Accessibility for All Abilities: How Universal Design, Universal Design for Learning, and Inclusive Design Combat Inaccessibility and Ableism

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Abstract. Accessibility is the means of enabling everyone to participate in society as independently as possible. People with disabilities are those most often concerned about accessibility because of the many barriers they continue to encounter. The United States has passed laws with the objective of making society more accessible. This includes access to information. Still, there are significant ableist attitudes that prohibit people with disabilities from having their right to information respected. Discussions about accessibility surged at the start of the COVID-19 pandemic as people became more dependent on accessing information from the web. This article will explore different disability models to understand the oppression of people with disabilities. It will examine how the different principles and methods of Universal Design, Universal Design for Learning, and Inclusive Design can be combined in innovative ways to ensure that all citizens have access to information without barriers.

1. Web Accessibility at the Start of the COVID-19 Pandemic

A new perspective is emerging on how accessibility will play a fundamental role around the globe as the world rapidly changes. During 2020, people worldwide are dealing with the COVID-19 pandemic for the first time. Global citizens are more dependent than ever before on accessing information on the web. The telecommunication company Infinera reported that the overall use of the internet in the United States increased by 47% during the first quarter of 2020, which was the time when stay-at-home orders first were issued (Cohen, 2020). Surveys conducted by the Pew Research Center found that roughly half of the adults in the United States say the internet has been essential for them during the pandemic (Vogels et al., 2020).

COVID-19 has highlighted the accessibility barriers that have always been an issue for the disability community. At this time, the barriers are more pronounced because in-person communication is often not possible.

Knowbility, a web-accessibility consulting firm, says that accessibility must be part of companies' and organizations' responses to COVID-19 (Rush, 2020). Most important, accessibility has to be a key part of all communication and technology strategies going forward, as people continue to use the internet for shopping, working, learning, and entertaining. In addition, accessibility will be critical for accessing healthcare and for vital services.

Title II of the Americans with Disabilities Act (ADA) of 1990 requires state and local governments and recipients of federal funding to ensure full public access to their services and activities (U.S. Department of Justice, 2020). In 1998, the United States Access Board established Section 508 of the Rehabilitation Act of 1973 (U.S. Environmental Protection Agency, 2019), requiring federal agencies to follow its

accessibility standards when developing, procuring, and maintaining information and communications technology (ICT). The standards require the execution of the Web Content Accessibility Guidelines (WCAG) 2.0, Level AA Success Criteria (U.S. General Services Administration, 2018). Assistive technologies, such as alternative keyboards, screen readers, and voice recognition, can be used on websites and platforms to meet Section 508 standards.

Websites and platforms that do not meet these standards are considered noncompliant, which has become a significant issue for companies in recent years. The number of federal web-accessibility lawsuits jumped by 177% from 2017 to 2018, with retail websites facing the most lawsuits in 2019 (Vu et al., 2019; UsableNet, 2020). WebAIM, a nonprofit organization based at the Center for Persons with Disabilities at Utah State University, tested over a million sites in 2019 and 2020 for accessibility compliance. It found 98.1% of websites' home pages had detectable WCAG 2.0 failures (WebAIM, 2020).

2. Who Has a Disability?

The World Health Organization (WHO) and the World Bank declared that 15% of people worldwide have a disability (World Health Organization and World Bank, 2011). That is an increase of 5% from what was estimated in the 1970s. The total disability population in the world is now over a billion people. WHO's website states that the number of people with disabilities has risen because of the growing aging population and the spread of chronic diseases.

As the world population of people with disabilities has increased, so has the disability population in the United States. In 2016, the Centers for Disease Control and Prevention published a report titled "Prevalence of Disabilities and Health Care Access by Disability Status and Type Among Adults." It reported that 61 million people with disabilities are living in the United States—more people than the total population of Canada. Data shows that two in five adults age sixty-five and older, one in four women, and two in five Indigenous people have a disability. The American Institutes for Research found that working-age adults with disabilities are the third-largest marketing segment in the United States (Yin et al., 2018).

That said, the community of people with disabilities should not be defined by data. Someone may experience one or more disabilities, including sensory, auditory, cognitive, learning, physical, speech, visual, and mental health. This range of disabilities makes the disability community diverse, with each individual possessing unique talents, insights, and experiences. Intersectionality is also an essential aspect of identifying as a person with a disability. Gender, ethnicity, and cultural and social identities also shape people with disabilities and the way they experience the world.

