HUMAN CENTERED DESIGN

HUMAN CENTERED DESIGN

*« **Human-centered design** (**HCD**) or User Centered Design (UCD) is a design and management framework that develops solutions to problems **by involving the human perspective in all steps** of the problem-solving process. »*

Human involvement typically takes place in observing the problem within context, brainstorming, conceptualizing, developing, and implementing the solution.

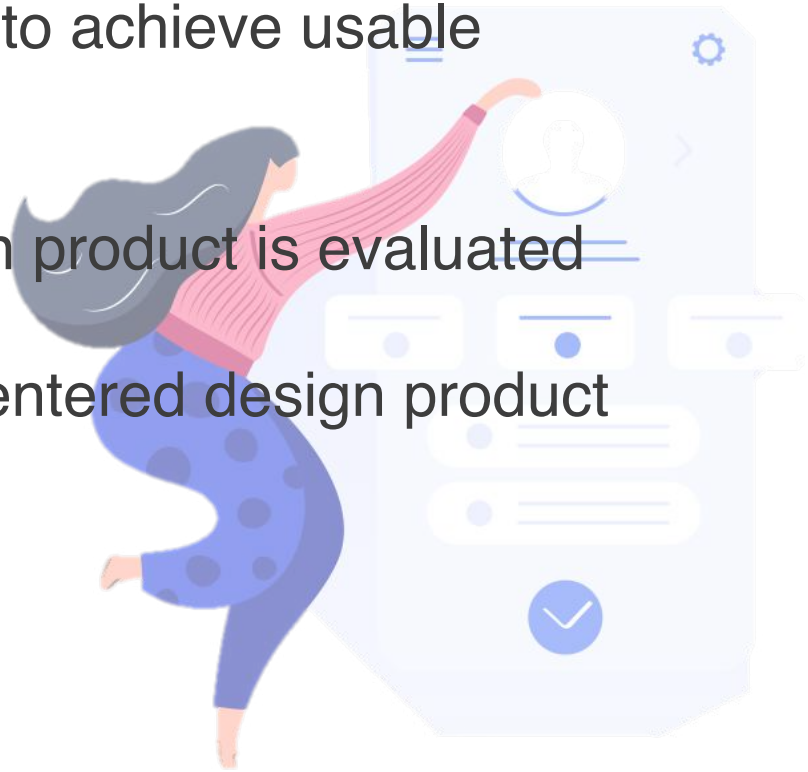
HCD, USABILITY AND USER EXPERIENCE

- **Human-centred design** is a framework that considers human perspectives throughout the design process.
- **User experience design** is the design of multisensory experiences, typically at the interface between humans and technology. It is one of many design disciplines that takes a human-centred approach.
- **Usability** is a measure of how well a specific user in a specific context can use a product/design to achieve a defined goal effectively, efficiently and satisfactorily.

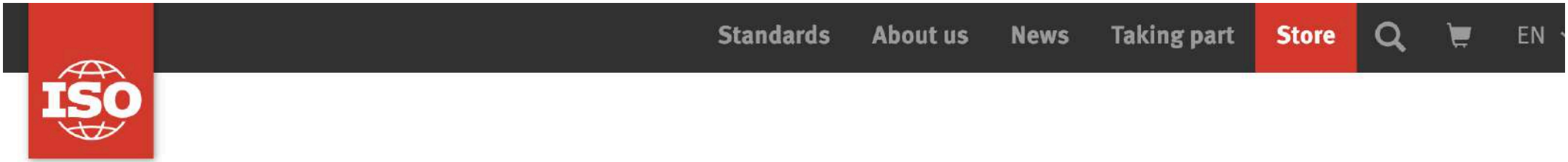
Def. By Francesca Elisia

HCD, USABILITY AND USER EXPERIENCE

- **Human-centered design** is what you do to achieve usable systems
- **Usability** is *a way* a user-centered design product is evaluated
- **User Experience (UX)** is *a way* a user-centered design product is evaluated



ISO ON HUMAN-CENTERED DESIGN



ICS › 13 › 13.180

ISO 9241-210:2019

Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems

ISO ON HUMAN-CENTERED DESIGN

Principles of human-centered design:

- **Active involvement of users**
- Appropriate allocation of function between user and system
- **Iteration** of design solutions
- Multidisciplinary design teams

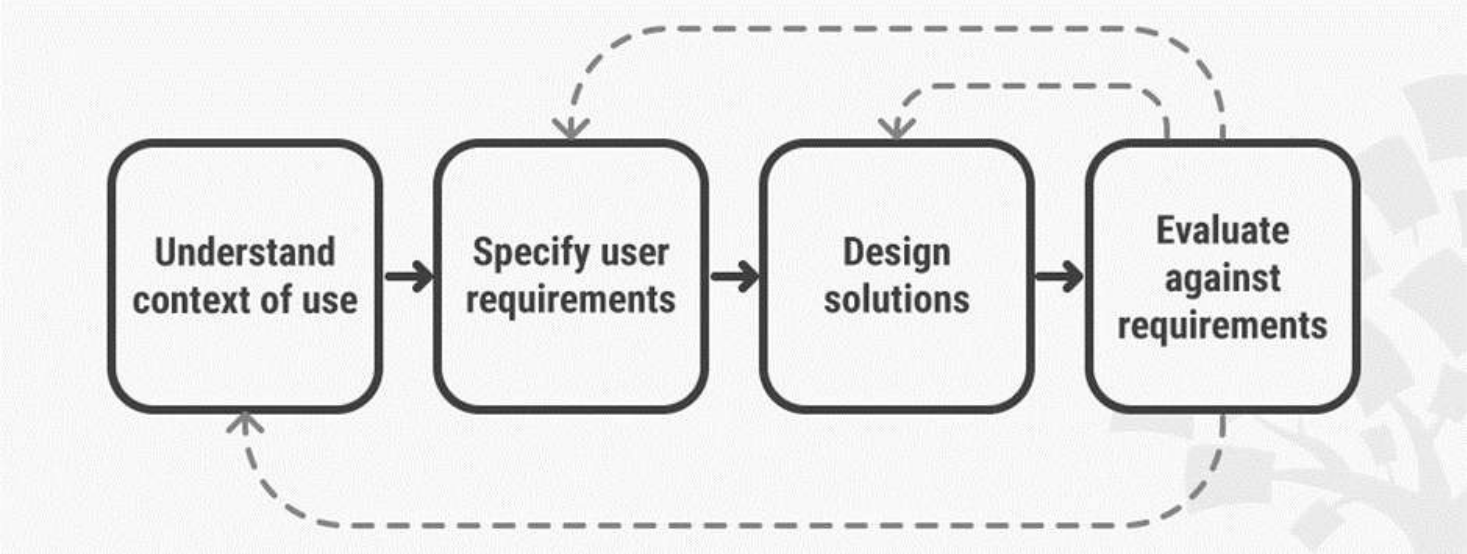
THE USE OF AN ITERATIVE DESIGN CYCLE

- Iterative design is a process where an interface is progressively developed and improved over a series of iterations, each the result of user testing and feedback.

- In its simplest form, the iterative design cycle can be said to have three phases: **design, test, redesign**. These phases operate in a continual cycle (in theory that is; in practice iterations are limited by budgetary considerations) so that designs are continually evaluated and improved.

PRINCIPLES FOR HCD/UCD

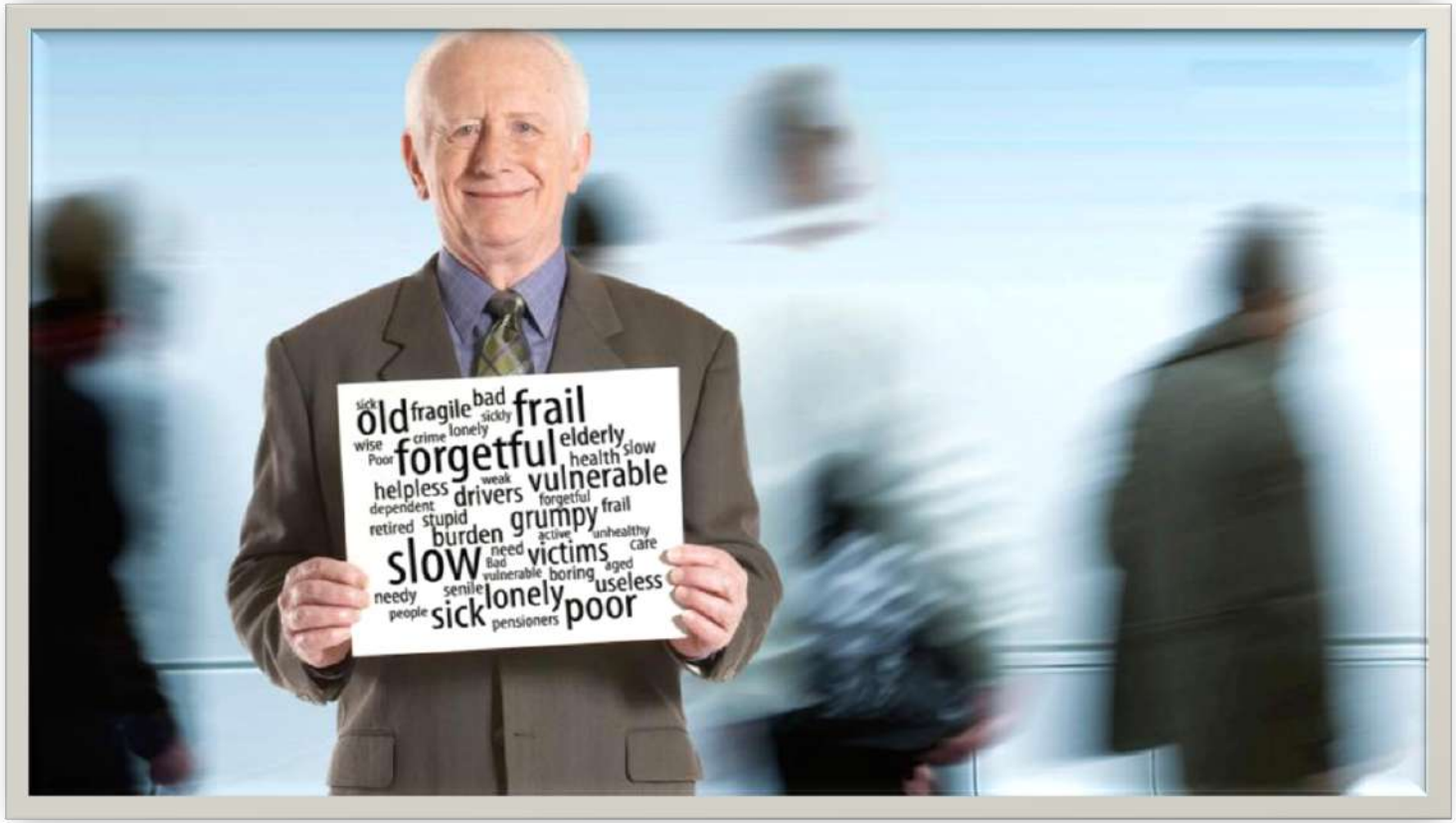
- Early focus on users
- Empirical measuremen
- Iterative design



ELEMENTS OF USER-CENTERED DESIGN?

