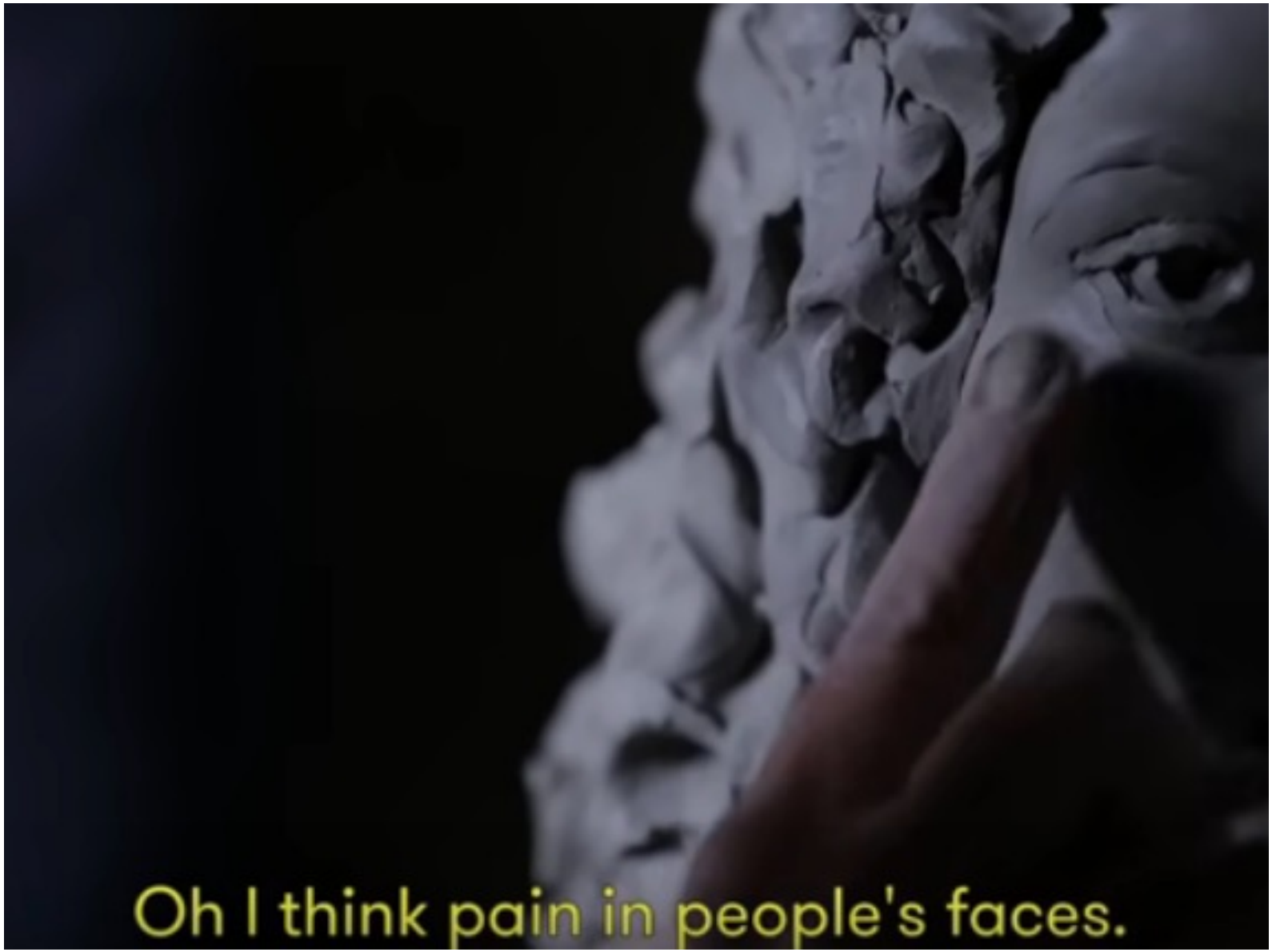
HCI
Lecture 8

Mario Verdicchio
Università degli Studi di Bergamo
Anno Accademico 2024-2025

Accessibility

- In the context of UX, **accessibility** is defined as the quality of a product, service, or website being easily reachable and usable by people with disabilities.
- This lesson is based on a scientific article (Theofanos and Redish, 2006) that has become a cornerstone of accessibility, with a specific focus on blindness.


- Are you glad that there are
some things that you can't see?


Oh I think pain in people's faces.

Blind People Describe Loved Ones to a Sculptor
https://www.youtube.com/watch?v=xkVaSXAu5vY