The question of who has a disability can never be answered as easily as one may think. The International Classification of Functioning, Disability and Health (ICF), approved by the World Health Assembly in 2001, is a framework that defines disability broadly as impairments, activity limitations, and participation restrictions (World Health Organization, 2002). The ICF provides a common language for describing a person's level of function within their unique environment (World Health Organization, 2002). It rejects

classifying people with specific conditions or giving a yes/no answer to the question of whether a person is disabled. According to the ICF, human functioning and disability are multidimensional concepts related to the following considerations (World Health Organization, 2002):

- Body Functions: The physiological functions of body systems.

- Body Structures: The anatomical parts of the body such as organs, limbs, and their components.

- Activities: The execution of a task or the difficulties an individual may have in executing activities.

- Participation: The problems an individual may experience while involved in life situations.

- Environmental Factors: The barriers caused by physical, social and attitudinal environments.

The ICF was not created to identify someone as disabled. Instead, it was meant to show that there are "multiple dimensions of disability, and potentially multiple perspectives to consider" (World Health Organization, 2002).

WHO has outlined that the ICF is a model used across different sectors of the economy and areas of study, from rehabilitation to social policy. The design process of websites and web applications can benefit from this model because it provides insights into the diversity of human experience when accessing information online.

Teams that are responsible for building and managing websites and apps can also use the Microsoft Inclusive Design Toolkit, a set of documents that was instrumental in bringing awareness about inclusive design to the business and technology sectors. Microsoft has used the Toolkit to reimagine and develop new products across its brands, most notably the Xbox Adaptive Controller (see Figure 1).

Figure 1. A photograph of the Xbox Adaptive Controller.[1]

Like the ICF, the Toolkit redefines what disabilities are and how they happen. It explains that there are three kinds of disabilities—permanent, temporary, and situational—that someone could have related to touching, seeing, hearing, and speaking. (For examples of disabilities in each of these categories, see the model illustrated in Figure 2.)

	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

Figure 2. An illustrative table of the Persona Spectrum.[2]

Microsoft named this model the Persona Spectrum Model (Microsoft, 2016). It is easy to understand the way the Xbox Adaptive Controller is made because its design process was based on the model. For example, a person with a permanent disability, such as cerebral palsy, may have mobility difficulties that prevent them from using a traditional game controller. The big buttons on the Xbox Adaptive Controller may be a perfect solution for that person's gaming needs. They may also be an ideal solution for someone with a temporary disability, such as an individual with a broken arm in a cast, or for a parent who has their child in one arm and only one hand free to operate the controller.

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[2] Microsoft (2016), *Inclusive Microsoft Design*, p. 41.

The Persona Spectrum Model can also be used in mass communication media, such as websites. The model ensures that the content and the user interface (UI) of websites are accessible to users with a variety of abilities. This is peculiarly important for court systems around the United States, as it may increase people's confidence in the government.

Having a disability is a part of life. For some people it is a fluid experience while for others around the world it is permanent. Understanding the spectrum of human abilities puts into context why accessibility is a quintessential requirement for every part of life.

3. Ableism = Lack of Accessibility

Understanding the discrimination and disparities that people with disabilities experience will provide a more precise understanding of why there have always been barriers to web access. These barriers are a part of the ableist culture that continues to persist in America. It will be a societal problem until there is full inclusion and equality of people with disabilities.

Ableism results in disparities between people and a lack of equitable participation in society. In its annual report, the Institute on Disability at the University of New Hampshire found that the employment-to-population ratio in 2018 of people without disabilities in the United States was 76.6%, almost double what was reported for the disability community, at 37.5% (University of New Hampshire, 2020). The report also found other gaps between members of the disability community and people living without disability in the United States. Most notably, over 25% of people with disabilities are living in poverty; only 15% percent have received a college degree; and as a whole their annual income is $7,000 less than that of their non-disabled counterparts. The poverty rate of individuals without disabilities was estimated at 12.2% (University of New Hampshire, 2020).

People with disabilities also have had historically low voting turnouts, due to physical barriers, financial injustices, and a lack of resources such as money and time. During the 2016 election, 55.9% of people with disabilities voted, compared to 62.2% of people without disabilities. Rutgers School of Management and Labor Relations reported that an additional 2.2 million more votes could have been cast nationally if people with disabilities had voted at the same rate as people without disabilities (Schur and Kruse, 2019).

Examples of ableism in all of its forms, past and present, have shown that web accessibility has never been a top priority. Fixing the inaccessibility of the web is more than a technology and design problem; a cultural change needs to occur first that addresses the inequities experienced by people with disabilities. It is only then that web accessibility can indeed be dealt with in a manner with the potential to reshape thoughts and feelings about disability.