- Is an approach to interactive system development that focuses specifically on making products/web interfaces **usable**.
- The **quality** of interaction between the person who uses the product to achieve actual work and the product itself is the primary goal of user-centered design. (Usability + User eXperience)
- User-centered systems **empower** users and motivate them to learn and explore new system solutions

THE AVERAGE USER DOES NOT EXIST



Johanna Quaas, 86

WHAT IS A HUMAN-CENTERED APPROACH?

User-centered approach is based on:

- Early focus on users and tasks: directly studying cognitive, behavioral, anthropomorphic & attitudinal characteristics
- Empirical measurement: users' reactions and performance to scenarios, manuals, simulations & prototypes are observed, recorded and analysed
- Iterative design: when problems are found in user testing, fix them and carry out more tests

UNDERSTANDING HUMAN BEHAVIOUR IS INDISPENSABLE, AND PSYCHOLOGY IS A VITAL TOOL FOR UX/UI DESIGNERS.

WHAT ARE ‘NEEDS’?

- Users rarely know what is possible
- Users can’t tell you what they ‘need’ to help them achieve their goals

Instead, look at existing tasks:

- their context
- what information do they require?
- who collaborates to achieve the task?
- why is the task achieved the way it is?

UNDERSTANDING HUMAN BEHAVIOUR IS INDISPENSABLE, AND PSYCHOLOGY IS A VITAL TOOL FOR UX/UI DESIGNERS.

User Centered Design is based upon a user's abilities and real needs, context, work, tasks. Interface design focus on the user rather than forcing the users to change their behavior to accommodate the product.

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BEFORE DEVELOPING

UNIVERSAL DESIGN

UNIVERSAL DESIGN

- Universal Design is **about designing systems so that they can be used by anyone in any circumstance**
- Universal Design is the process of designing products so that they can be used by as many people as possible in as many situations as possible

(Nurul Ihsaniah Omar)

UNIVERSAL DESIGN IS A FORM OF HUMAN CENTERED DESIGN

In reality, we may not be able to design everything to be accessible to everyone. But we can work toward the aim of universal design.

UNIVERSAL DESIGN

Universal Design in Architecture and Physical Environments – design of structures that anticipates the needs of individuals with disabilities and accommodates these needs from the outset

UNIVERSAL DESIGN

- Universal Design is primarily about trying to ensure that you do not exclude anyone through the design choices you make but, by giving thought to these issues, you will invariably make your design better for everyone
- Universal design means designing for diversity
  - **people with sensory, physical or cognitive impairment**
  - **people of different ages**
  - **people from different cultures or backgrounds**

IT'S ABOUT A CHANGE OF MINDSET

Equality

Equity

Accessibility

THE 7 PRINCIPLES OF UNIVERSAL DESIGN

1. Equitable Use
2. Flexibility in Use
3. Simple and Intuitive
4. Perceptible Information
5. Tolerance for Error
6. Low Physical Effort
7. Size and Space for Approach and Use

PRINCIPLE 1: EQUITABLE USE

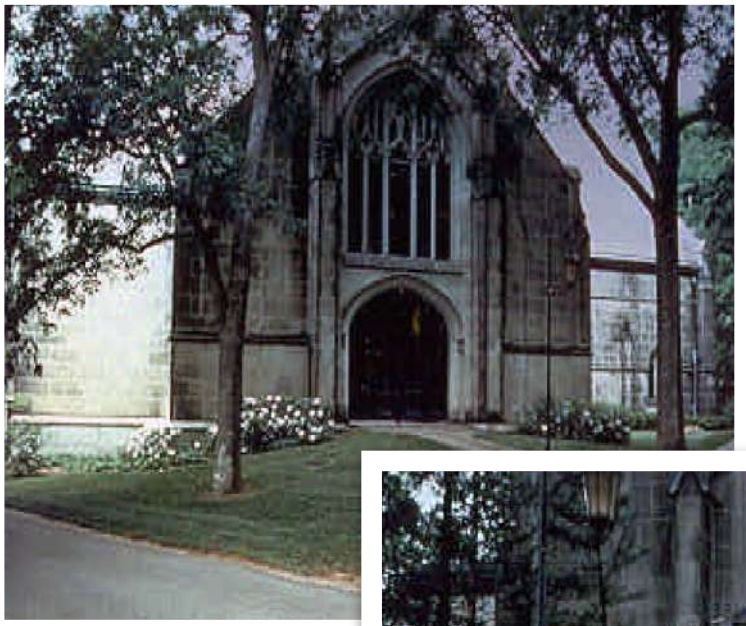
Principle 1: Equitable Use
The design is useful and marketable to people with diverse abilities.

Guidelines:

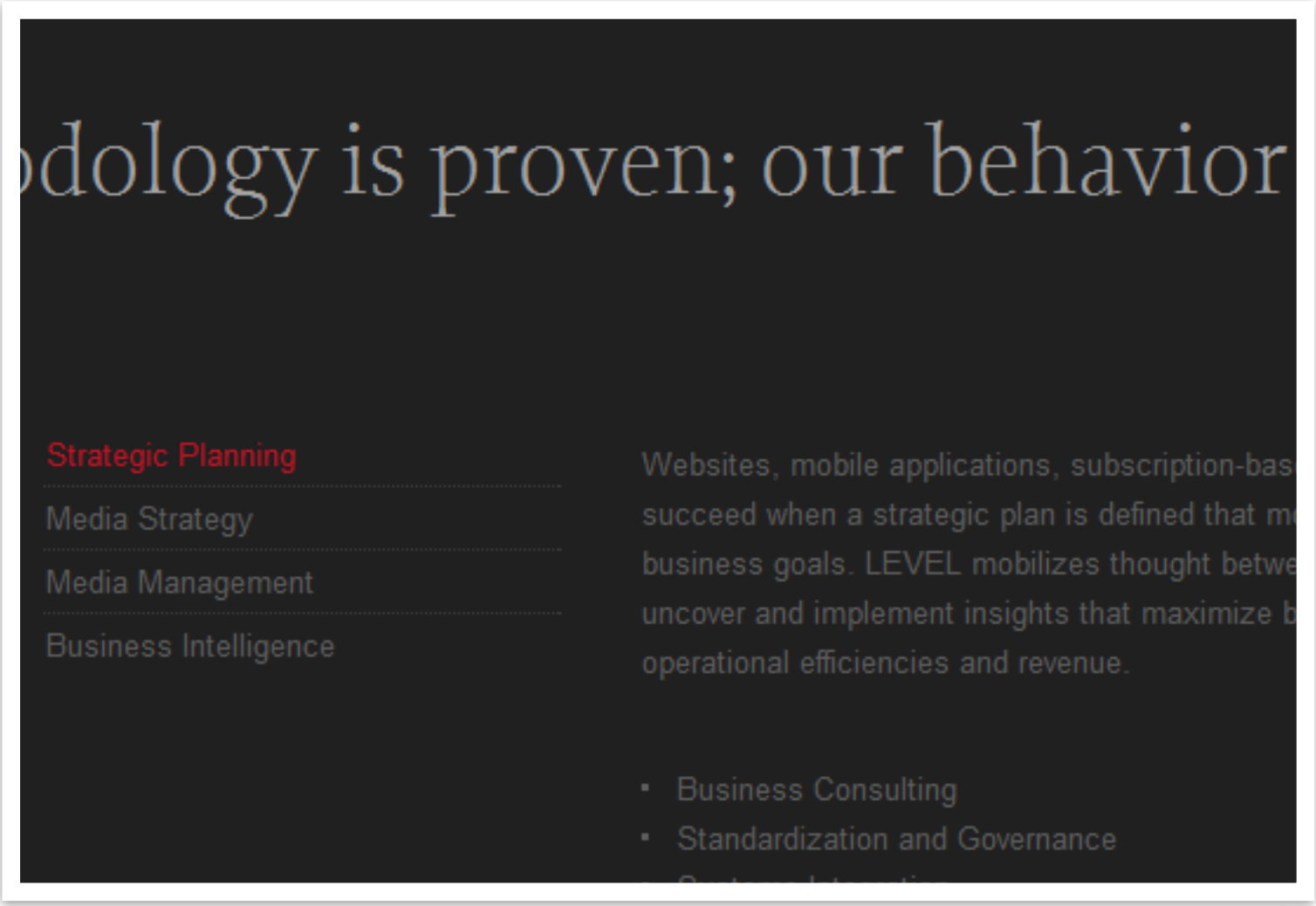
- 1a. Provide the same means of use for all users: **identical whenever possible; equivalent when not.**
- 1b. Avoid segregating or stigmatizing any users.
- 1c. Provisions for privacy, security, and safety should be equally available to all users.
- 1d. Make the design appealing to all users.