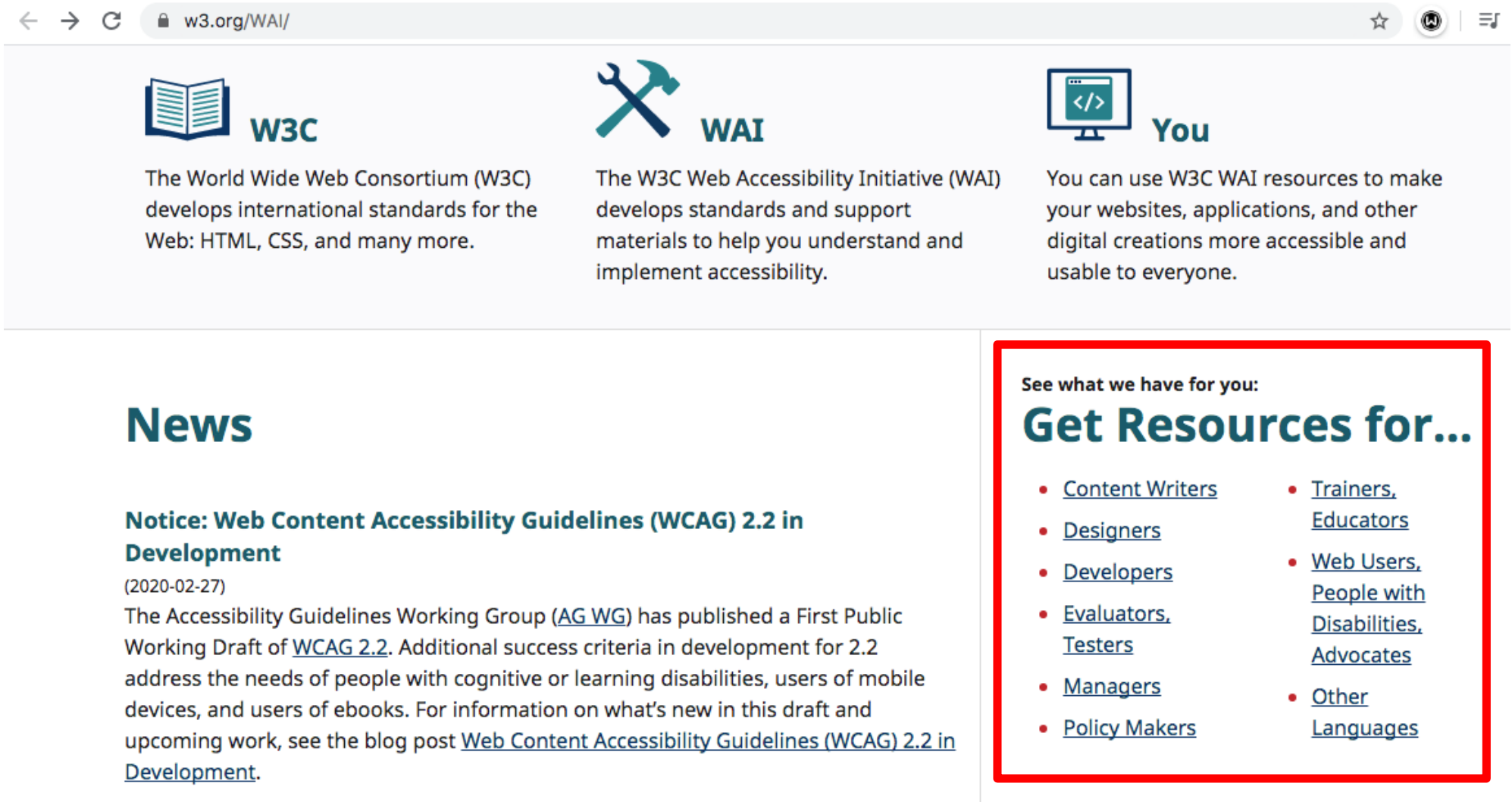
Accessibility and usability

- Since June 2001, U.S. federal government websites have been required to comply with Section 508 of the Rehabilitation Act, a law that mandates agencies to provide access to electronic information for people with disabilities.
- Section 508 outlines 16 specific standards for website accessibility.
- However, following these standards does not necessarily mean that the website is usable by people with disabilities.
- If a site is not usable, then it is not truly accessible—even if it includes all the elements required by law.
- Therefore, even in a regulated context for accessibility, usability testing is essential.

Other resources for accessibility

- We mentioned the American Section 508 because the article for this lesson refers to it.
- However, for European UX designers, there is a much more recent and comprehensive resource provided by the W3C, the World Wide Web Consortium.
- The W3C is an international organization where staff, member organizations, and the public work together to develop and maintain web standards.
- It is led by the person considered the inventor of the Web, Tim Berners-Lee.

w3.org/WAI


w3.org/WAI/
W3C
The World Wide Web Consortium (W3C) develops international standards for the Web: HTML, CSS, and many more.
WAI
The W3C Web Accessibility Initiative (WAI) develops standards and support materials to help you understand and implement accessibility.
You
You can use W3C WAI resources to make your websites, applications, and other digital creations more accessible and usable to everyone.
News
Notice: Web Content Accessibility Guidelines (WCAG) 2.2 in Development
(2020-02-27)
The Accessibility Guidelines Working Group (AG WG) has published a First Public Working Draft of WCAG 2.2. Additional success criteria in development for 2.2 address the needs of people with cognitive or learning disabilities, users of mobile devices, and users of ebooks. For information on what's new in this draft and upcoming work, see the blog post Web Content Accessibility Guidelines (WCAG) 2.2 in Development.
See what we have for you:
Get Resources for...
Content Writers
Designers
Developers
Evaluators, Testers
Managers
Policy Makers
Trainers, Educators
Web Users, People with Disabilities, Advocates
Other Languages

Why accessibility? (1/6)

- **Disabilities affect far more people than you might think**. Worldwide, there are 750 million people with disabilities, and 3 out of 10 families are affected by disability-related issues. In the U.S., 1 in 5 people has some form of disability, and 1 in 10 has a severe one. In 2001, 180 million people around the world were blind or visually impaired. This is a portion of potential users that cannot be ignored.

Why accessibility? (2/6)

- **There's also good business to be made.** According to the U.S. President's Committee on Employment of People with Disabilities, the annual discretionary income of people with disabilities amounts to 175 billion dollars.

Why accessibility? (3/6)

- **The number of people with disabilities is expected to grow.** The likelihood of having a disability increases with age, and the population is aging.

Why accessibility? (4/6)

- **The Web plays an important role and offers significant benefits for people with disabilities.** Of the 54 million Americans with disabilities, 4 out of 10 are online. These users spend more time online than users without disabilities—on average, 20 hours per week—and report more positive feelings about their online interactions.

Participants in the tests conducted by Theofanos and Redish repeatedly emphasized how the Web had opened up a new world for them and given them a sense of independence and freedom.

For example, P7 (Participant 7) was able to read a newspaper for the first time. P5, who was unemployed at the time of the test, spent more than 12 hours a day online, listening to the radio, “reading” websites, and chatting.

According to a survey by the Nielsen group, 48% of respondents with disabilities felt that the Web had improved their quality of life, compared to 27% of respondents without disabilities.

Why accessibility? (5/6)

- **Improving website accessibility also enhances usability for all users.** As shown by the results presented in this article, making changes so that websites work better for those who “read” them using screen readers is a small effort with huge benefits for everyone.

Why accessibility? (6/6)

- **From a moral standpoint, it's the right thing to do.**

Usability test

- The authors observed and listened to 16 blind users in the fall/winter of 2002-2003 as they visited websites with the support of assistive tools that read the screen content for them, called “screen readers.”
- The participants used the screen reader they regularly use: 13 used JAWS, and 3 used Window-Eyes.
- Although the test dates more than 20 years, even in 2020, JAWS remains a reference screen reader for the blind, as demonstrated by this video on YouTube, “A Comparison of Three Screen Readers: JAWS, NVDA, and Voiceover” [https://www.youtube.com/watch?v=9_K5-4ngDtE].

What participants did

- Each participant worked individually for 2 hours.
- At the beginning of each session, participants were invited to customize their screen reader software.
- Almost all of them adjusted the voice and speed but made no other changes.
- We discovered that people with low vision who use “screen magnifiers” (digital magnifying lenses) spend a lot of time customizing, while those who use screen readers do not.