The ICF and the Persona Spectrum may provide a perspective on the diversity of people's abilities, including temporary and situational conditions that do not make people part of the disability community. Members of this community live with a permanent disability that impacts most aspects of their lives, from their social status and stereotypes to the barriers they encounter. These barriers have created a culture of ableism throughout history that is still present. Thomas Hehir defines ableism as "the devaluation of

disability" that "results in societal attitudes that uncritically assert that it is better for a child to walk than roll, speak than sign, read print than read Braille, spell independently than use a spell-check, and hang out with non-disabled kids as opposed to other disabled kids" (Lynch, 2013).

There are many things to point to when debating why ableism has always been present in culture. One is the medical model of disability, which focuses first on a person's disability and then seeks ways to improve the individual's body functions or provide them with services to reduce their limitations. Scholars and advocates of disability studies believe this model suggests there is a "right" way for the human body to function; if it does not work correctly, it needs to be brought as closely as possible to an able-bodied state. For people with disabilities, stigma may also be an issue, the theory of which stems from the human quest for an ideal body and "supports the contention that individuals who fall outside of societal norms become marginalized and are treated with disdain" (Reel and Bucciere, 2010).

Humanity strives for the perfect body and mind because they are typically seen as attractive and strong. In his book *Academic Ableism*, Jay Timothy Dolmage notes that the origin of ableism in higher education comes from the idea that "students and teachers alike are encouraged to accentuate ability, valorize perfection, and stigmatize anything that hints at intellectual (or physical) weakness" (Dolmage, 2017). This idea is widespread throughout every aspect of culture. Physical or intellectual limitations have been associated with being "less than" in a society that values perfection and celebrates a narrow definition of beauty. Only able bodies qualify as attractive, and falling short of the ideal often results in body-image concerns.

Designer and author Kat Holmes spoke about how designers can have ability biases, meaning that they design solutions based on their own abilities or their assumptions about the abilities of others (Holmes, 2018). For example, it is easy to assume that web accessibility is simple to achieve because of the various tools available, such as screen readers, captioning, and screen magnification. However, web accessibility is not a matter of checking the boxes for compliance. Not having access to high-speed internet, assistive technologies, or digital literacy education are a few of the limitations to achieving web accessibility, regardless of how well WCAG requirements are met. Ability biases stem from the charity model of disability, which treats people with disability as charity cases, believing that their problems can be solved without their involvement. Innovative solutions, however, are born when people with disabilities are a part of teams that design and build accessible solutions.

4. Abilities Design: The Pathway to Accessibility

After centuries of marginalizing people with disabilities, the disability rights movement emerged in the 1970s and 1980s. It led to the signing of the Americans with Disabilities Act (ADA) in the United States in 1990, twenty-six years after the Civil Rights Act of 1964 (ADA National Network, 2017). During that time, disability studies rose to become a discipline that engages in research, provides perspectives, and gives insights about the disability community.

Part of the quest to make the world more equitable and inclusive for people with disabilities includes the design discipline. Three design disciplines have paved the way for the inclusion of people with

disabilities, by offering innovative solutions for digital and nondigital environments alike: Universal Design, Universal Design for Learning, and Inclusive Design.

I have grouped these three design disciplines collectively under the name Abilities Design to show that they have differences but share the same objective: designing for people's various abilities (O'Neill, 2020). Designers, businesses, organizations, and governments do not have to use the three disciplines in isolation of each other, which risks making something that is mechanical and generic. Rather, they can be combined under the rubric of Abilities Design to create solutions that honor the humanity of all individuals.

4.1 Universal Design

From 1979 to 1981, the industrial designer Pattie Moore researched the barriers that elderly populations in the United States and Canada were encountering. She worked with a Hollywood makeup artist to disguise herself as different female elderly persons. Some looked like they were homeless while others looked wealthy. When she dressed as one of them, Moore inserted earplugs to distort her hearing and wore thick glasses to decrease her vision (see Figure 3). She walked the streets of various cities, where she was discriminated against and experienced physical abuse (Myerson, 2007). Her research later led her to be known as the so-called mother of Universal Design.

Figure 3. Two photographs of Pattie Moore. The image on the left is a traditional portrait focusing on her head and face; the one on the right shows her dressed as an elderly person.[3]

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[3] *Core 77* (2011), https://www.core77.Com/Posts/18559/Interview-with-Pattie-Moore-Proponent-of-Universal-Design-18559.

Moore's work paved the way for Ronald Mace, who coined the term Universal Design in the mid-1980s (Center for Universal Design, 2008). His work and research led to the establishment of the Center of Universal Design at North Carolina State University in 1989. Universal Design focuses on developing solutions that can be used by everyone without any alterations; it is also known as Design for One–Design for All. Mace, developed seven Universal Design principles:[4]

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

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

2. Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.