Universal Design principles

PROVIDE THE SAME MEANS OF USE FOR ALL USERS: **IDENTICAL WHENEVER POSSIBLE; EQUIVALENT WHEN NOT.**

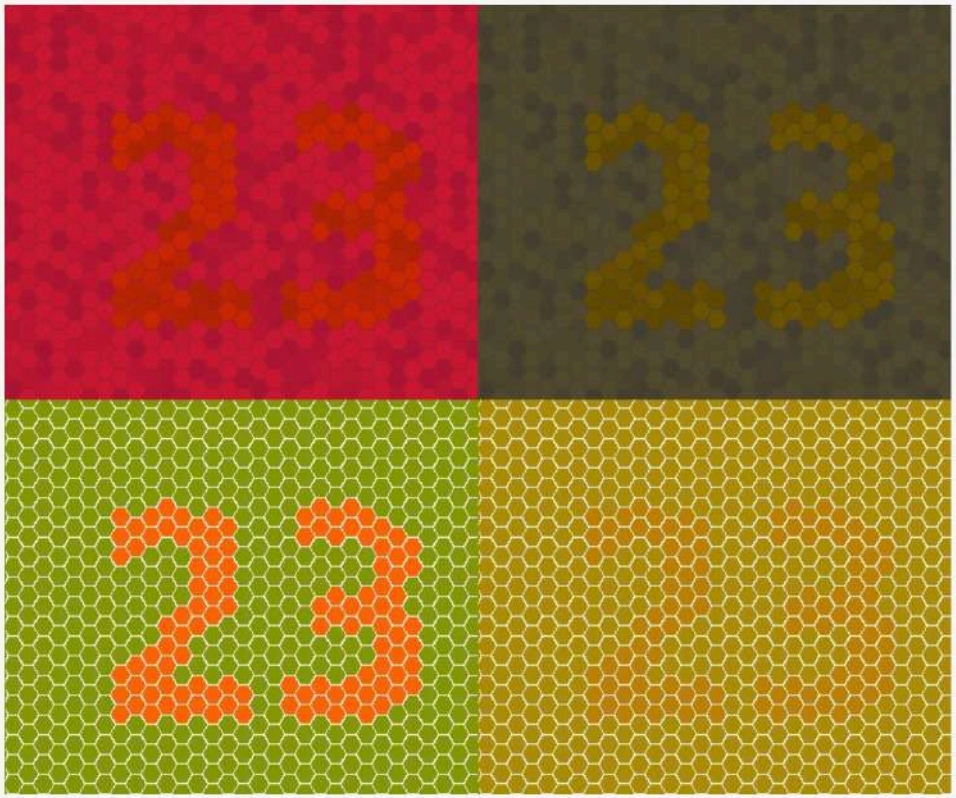


A BAD EXAMPLES:
A WEBSITE DIFFICULT TO READ



You should use something that is usable by the majority of users

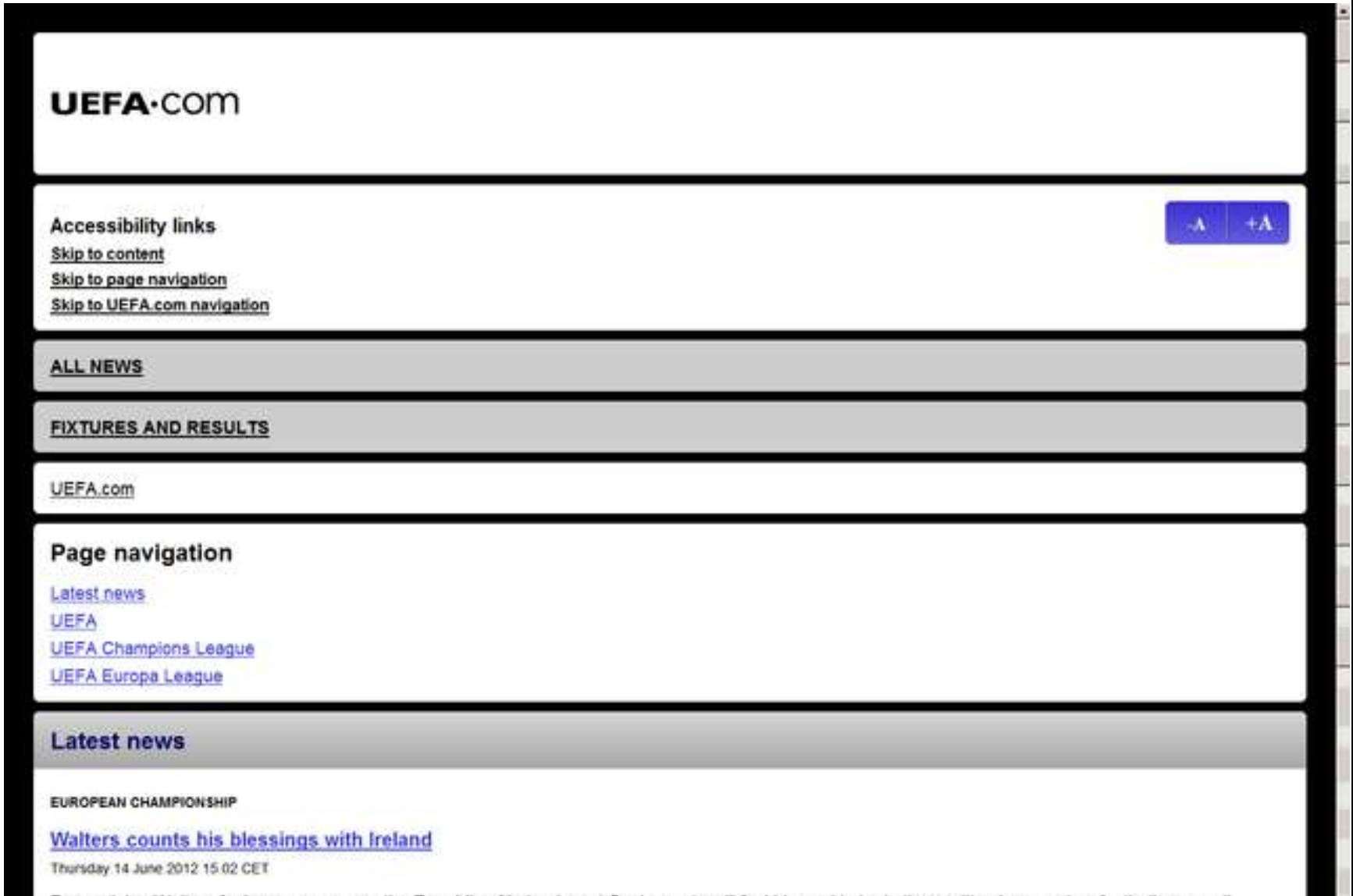
DESIGN EXAMPLE: USE STRONG COLOUR CONTRAST TO AVOID STIGMATIZING USERS WITH COLOUR BLINDNESS

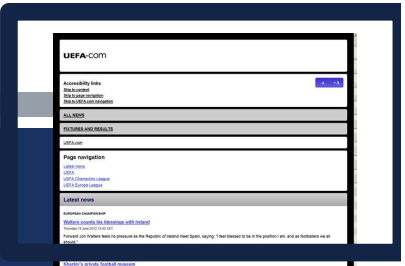


Colour blindness - deuteranomaly (red/green distinction). On the left are two pictures as seen by a person with "normal" vision. On the right, the same pictures are simulated as seen by a person with deuteranomaly. When you choose colours for your design, make sure to avoid red/green combinations.

A BAD EXAMPLE: A STRANGE IDEA OF ACCESSIBLE VERSION

A BAD EXAMPLE: A STRANGE IDEA OF ACCESSIBLE VERSION





TEXT TO SPEECH READERS

Text-to-speech (TTS) is a type of assistive technology that reads digital text aloud. It's sometimes called "read aloud" technology.

Now think about the previous « accessible » website…..

How many seconds before you go on cognitive overload ?

How are you supposed to make choices about where to go next ?

PRINCIPLE 2: FLEXIBILITY IN USE

The design accommodates a wide range of individual preferences and abilities.

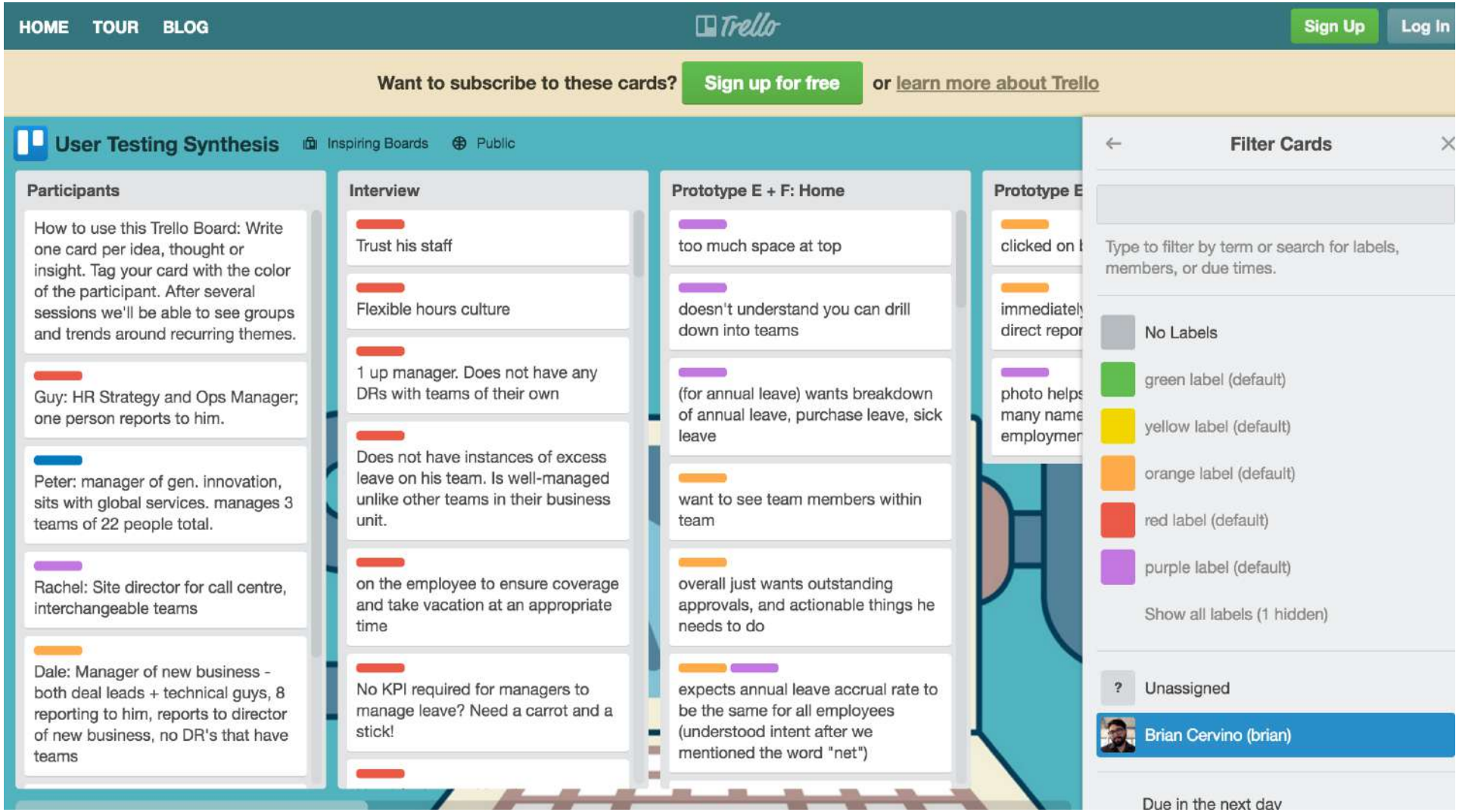
Guidelines:

- 2a. Provide choice in methods of use.
- 2b. Accommodate right- or left-handed access and use.
- 2c. Facilitate the user's accuracy and precision.
- 2d. Provide adaptability to the user's pace.

DOES THE DESIGN PROVIDE CHOICE IN METHOD OF USE?