What participants did

- The majority of screen reader users listen at a very high speed.
- Some of the participants stated that they were listening at a slower speed than usual to make it easier for the observers to follow.
- At the beginning of each session, the observers asked participants about their expectations and web usage habits.
- At the end of each session, the observers asked participants about their reactions to the experience and the specific websites they visited during the test.
- For most of the test time, participants tried to complete the tasks assigned by the observers, all of which were to be carried out on U.S. government websites.

What observers learned

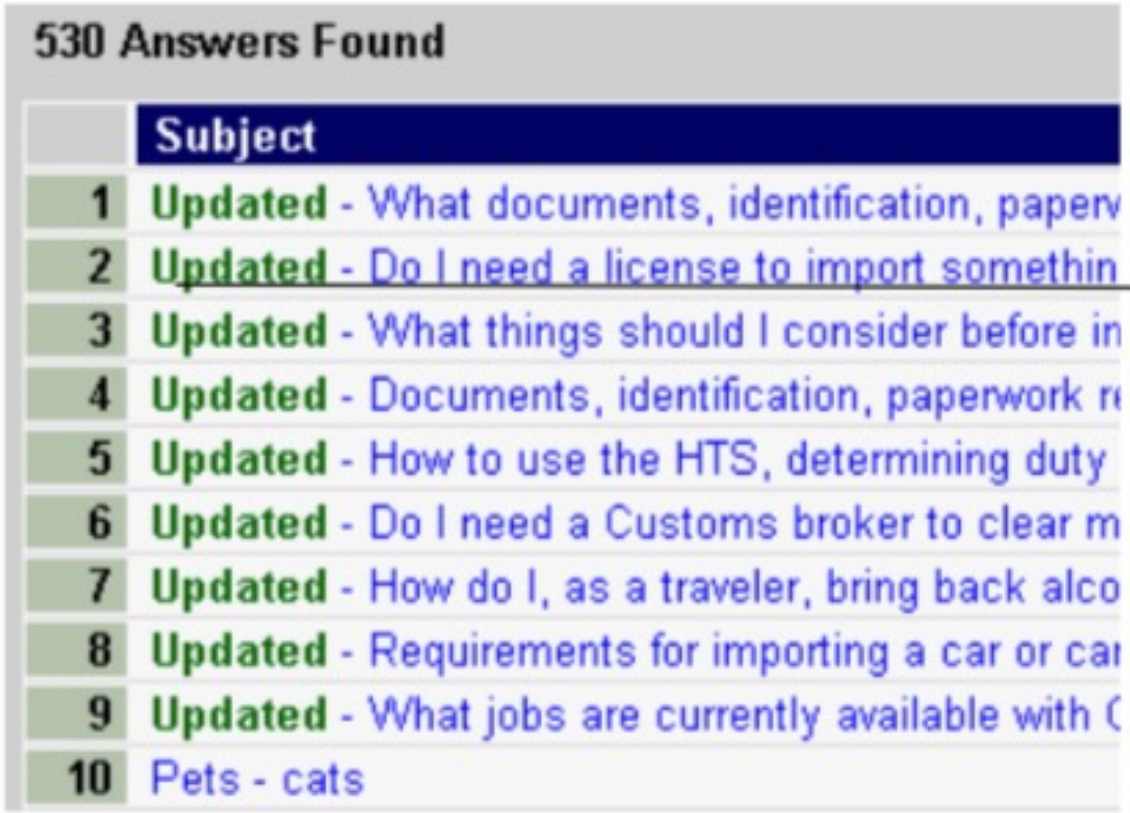
- The goal of the observers was to understand how blind users interact with websites and what this means for designers and developers.
- The focus, therefore, was not so much on specific websites but on the users within this special category.
- From this experience, the observers developed guidelines that ensure both compliance with the law and real usability for users who rely on screen readers.
- The lessons learned by the observers cover:
  - The use of screen readers (1 ~ 5)
  - Navigation (6 ~ 12)
  - Form filling (13 ~ 16)
- Each lesson learned generated one or more guidelines.

Lessons learned
on the use of the screen reader

1: Screen reader users “scroll” the page with their ears.

- Most blind users are as impatient as sighted users.
- They want to get information as quickly as possible.
- Just as sighted users don’t read every word of a text but skim through it, blind users don’t listen to every word either.
- Blind users skim through the words, listening to enough to decide whether to stay or move on.
- The speaking speed of the screen reader that many users use is incredibly fast.

Guideline 1



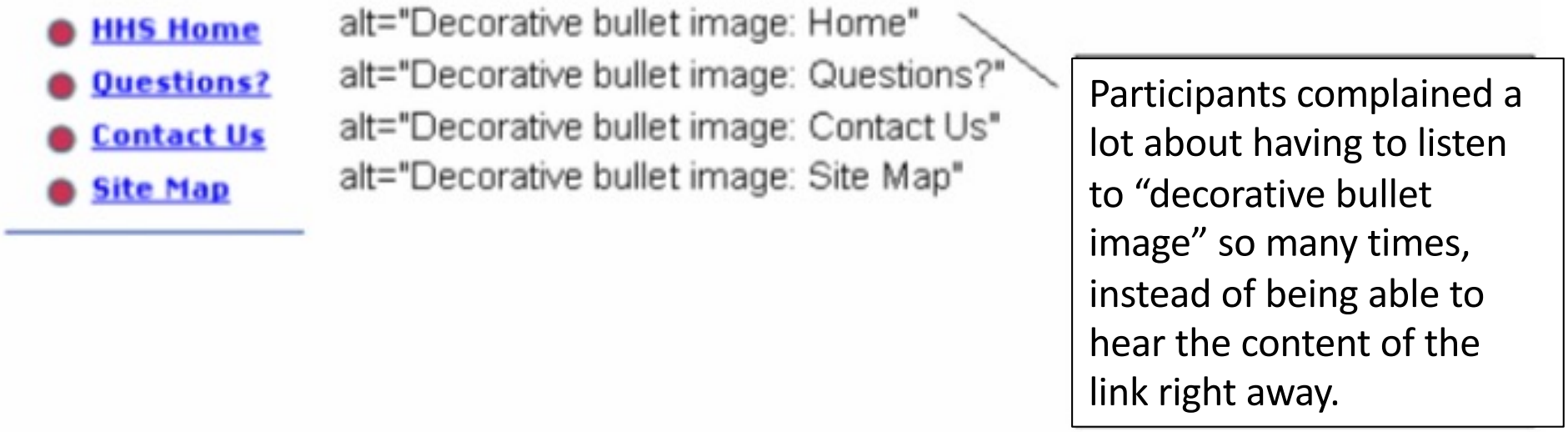
530 Answers Found

	Subject
1	Updated - What documents, identification, paperv
2	Updated - Do I need a license to import somethin
3	Updated - What things should I consider before in
4	Updated - Documents, identification, paperwork r
5	Updated - How to use the HTS, determining duty
6	Updated - Do I need a Customs broker to clear m
7	Updated - How do I, as a traveler, bring back alco
8	Updated - Requirements for importing a car or car
9	Updated - What jobs are currently available with (
10	Pets - cats

The repetition of "updated" before every link makes scrolling through the page with a screen reader much more difficult.

