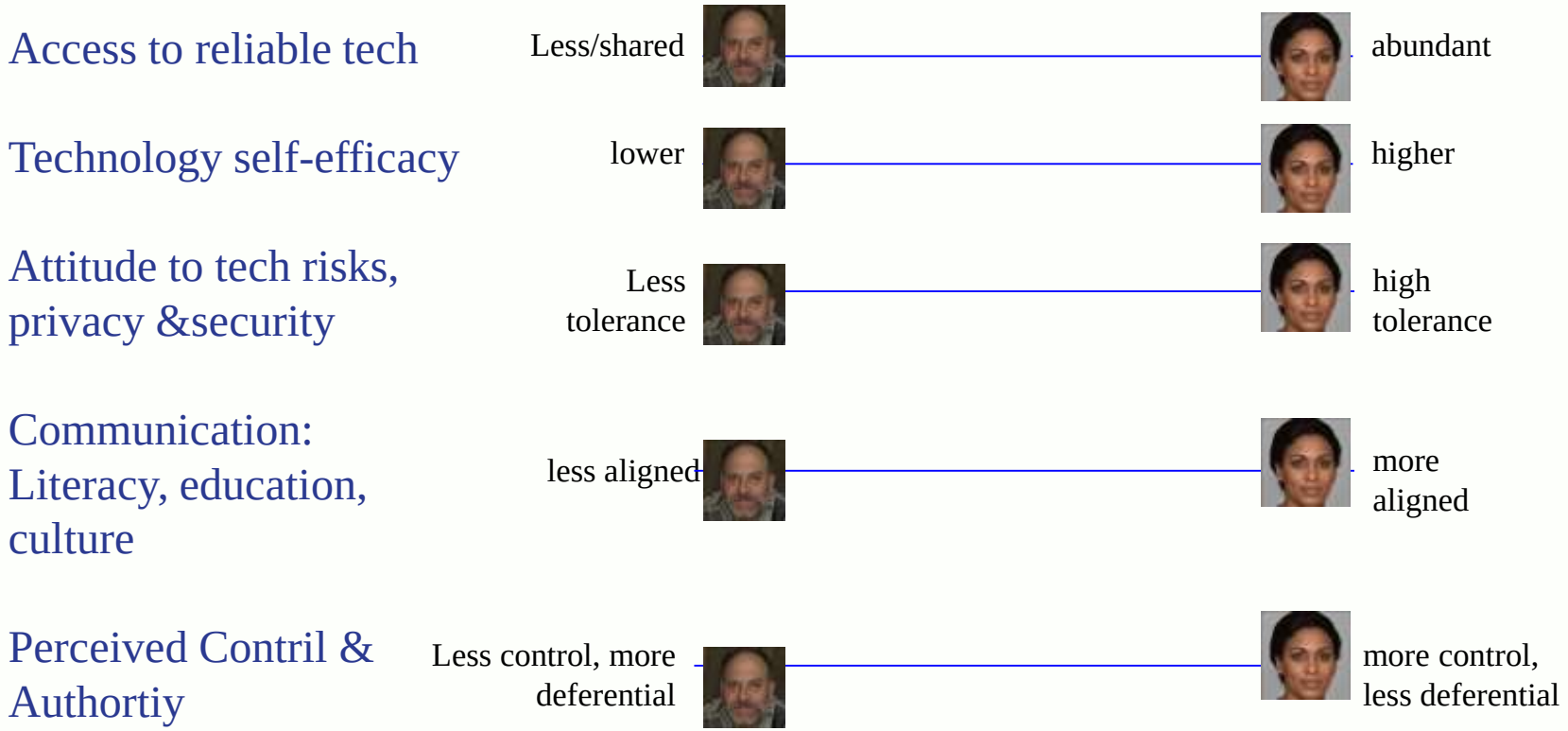


## Dav (David, Davu, Davida)

**Introduction**

Dav is is 50 years old works as a cleaner in London.

**Background/interests:**

She grew up in a housing estate  Hull and had to leave school early to care for her sick parents, who had immigrated from Bangladesh in the 80's.