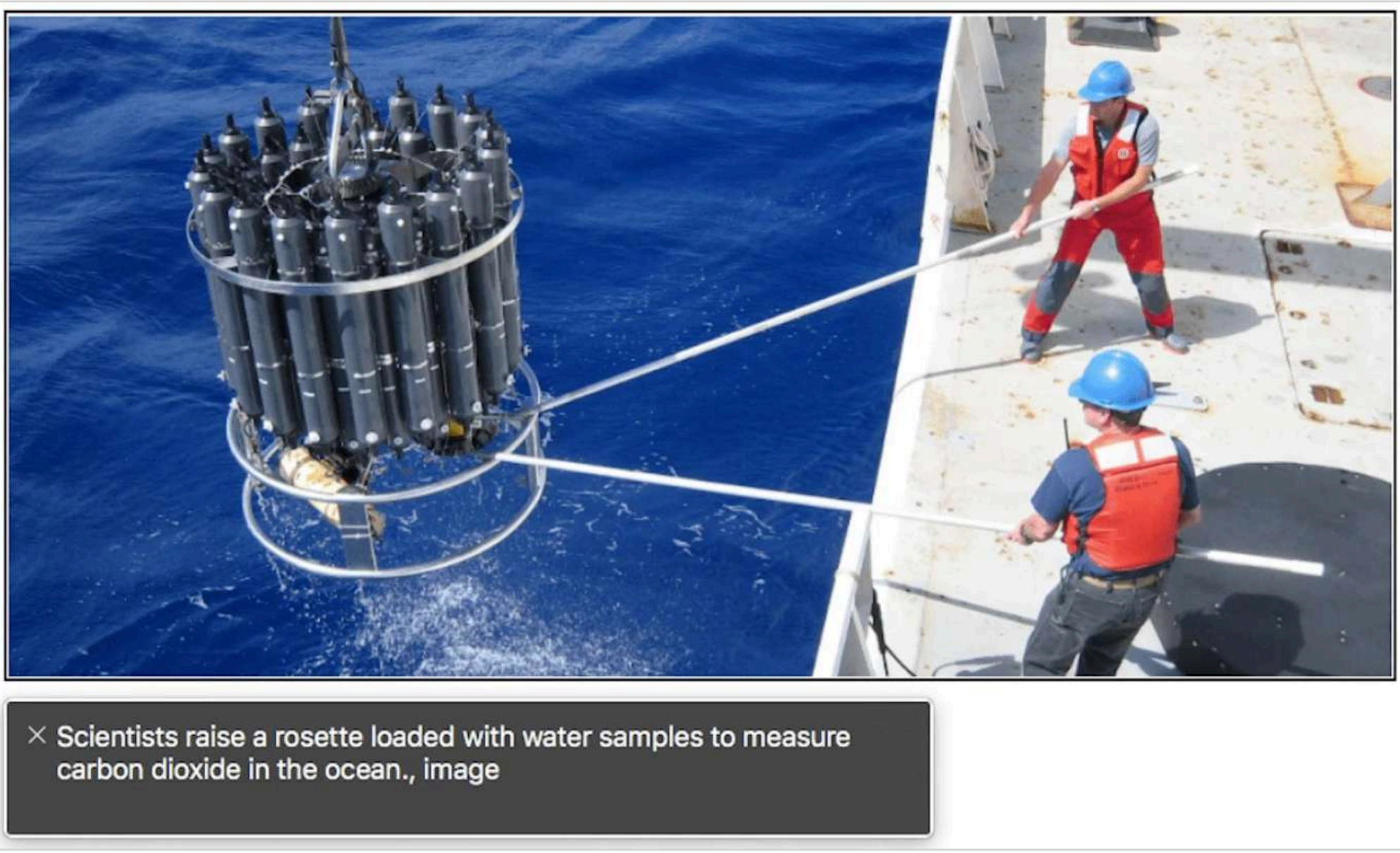
ACCOMMODATE INDIVIDUAL PREFERENCE?

CHOICES AND PREFERENCES IN WEBSITES AND APP? CUSTOMIZATION

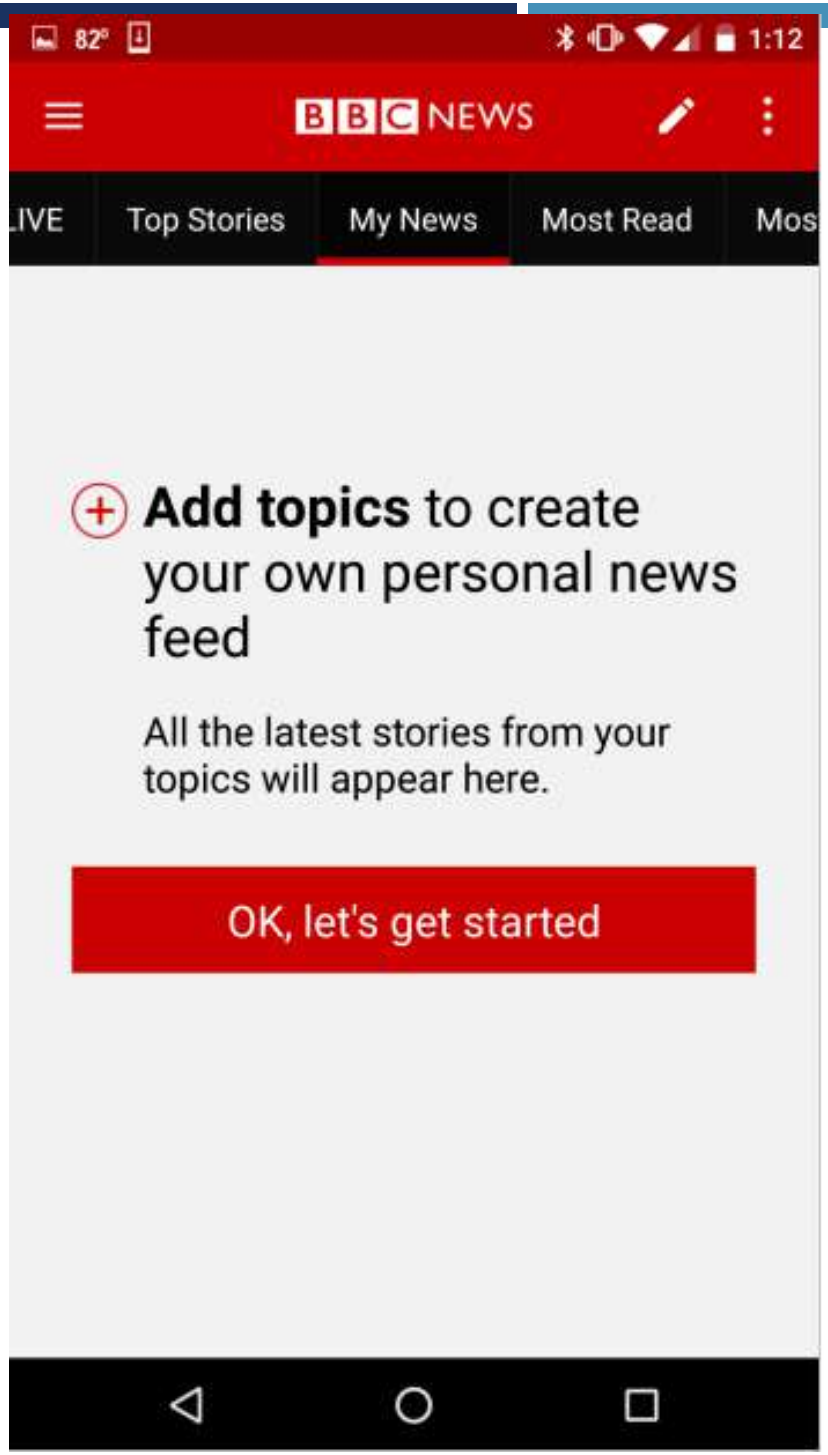


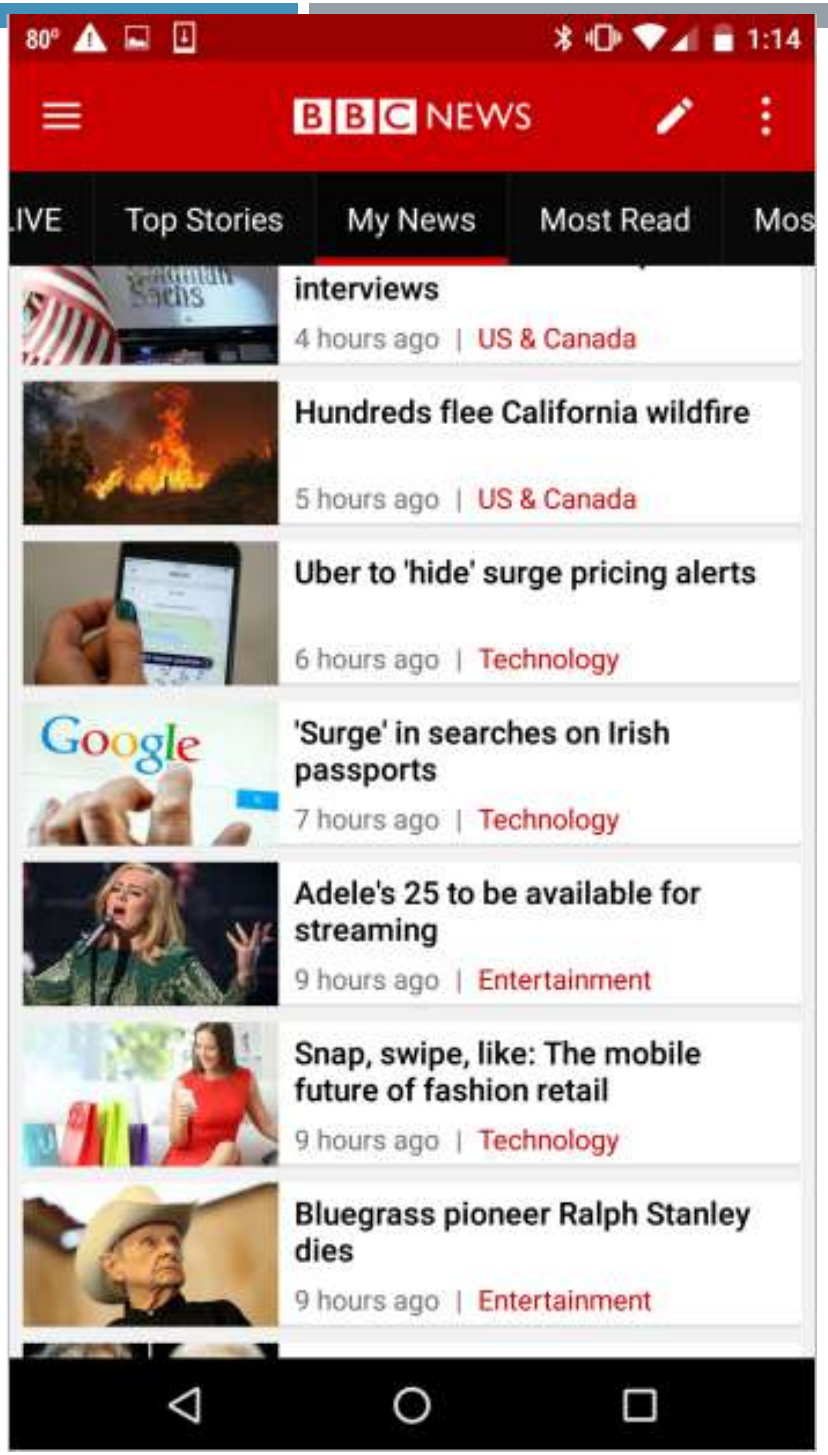
https://www.interaction-design.org

DOES THE PRODUCT ADAPT TO PEOPLE'S NEEDS AND ABILITIES?



Apple screen reader VoiceOver reads helpful alt text from NOAA.gov.