Write for the Web. Write short, clear, and direct sentences. Use bullet points. Place the main point of a paragraph at the beginning. Write links that start with the keyword.

Guideline 2



“ALT text” are short texts that describe graphic elements and images. Leave them empty (ALT = "") for graphic elements: it’s not important to know that there is a graphic element acting as a bullet, but rather the keyword of the link that the bullet introduces.

2: Screen reader users face a significant mental effort.

- Users must build a mental model of the browser, one of the screen reader, and one of the website.
- For example, one participant had recently switched from Outspoken (a screen reader for Mac) to Window-Eyes (for PC) and had brought along Braille notes to remember the commands for Window-Eyes.
- Often, this participant would lose track because they interrupted their navigation too frequently to recall screen reader commands.

Guideline 3

For screen reader software developers: equip them with intuitive commands that are easy to remember.

Guideline 4

For website designers and developers: make the site structure clear and obvious. The more apparent the site structure is, the easier it will be for screen reader users (and sighted users) to understand and navigate the site.

A site that all participants found very usable: clear structure, lists, keywords right at the beginning. When the screen reader announced that the page contained 43 links, participants considered it a reasonable number. Pages with hundreds of links, on the other hand, discouraged them right from the start.

3: Many users do not know or do not use all the features of the software.

- Given the mental workload of managing the browser, the website, and the screen reader, it should come as no surprise that many participants were not fully familiar with all the features of their assistive tool.

Guideline 5

For screen reader developers: consider providing training sessions to help users make the most of the software and create easy-to-follow demos and tutorials for new features.

4: The software works very well but mispronounces some words.

- These are the most notable issues with the JAWS screen reader.

Chart 1

Word on the screen	What JAWS says
homepage	hommapodge
LiveHelp	livahelp
MEDLINEPlus (a very large database of medical information)	Medlynepalus
FY (meaning "fiscal year")	fie
VA (meaning "Virginia")	va (like the Spanish for "go")

- Issues arise with compound words, abbreviations, and acronyms.

Guideline 6

Write "home page" as two separate words.

Guideline 7

Do not invent unusual names for products, services, or elements of a website. Do not combine two or more words into a single name. If compound names are already established within the company and the site, do not add new cases of the same issue and make the problem known within the organization.

Guideline 8

There are tags (<ABBR> or <ACRONYM>) that signal to the screen reader the presence of abbreviations and acronyms. Use them.

5: Many users do not want a special (text-only) version of the site.

- The text-only version of a site is designed specifically for screen reader users.
- However, only 2 out of 16 participants expressed a preference for this version.
- The others expressed a strong preference for a single site that is usable for everyone.
- P7 expressed doubts about whether the text-only version was kept up to date.
- P8 (who works in web development) stated that maintaining two versions is more work than making a single version accessible.

Guideline 9

For most websites, the advice is to have just one version that is usable for everyone, rather than maintaining both a classic version and a text-only version.

Lessons learned on navigation

6: Many want to skip the navigation but don't.

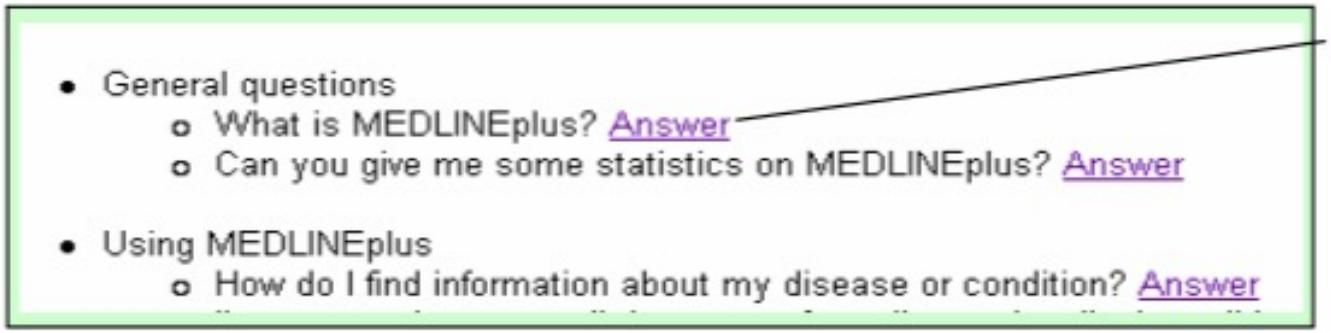
- Remember the persistent navigation that appears on every page of a website?
- Imagine having to listen to it every time you enter a page on the site.
- The problem is that many users don’t realize that “skip navigation” actually refers to the ability to skip the navigation (it may sound incredible in a UX course, but not to the general public).

Guideline 10

Always ensure the ability to skip the navigation by including a “skip” link at the beginning of the page. If “navigation” is a problematic term, rephrase the link as “skip to main content” for greater simplicity and clarity.

7: Many users jump from link to link in search of their goal.

- It's a common habit even among sighted users: there are navigation pages and destination pages with the content we're interested in, and until we reach the destination, the journey consists of jumping from link to link.
- Many blind users, to speed up navigation, use a feature called "link box," which collects all the links on the page.
- Links need to be designed well; otherwise, usability issues arise.



Screen reader users who use the Link Box feature will only hear a sequence of “Answer.” They will realize that the links lead to answers, but they won't know which questions they are answering.

Due to the grammatical structure of the questions, while they are very expressive, they place the keywords at the end, with the first part always being the same (What...When...Where...How...), which slows down the search for the right question by users who use screen readers.

Guideline 11

Make links descriptive, avoiding the repetition of single, meaningless words.

Guideline 12

Start links with meaningful words.

Guideline 13

Minimize the number of links that start with the same word.

Guideline 14

If the links are questions, place a keyword at the beginning and then the question. For example,
“Volunteering – What are the office hours for registration?”

8: Performing a find to locate words on a page is not easy.

- Almost half of the participants, when performing the task of finding a word on a page, were unsuccessful.
- If a keyword is part of an image, it is not recognized as text and cannot be found.
- Screen reader software performs the find function, but not circularly, so if the user launches the feature halfway down the page, the earlier part is not examined.