She then became a single parent herself at age 19 and never returned to education or training. She moved to London to find work and stayed, even though she was far from her family and community. Dav works long hours, and she lives an hour and a half bus ride from where she works but she enjoys reading books that she borrows from the local library during the commute. Dav relaxes by cooking and baking and gardening in her community allotment.

***Access to Reliable Technology:*** Dav has spotty access to reliable devices with reliable internet access, so relies mainly on a mobile phone for internet access. Dav also often uses shared devices or public devices to get work done. This affects how, when, and why Dav uses technology.

***Communication Literacy/Education/Culture:*** Dav went to school in a low-SES community which offered only a basic education. Now Dav rarely chooses to read lengthy or complex text (e.g., newspapers), and some cultural/literary allusions are unfamiliar to Dav. Although the school had a few older computers, it offered little technology education.

***Attitudes toward Technology Risks:*** Dav's life is crowded, so they rarely have spare time. So Dav is risk-averse about using unfamiliar technologies that they might need to spend extra time on, even if the new features might be relevant. Dav instead performs tasks using familiar features, because they're more predictable about what Dav will get from them and how much time they will take.

***Technology Privacy and Security:*** Dav is very protective of their personal information, like their location and identity. Dav's caution stems from their privacy/security being particularly at risk because of having to share devices, prior negative experiences with high surveillance, prior experiences with credit card/identity theft, etc.

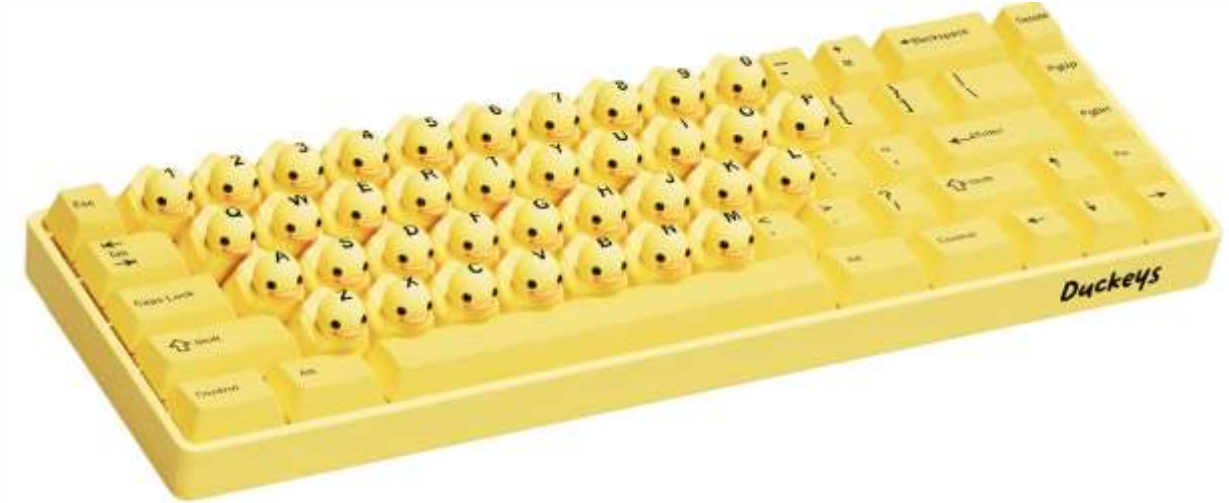
***Perceived Control and Attitude toward Authority:*** Dav does not expect to have much influence over technology's outcomes. Instead, Dav views technology as if it represents an authority figure, so expects technology to treat Dav as other authority figures do.

***Technology Self-Efficacy:*** Dav's prior experiences and education have produced a lower technology self-efficacy than their peers about using unfamiliar technology features. If problems arise with technology, Dav often blames themselves for these problems. This affects whether and how they will persevere with a task.

# Activity

# Design keyboard

Take 5 minutes to design your vision of an ideal keyboard




https://www.tiktok.com/@duckeycaps/video/7331422168388996395?lang=en

# Your keyboard design


https://www.macrumors.com/2020/12/29/apple-researching-keyboards-with-displays-on-keys/