82°
1:12
BBC NEWS
LIVE
Top Stories
My News
Most Read
Mos
Add topics to create your own personal news feed
All the latest stories from your topics will appear here.
OK, let's get started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Mos
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4 hours ago | US & Canada
Hundreds flee California wildfire
5 hours ago | US & Canada
Uber to 'hide' surge pricing alerts
6 hours ago | Technology
'Surge' in searches on Irish passports
7 hours ago | Technology
Adele's 25 to be available for streaming
9 hours ago | Entertainment
Snap, swipe, like: The mobile future of fashion retail
9 hours ago | Technology
Bluegrass pioneer Ralph Stanley dies
9 hours ago | Entertainment

PRINCIPLE 3: SIMPLE AND INTUITIVE

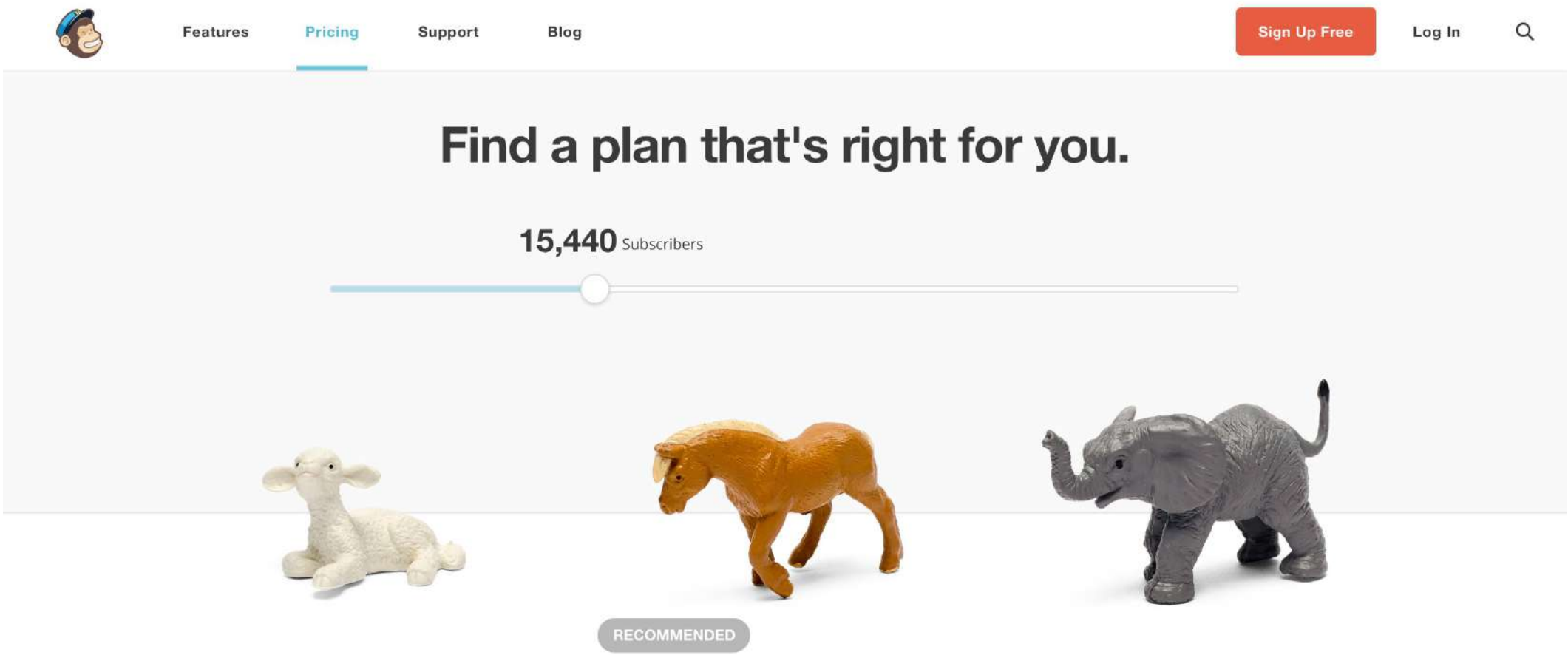
Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Guidelines:

- 3a. Eliminate unnecessary complexity.
- 3b. Be consistent with user expectations and intuition.
- 3c. Accommodate a wide range of literacy and language skills.
- 3d. Arrange information consistent with its importance.
- 3e. Provide effective prompting and feedback during and after task completion.

IS IT EASY TO UNDERSTAND? CAN YOU MAKE IT WORK?

SIMPLE AND INTUITIVE: COGNITIVE AND VISUAL ELEMENTS



https://www.interaction-design.org

PRINCIPLE 4: PERCEPTIBLE INFORMATION

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

Guidelines:

- 4a. **Use different modes (pictorial, verbal, tactile) for redundant** presentation of essential information.
- 4b. Provide adequate contrast between essential information and its surroundings.
- 4c. Maximize "legibility" of essential information.
- 4d. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- 4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

DOES THE DESIGN USE DIFFERENT MODES FOR PRESENTATION?

Auditory and visual stimuli

DOES THE ENVIRONMENT HELP YOU FIND YOUR WAY?

A BAD EXAMPLE: VISUAL NOISE

PRINCIPLE 4: PERCEPTIBLE INFORMATION

TEDxHouston · Filmed June 2010 · 20:19

Brené Brown: The power of vulnerability

Watch next

Barry Schwartz: Our loss of wisdom

Return to talk

Subtitles and Transcript

Select language

English

0:12 So, I'll start with this: a couple years ago, an event planner called me because I was going to do a speaking event. And she called, and she said, "I'm really struggling with how to write about you on the little flyer." And I thought, "Well, what's the struggle?" And she said, "Well, I saw you speak, and I'm going to call you a researcher, I think, but I'm afraid if I call you a researcher, no one will come, because they'll think you're boring and irrelevant."

0:36 (Laughter)

0:37 And I was like, "Okay." And she said, "But the thing I liked about your talk is you're a storyteller. So I think what I'll do is just call you a storyteller." And of course, the academic, insecure part of me was like, "You're going to call me a what?" And she said, "I'm going to call you a storyteller." And I was like, "Why not 'magic pixie'?"

0:56 (Laughter)

0:59 I was like, "Let me think about this for a second." I tried to call deep on my courage. And I thought, you know, I am a storyteller. I'm a qualitative researcher. I collect stories; that's what I do. And maybe stories are just data with a soul. And maybe I'm just a storyteller. And so I said, "You know what? Why don't you just say I'm a researcher-storyteller." And she went, "Ha ha. There's no such thing."

1:25 (Laughter)

1:27 So I'm a researcher-storyteller, and I'm going to talk to you today -- we're talking about expanding perception -- and so I want to talk to you and tell some stories about a piece of my research that fundamentally expanded my perception and really actually changed the way that I live and love and work

PERCEPTIBLE INFORMATION

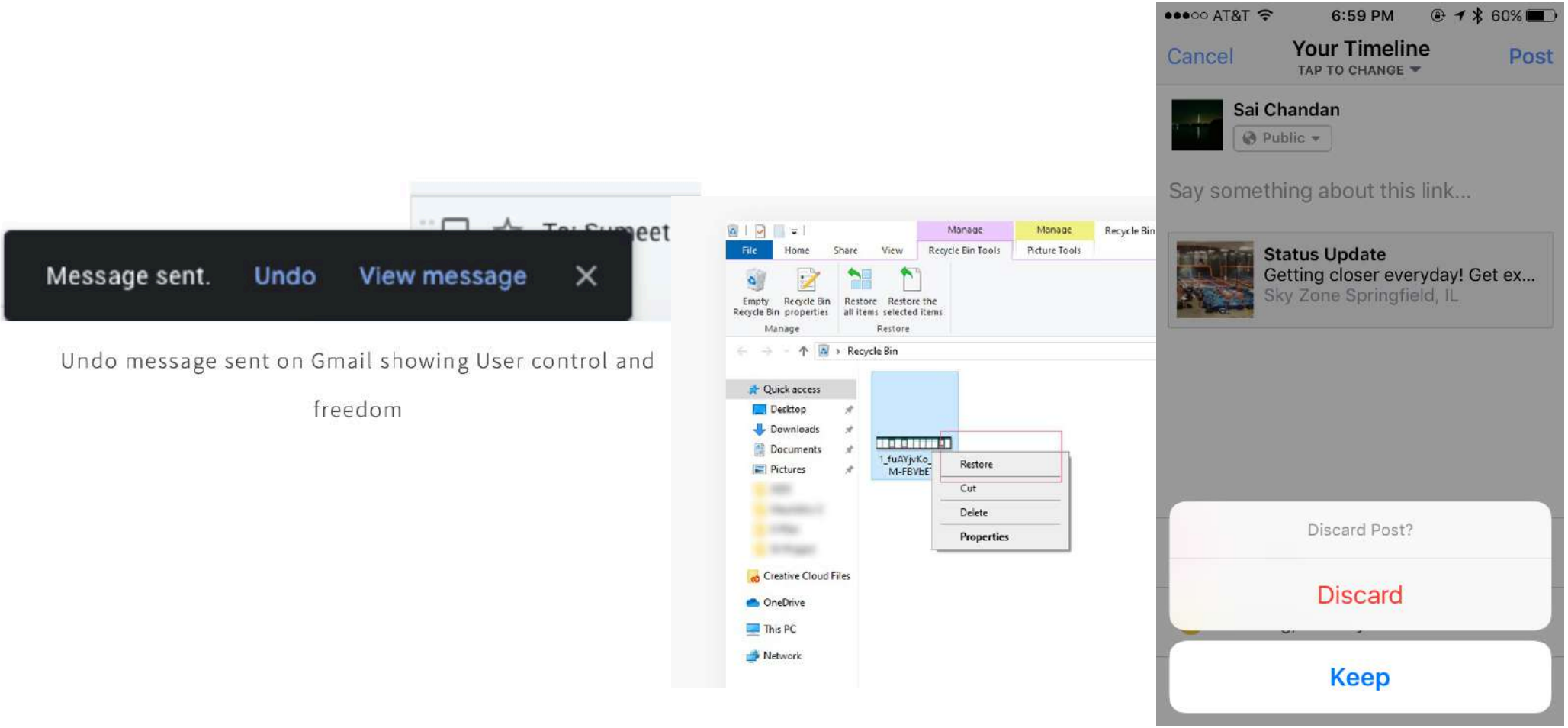
Figure 2-1. The parts of a URL.

PRINCIPLE 5: TOLERANCE FOR ERROR

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

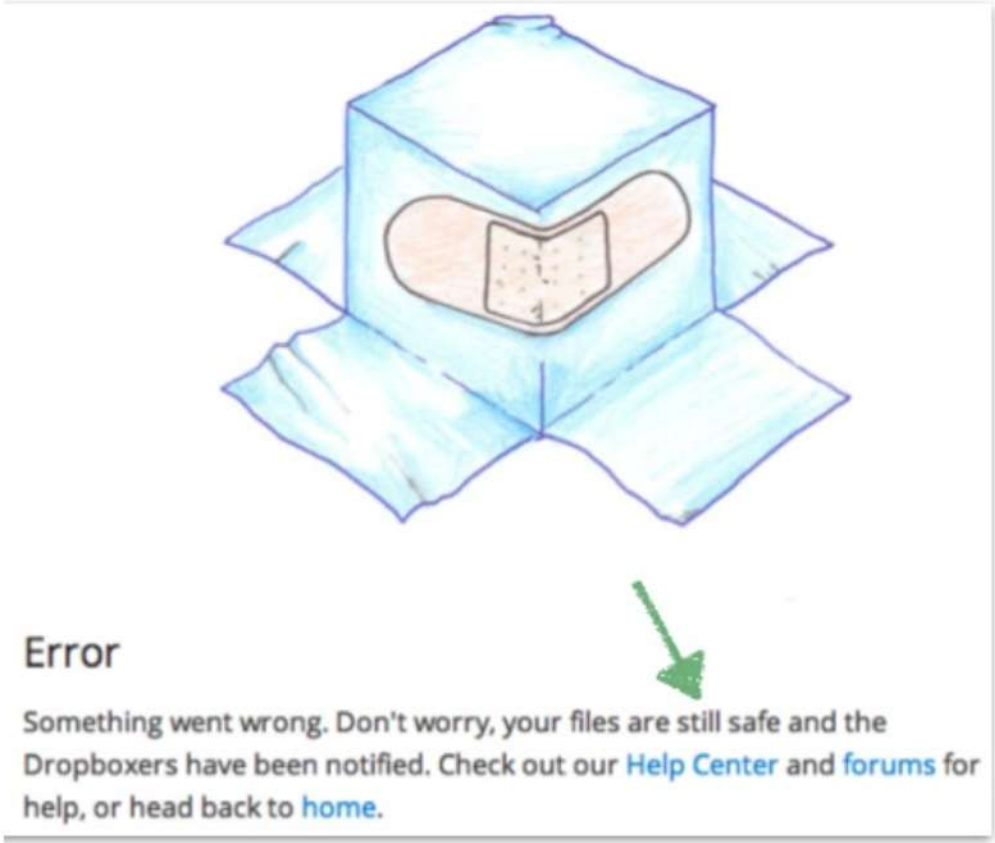
Guidelines:

- 5a. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- 5b. Provide warnings of hazards and errors.
- 5c. Provide fail safe features.
- 5d. Discourage unconscious action in tasks that require vigilance.