An image that displays keywords. These are not text but graphic elements, and they will be ignored by screen readers.

Guideline 15

First, pay attention to the words on a page and ensure that the keywords users typically search for on that page are actually present (this is also useful for sighted users).

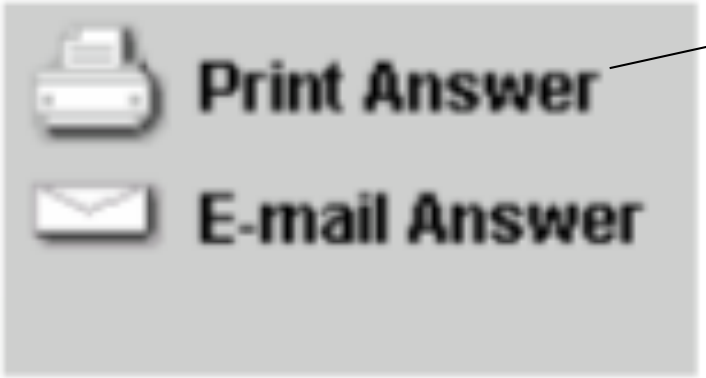
Guideline 16

Make sure that the keywords are not part of images.

Guideline 17

For screen reader developers: implement the circularity of the find function.

9: Discrepancies between ALT tags and the text on the page make the find function problematic.



ALT tag: “printer-friendly version”

P16 heard the option “printer-friendly version” through the Window-Eyes software. However, the text on the page was “Print Answer.”
When P16 tried to find the option again later, they searched for “printer” and found nothing.

Guideline 18

Do not create differences, even subtle ones, between the keywords in the text of an image and the keywords in the ALT tag associated with the image. Even better, do not put text in the form of an image, but as plain text.

10: Some users don't spell words correctly, which makes searches difficult.

These words, which when pronounced in English sound exactly like the correct words "Virginia" and "terrorism," are not suitable as search input.

Guideline 19

Use a search engine that provides suggestions for correcting misspelled words.

11: Anchor links make it easier to find information.

Anchor links do not lead to other pages, but to sections located further down the page.

However, be cautious: automatic page refreshes bring the user back to the top and negate the benefit of anchor links.

Guideline 20

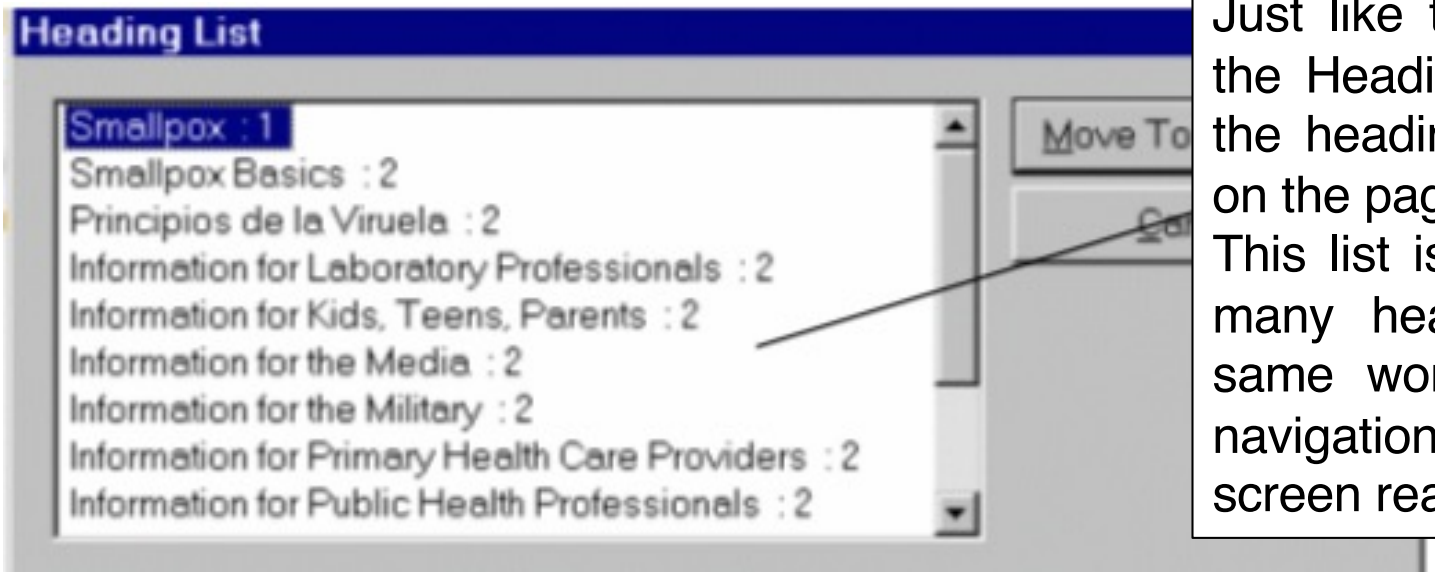
Use anchor links when a page contains numerous topics.

Guideline 21

Prevent page refreshes when a user has clicked on an anchor link.

12: Some users jump from heading to heading.

- Just like sighted users, blind users also want to focus on the paragraph of the page containing the most interesting information for them.
- To do this, they “read” only the paragraph headings, and once they find an interesting heading, they enter the paragraph.
- Screen readers have a feature (H key, for heading) to read all and only the headings of the paragraphs.
- Not all participants know this function (see lesson learned 3), but those who do are very eager to use it.



Just like the Link Box, there is the Heading List, which lists all the headings of the paragraphs on the page.

This list is problematic because many headings start with the same word, slowing down the navigation for users who use screen readers.

Guideline 22

Encourage content authors to use many paragraphs with clear, expressive headings. This guideline is useful for both blind and sighted users.

Guideline 23

Ensure that headings are properly labeled in HTML (using <H1>, <H2>, etc.) so that screen readers can recognize them correctly.