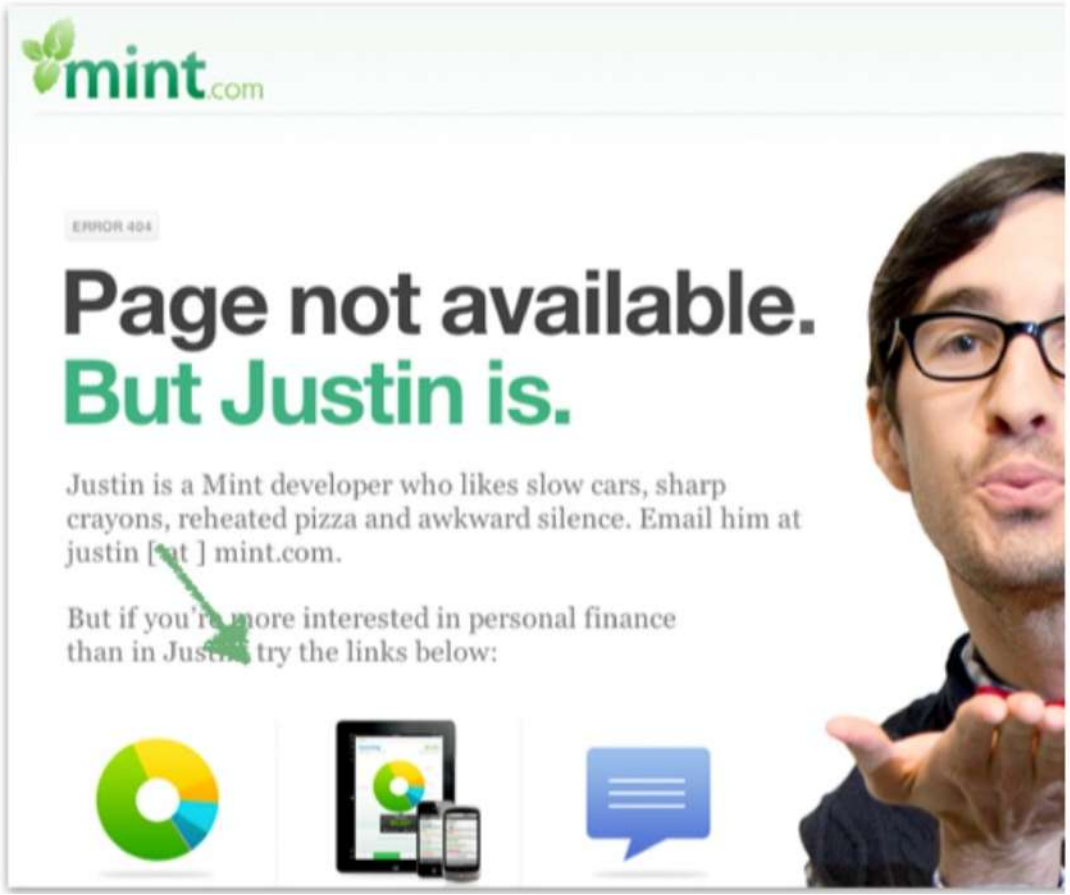


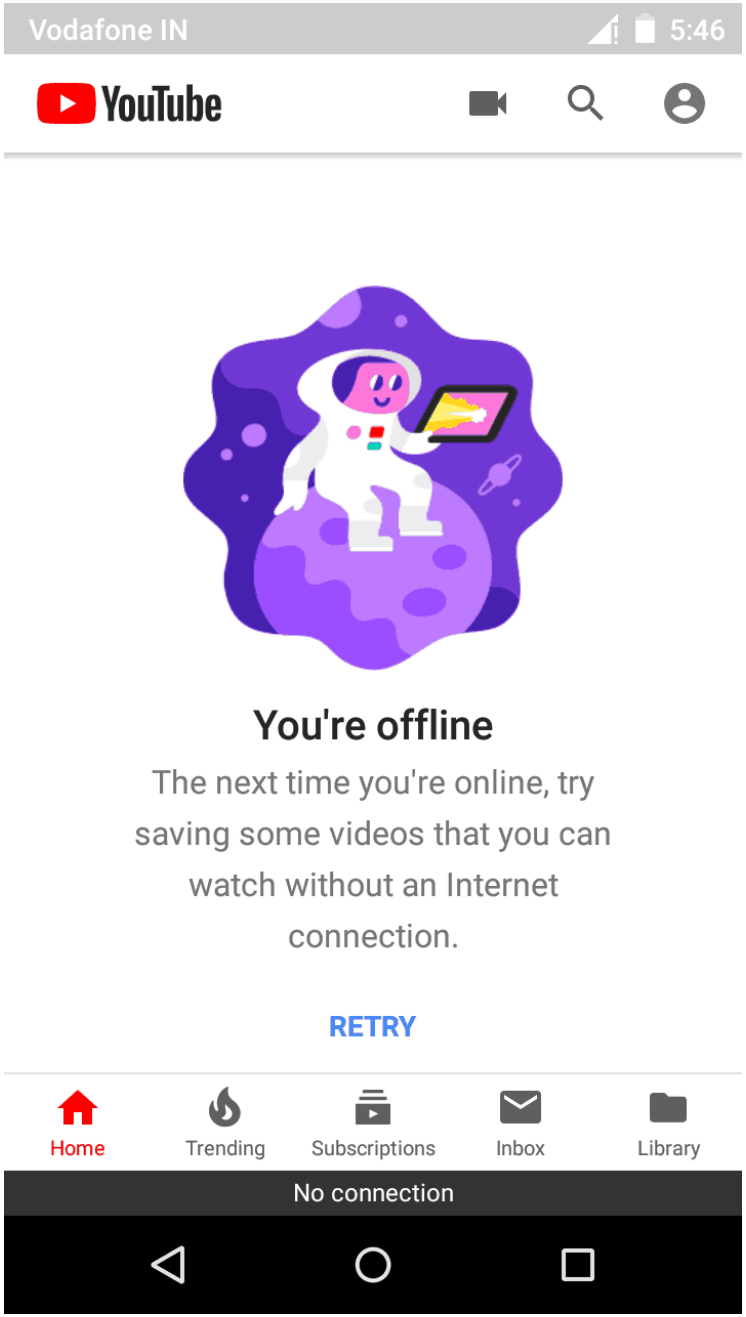
Undo message sent on Gmail showing User control and freedom

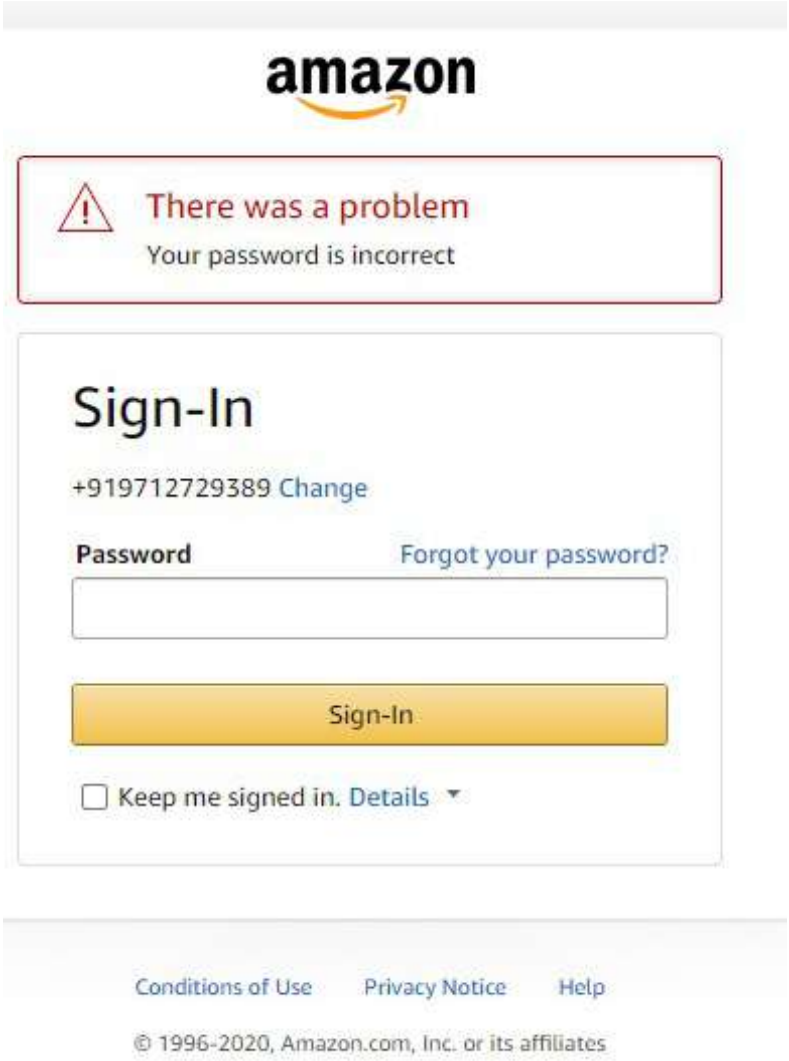
An assuring error message on Dropbox



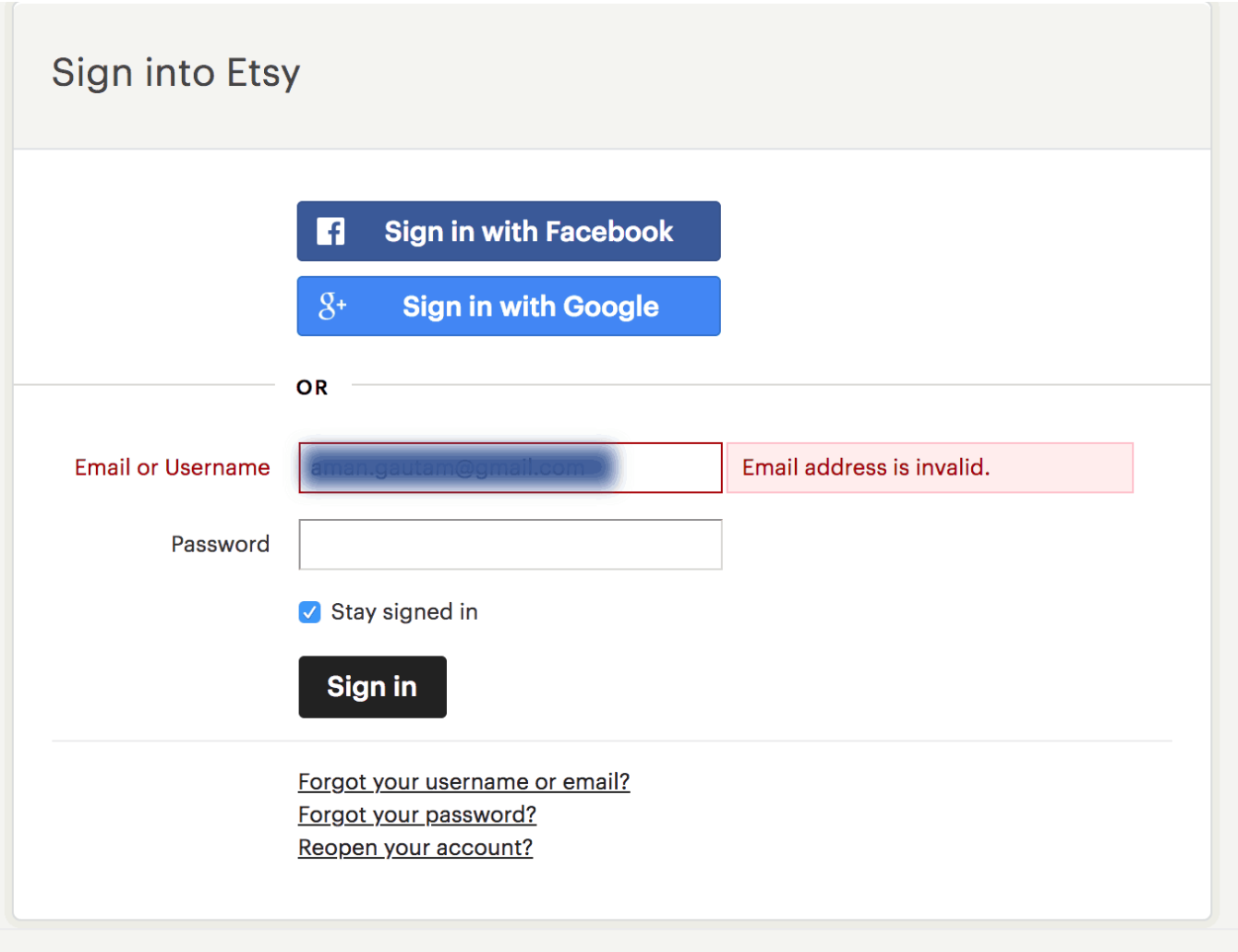
A funny message keeps the audience engaged, while relevant links make sure they stay on your website.





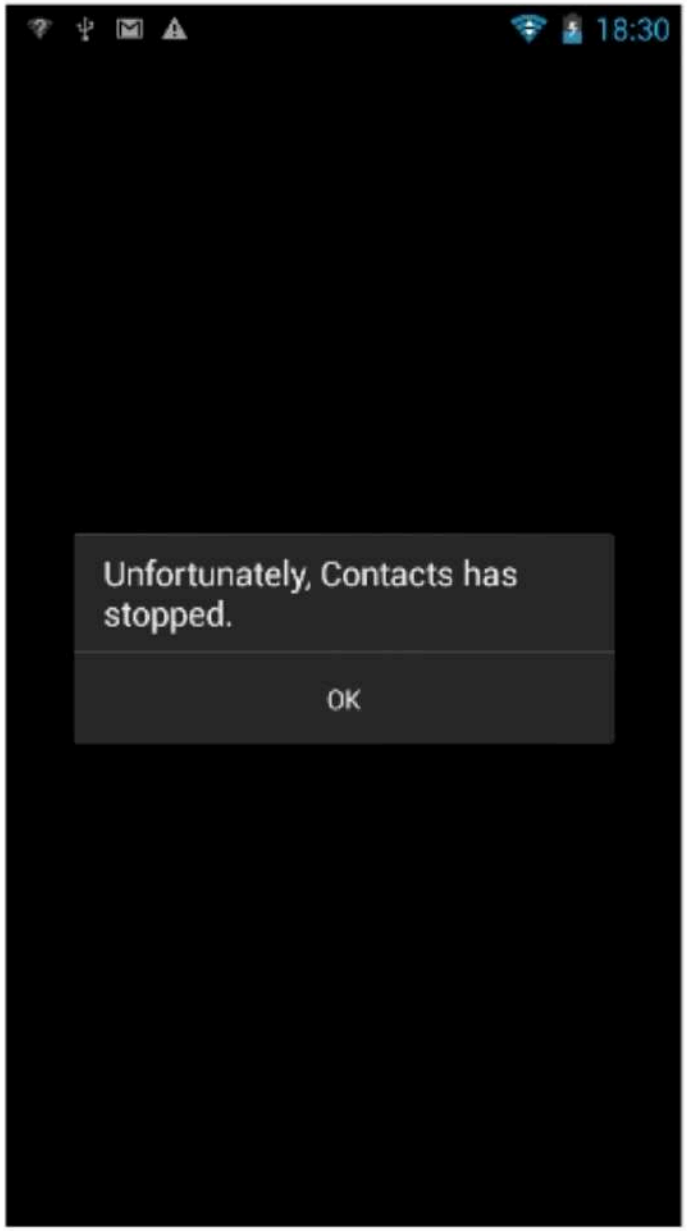


Never let the user guess what is the problem



People with visual disabilities and color blindness cannot rely on colors only to identify errors.
Adding text is thus a good solution for everybody

Don't tell people that something's broken and can't be fixed.



PRINCIPLE 6: LOW PHYSICAL EFFORT

The design can be used efficiently and comfortably and with a minimum of fatigue.

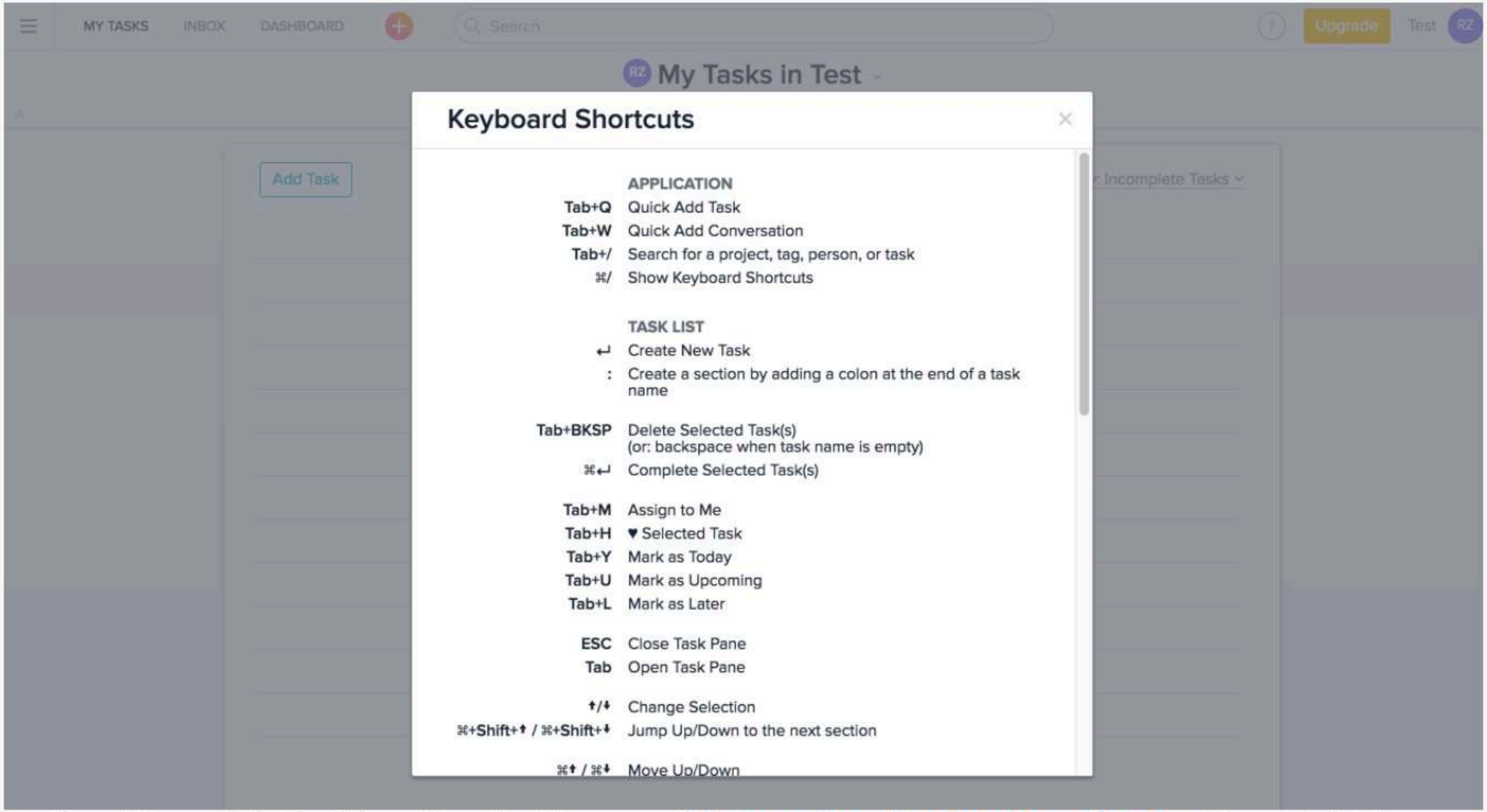
Guidelines:

- 6a. Allow user to maintain a neutral body position.
- 6b. Use reasonable operating forces.
- 6c. Minimize repetitive actions.
- 6d. Minimize sustained physical effort.

DOES THE DESIGN HELP MINIMISE THE EFFORT NEEDED?

MINIMISE THE EFFORT NEEDED?