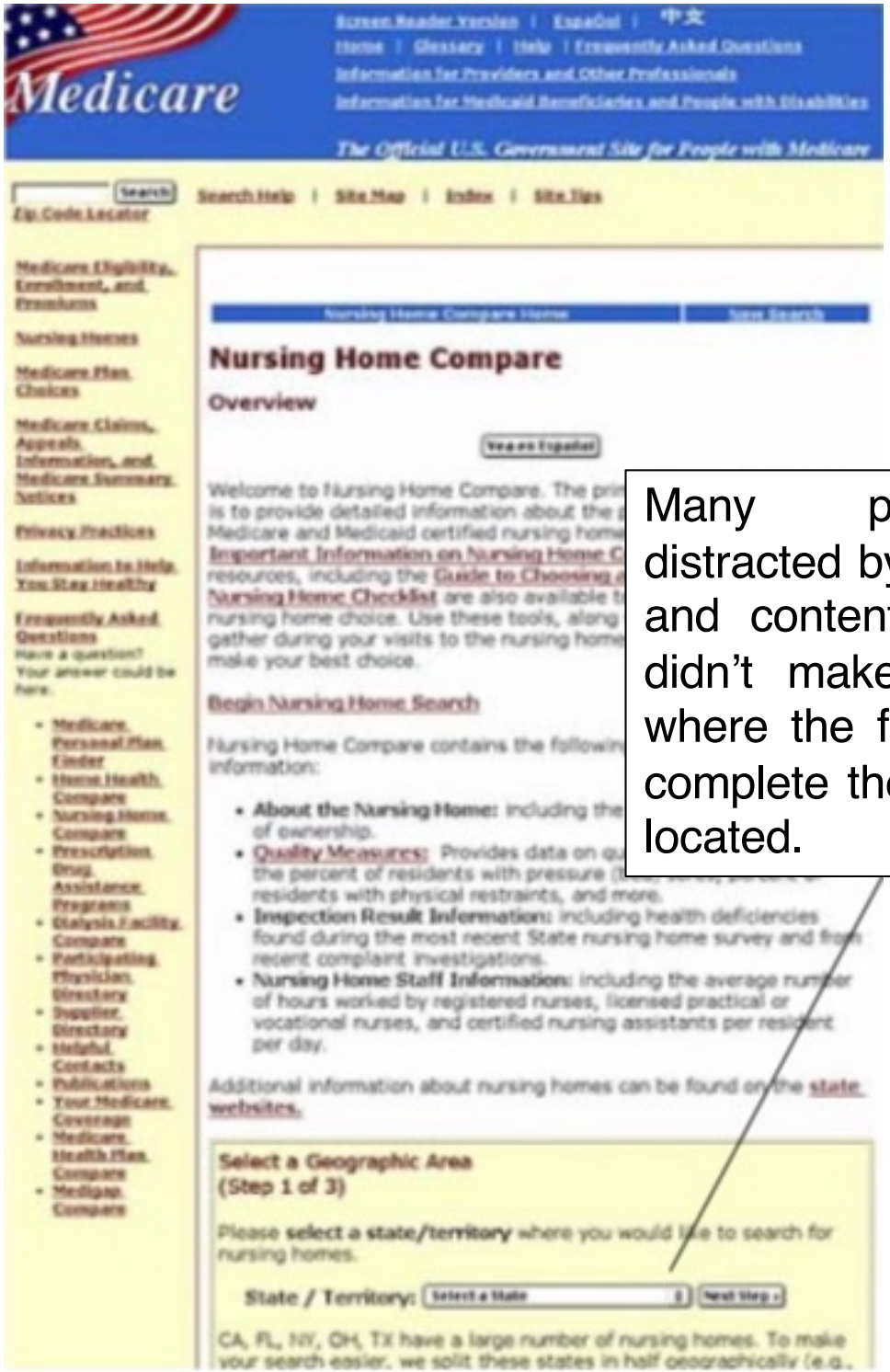
Guideline 24

Place a keyword at the beginning of the heading. If many headings refer to the same topic, make sure to differentiate them meaningfully.

Lessons learned on form filling

13: First of all, screen reader users need to find the form.

There's a significant amount of information to listen to before reaching the form on this page. Not all users are guaranteed to make it that far.



Many participants were distracted by the numerous links and content on the page and didn't make it to the bottom, where the form they needed to complete the assigned task was located.

Guideline 25

Avoid placing large amounts of text on the same page as a form.

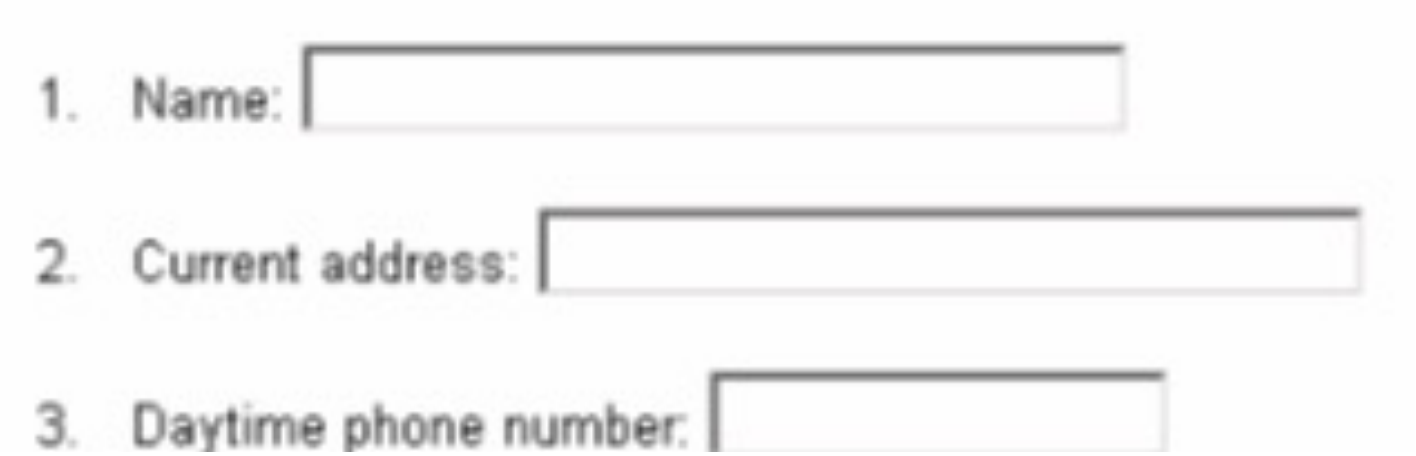
Guideline 26

Avoid placing a form too far down or too far to the right on a page.

14: Users do not want to constantly switch between different modes of their screen reader.