DESIGN EXAMPLE: MINIMALIZE MOUSE USAGE WITH KEYBOARD SHORTCUTS



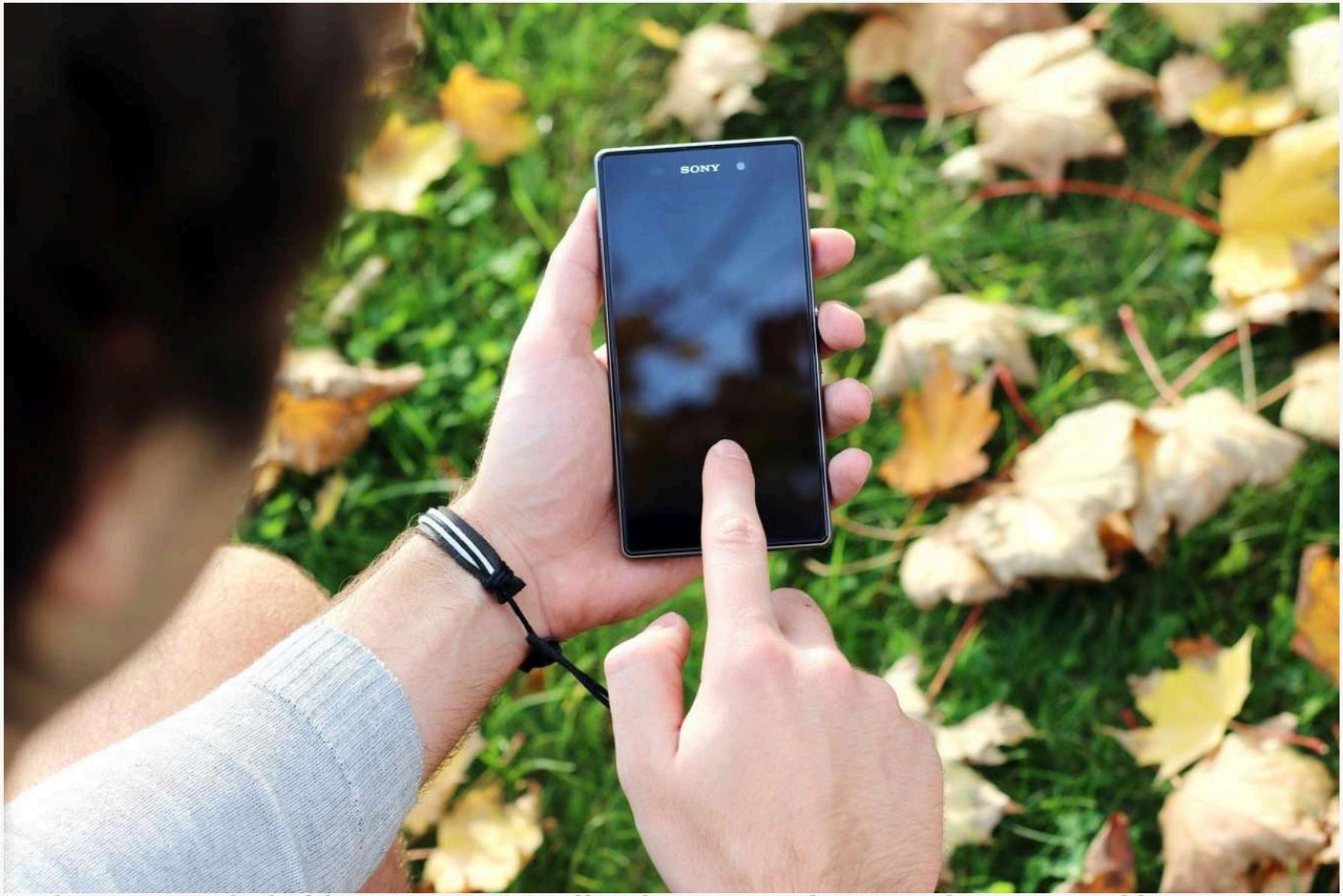
PRINCIPLE 7: SIZE AND SPACE FOR APPROACH AND USE

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

Guidelines:

- 7a. Provide a clear line of sight to important elements for any seated or standing user.
- 7b. Make reach to all components comfortable for any seated or standing user.
- 7c. **Accommodate variations in hand and grip size.**
- 7d. Provide adequate space for the use of assistive devices or personal assistance.

IS THERE ROOM TO MANOEUVRE?



According to an MIT Touch Lab study in 2003, the average size of a human adult index finger is 1.6 to 2 cm. If we convert that to pixels, then it is approximately 60px to 76px on a digital screen. You can improve the accessibility of your product if you provide adequate target areas for your users.

UNIVERSAL DESIGN IN THE IOT ERA?
IT'S A MIX OF PRODUCT DESIGN AND WEB DESIGN

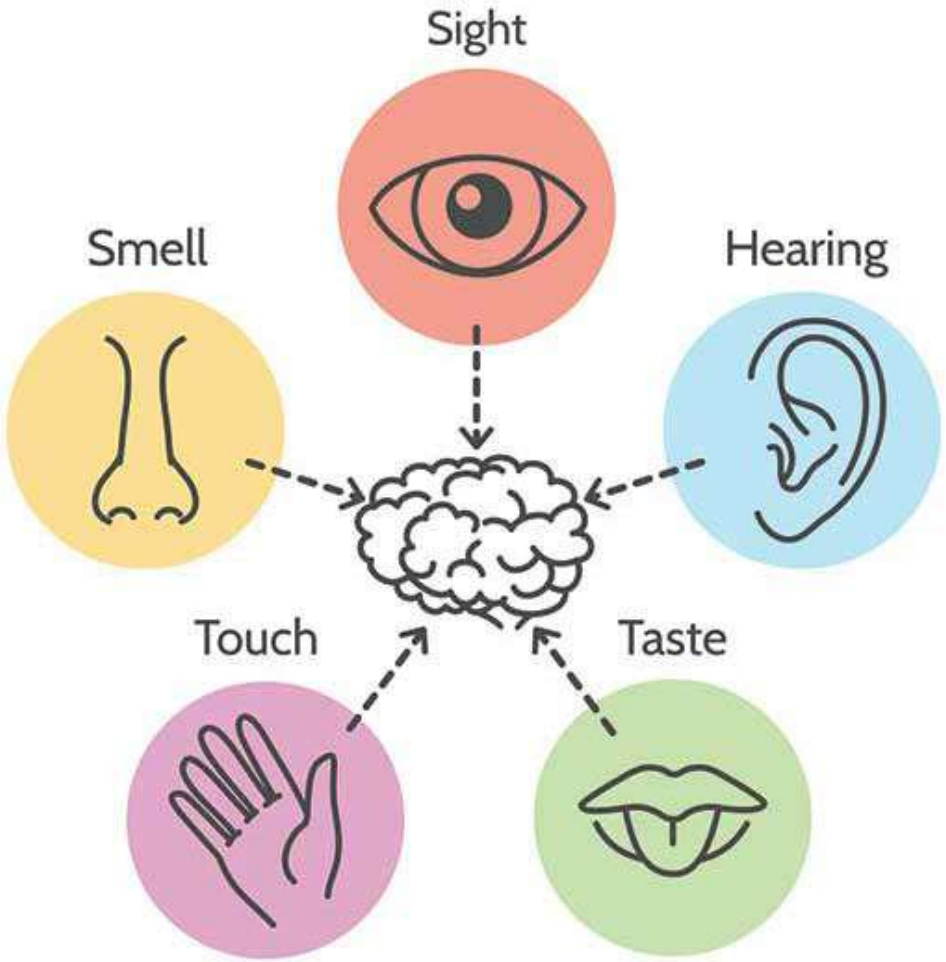
DESIGN WITH A MAXIMUM OF DISABILITIES IN MIND

- vision Impairment (physical)
- deaf or hard of hearing (physical)
- mental health conditions (non physical)
- intellectual disability (cognitive)
- acquired brain injury (physical and cognitive)
- autism spectrum disorder (non physical)
- physical disability.

HOW TO?

MULTI-MODAL INTERACTION

- **Providing access to information through more than one mode of interaction** is an important principle of universal design.
- Designing keeping in mind more than one sense is known as multi-modal interaction



MULTI-MODAL INTERACTION

- More than one sensory channel in interaction
  - Sight, sound, touch, taste, smell
  - e.g. sounds, text, hypertext, animation, video, gestures, vision
- Used in a range of applications:
  - particularly good for users with special needs, and virtual reality
- Sight – dominant

MULTI-MODAL VS. MULTI-MEDIA

- Multi-modal systems
  - use more than one sense (or mode) of interaction

    e.g. visual and aural senses: a text processor may speak the words as well as echoing them to the screen

- Multi-media systems
  - use a number of different media to communicate information

    e.g. a computer-based teaching system: may use video, animation, text and still images: different media all using the visual mode of interaction; may also use sounds, both speech and non-speech: two more media, now using a different mode

SOUND IN THE INTERFACE

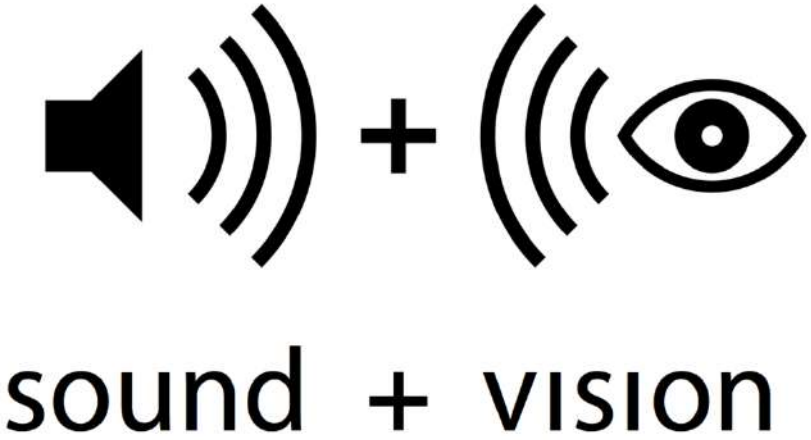
- Sound – **important contributor to usability**
- Experimental evidences:

  – Addition of audio confirmation of modes, in form of changes in key clicks, reduces errors

  – Video games: Experts tend to score less well when the sound is turned off than when it is on

SOUND IN THE INTERFACE

- Dual presentation of information through sound and vision supports universal design, by enabling access for users with visual and hearing impairments respectively. But is also useful to normal users with REDUNDANCE.
- Two general types:
  - Speech
  - Non Speech



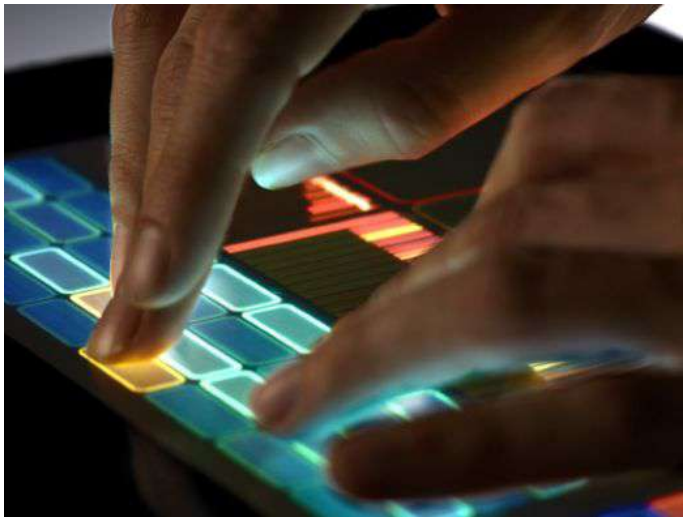
NON-SPEECH SOUNDS

boings, bangs, squeaks, clicks etc.

- commonly used for warnings and alarms
- Evidence to show they are useful
  - fewer typing mistakes with key clicks
  - video games harder without sound(?)
- Language/culture independent, unlike speech

TOUCH IN THE INTERFACE

- Touch is the only **sense that can be used to both send and receive information**
- Used of touch in the interface is known as haptic interaction
- Haptics is a generic term relating to touch, but it can be roughly divided into two areas:
  - Cutaneous perception
    Concerned with tactile sensations through skin
  - Kinesthetic
    Perception of movement and position



TOUCH IN THE INTERFACE

Examples of Tactile devices:

- Electronic braille display
- Force feedback devices in VR equipment

USERS WITH DISABILITIES

- visual impairment
  - screen readers,
- hearing impairment
  - text communication, gesture, captions
- physical impairment
  - speech I/O, eyegaze, gesture, predictive systems
- speech impairment
  - speech synthesis, text communication
- autism
  - communication, education

OTHER USERS

- age groups
  - older people e.g. disability aids, memory aids, communication tools to prevent social isolation
  - children e.g. appropriate input/output devices, involvement in design process