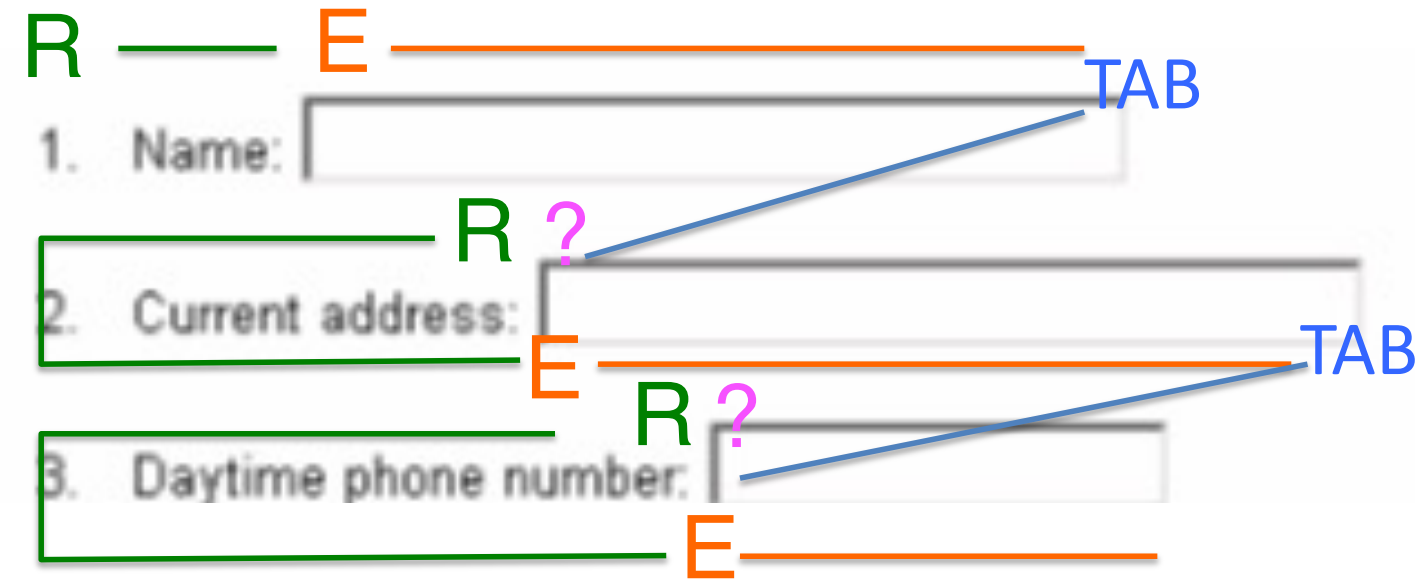
- Screen readers are controlled through the computer keyboard.
- For example, as mentioned earlier, “H” is used to “read” the titles of paragraphs.
- However, when the user wants to type an “H,” they must switch the screen reader’s mode.
- There are two modes: reading and writing (“reading mode” and “edit mode”).
- Reading mode is the default mode.

A non-user-friendly form



How can such a simple and clear form not be user-friendly?

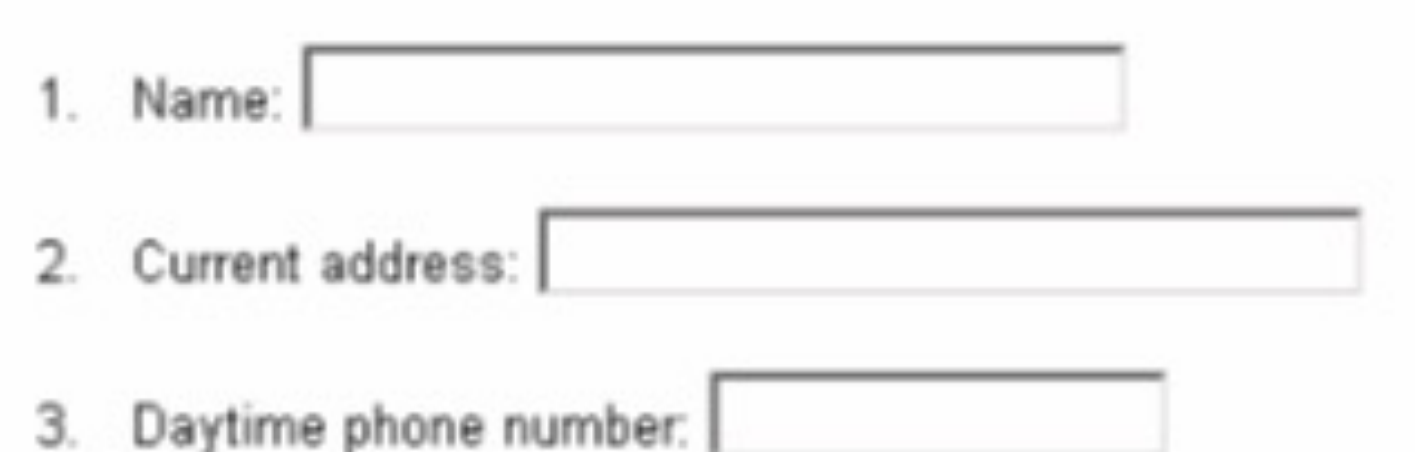
A non-user-friendly form



A form is not user-friendly if its fields are not labeled with explanations that the user can hear with their screen reader. In that case, the user is forced to follow this process:

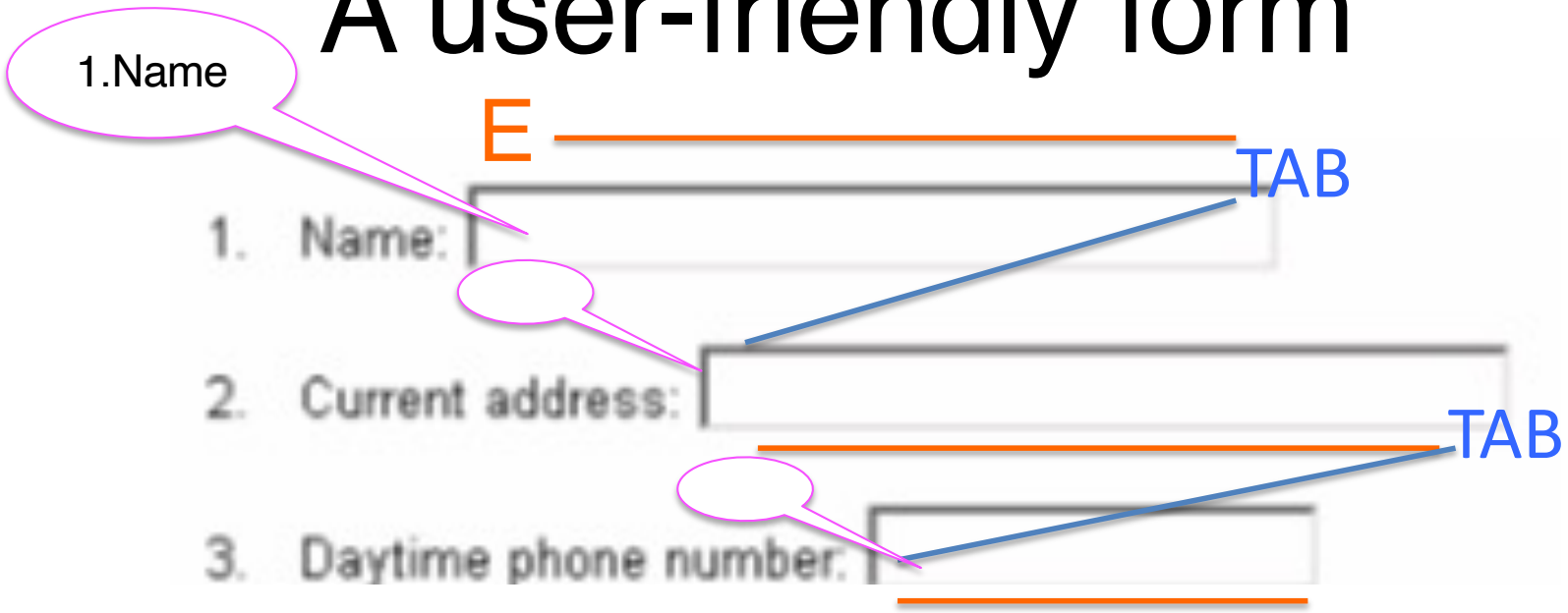
1. Reading mode (R), reads the text of the first field
2. Switches to editing mode (E), fills out the first field
3. Presses Tab to go to the next field, but since there is no explanation, they have to read the text of this field
4. Switches back to reading mode (R) and moves the cursor to the beginning of the text
5. Now they understand what the field is about, switches back to editing mode (E), fills in the second field, and so on.

A user-friendly form



It may seem like nothing has changed, but in reality…

A user-friendly form



A form is user-friendly if its fields are labeled with explanations that the user can listen to with their screen reader. This way, the user can stay in edit mode (E) throughout the entire form completion process.

1. The user listens to the explanation of the first field, fills it out, presses Tab.
2. The user listens to the explanation of the second field, fills it out, presses Tab.
3. The user listens to the explanation of the third field, fills it out, presses Tab.

Task complete!

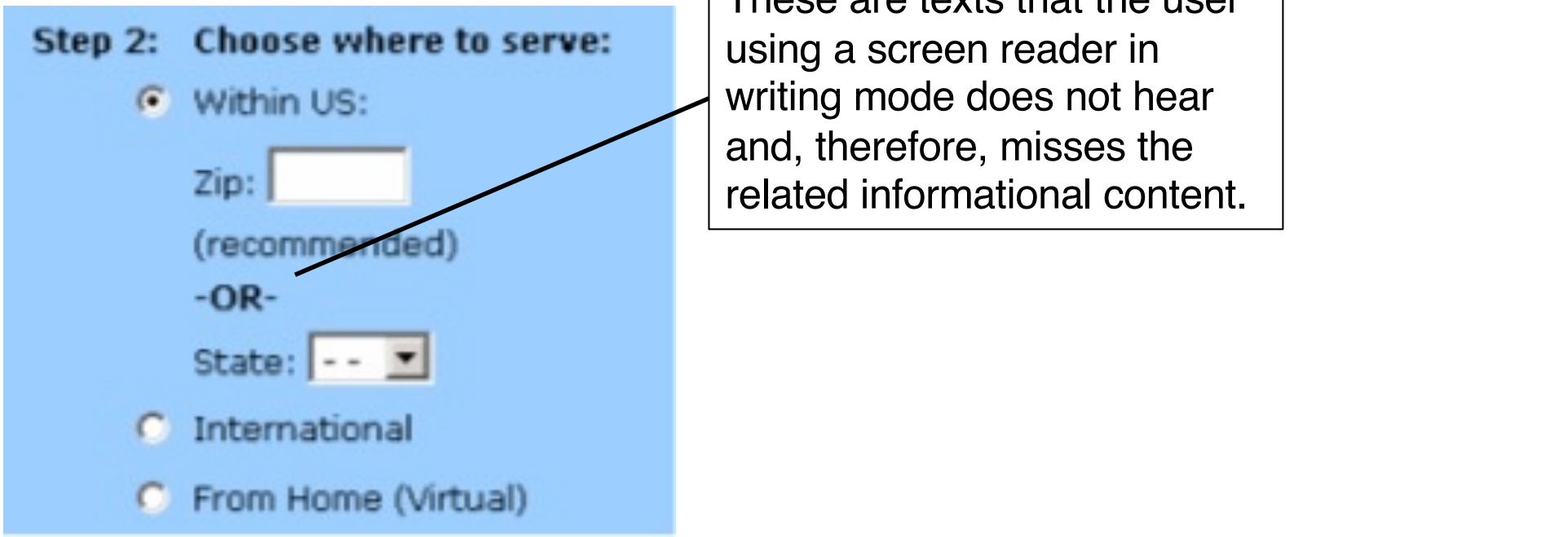
Guideline 27

Make sure that all form fields are coded in such a way that users do not have to switch modes on their screen reader.

Guideline 28

For an additional check on the form’s functionality, try using the website with a screen reader.

15: If users are filling out a form in writing mode, they do not hear any text that is not part of a field.



Guideline 29

Do not place information in between the fields of a form.

Guideline 30

If the user has the option to fill one of two mutually exclusive fields, inform the user with the label of the first field.

Guideline 31

Do not exclude labels from form fields.

16: If filling out a field causes the page to refresh, the screen reader will resume reading from the beginning of the page.

The red warning says: please enter your ZIP code first – the city name and state will be automatically filled using US Postal Service data.

This method of filling out forms also exists on many Italian websites: you enter one piece of data, and a new page is loaded with other data in the related fields. Useful (maybe) for sighted users, harmful (definitely) for blind users.

Guideline 32
Avoid page refreshes

In conclusion…

"In the absence of detailed information, we all work based on assumptions about who the user is, what they do, and what kind of system meets their needs. Following these assumptions, we tend to design products for ourselves and not for other people."

Rubenstein & Hersh
"The Human Factor: Designing Computer Systems for People"
Digital Press, 1984

- As UX experts, we know that almost always neither designers nor developers are representative of the users.
- If we are talking about blind users, then we are certain that neither designers nor developers are representative of the users.
- Therefore, observing, listening to, and speaking with representatives of the target audience is crucial.
- To truly meet the needs of all users, it is not enough to have guidelines based on technology.
- It is also necessary to understand the users and how they work with their tools.