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

3. Simple and Intuitive Use: The design's use is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

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

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

a) Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
b) Provide adequate contrast between essential information and its surroundings.
c) Maximize "legibility" of essential information.
d) Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).

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[4] Centre for Excellence in Universal Design (2020), *The 7 Principles*, available at: http://www.universaldesign.ie/What-is-Universal-Design/The-7-Principles/.

e) Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

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

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

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

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

7. Size and Space for Approach and Use: The design provides appropriate size and space for approach, reach, manipulation, and use, regardless of the user's body size, posture, or mobility.

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

4.2 Universal Design for Learning

David Rose founded the Center for Applied Special Technology (CAST) in 1984. CAST's work and research conducted in its early years evolved into a new teaching discipline: Universal Design for Learning (UDL) (Pisha and Coyne, 2001).

The early adopters of UDL recognized the influence of Mace's work and the principles of Universal Design. What derived from his architectural studies started to be used for teaching students with learning disabilities and other diverse student populations. UDL has gained more attention from educators due to the growing wave of online and remote courses being offered during the COVID-19 pandemic. Since the time UDL emerged, it has developed three core principles based on teaching methods that are successful for various learning styles:[5]

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[5] CAST, Universal Design for Learning Guidelines (2020), *About Universal Design for Learning*, available at: www.cast.org/our-work/about-udl.html#.Xw8k2S2z2CM.

1. Engagement: The why of learning. For purposeful, motivated learners, stimulate interest and motivation for learning.

2. Representation: The what of learning. For resourceful, knowledgeable learners, present information and content in different ways.

3. Action and Expression: The how of learning. For strategic, goal-directed learners, differentiate the ways that students can express what they know.

4.3 Inclusive Design

As Mace and Rose were breaking new ground, Professor Jutta Treviranus founded the Inclusive Design Research Centre (IDRC) at the Ontario College of Art and Design University (OCADU) in Toronto in 1993. The IDRC adopted the term Inclusive Design because it wanted to design solutions that consider the full range of human diversity related to ability, language, culture, gender, age, and other forms of human difference. Inclusive Research Centre Universal Design is a design practice that is concerned with Design for One–Design for All. In contrast, Inclusive Design is about developing systemic and adaptive solutions for various people. The IDRC believes that these solutions are more sustainable than Universal Design solutions because of their adaptivity, and are more suited for web media.

The IDRC developed a three-part framework for producing Inclusive Design solutions that are most suitable for the digital realm. The framework is not a set of principles but rather a methodology:

1. Recognize, respect, and design for human uniqueness and variability.[6]

- This directive breaks with the notion that Design for One–Design for All meets the needs of all people. Everyone is not going to use products and services in the same way. Although everyone may have the same objectives for using a product or service, there need to be different ways to use them.

2. Use inclusive, open and transparent processes, and co-design with people who have diverse perspectives, including people who can't use or have difficulty using the current designs.[7]

- The basis of this directive is not unique to Inclusive Design. It is based on Participatory Design processes that involve people who will be most affected by a design solution (Bjögvinsson et al., 2012).

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[6] J. Treviranus (2018), *The Three Dimensions of Inclusive Design, Part Three*, *Medium*, available at: medium.com/@jutta.trevira/the-three-dimensions-of-inclusive-design-part-three-b6585c737f40.
[7] J. Treviranus (2018), *The Three Dimensions of Inclusive Design, Part Two*, *Medium*, available at: medium.com/@jutta.trevira/the-three-dimensions-of-inclusive-design-part-two-7cacd12b79f1.

3. Realize that you are designing in a complex adaptive system.[8]

- This directive requires thinking about how design solutions should not only include people who are often not considered but should also propose ways of doing things that suit the needs of different people.

5. Case Study

To show how Abilities Design methods and principles can work in context, I examined the accessibility of the public service websites for the U.S. Southern District of Mississippi and the Sixth Judicial District of Minnesota (see the list of references for their URLs). I chose these websites because they each represent different court systems in the United States and a different demographic. Some of the various laws and proceedings in each location are also different.

These examinations resulted in recommendations on how to enhance the websites' user experience, so people can find the information they need to complete tasks, such as filling out a form. They also showed the importance of accessible information, which has become vital during the COVID-19 pandemic when social distancing measures have limited people from going to courthouses to obtain the information they need. Accessibility also becomes exceptionally important when it ensures that people can exercise their right to vote.

The examinations were based on the principles of perceptible information from Universal Design, representation from Universal Design for Learning, and adaptive systems from Inclusive Design.

5.1 Universal Design: Perceptible Information

The websites for the Southern District of Mississippi effectively use HTML tags and tables, which gives the pages a hierarchical system to help people find information. However, accessibility goes beyond dividing the text into headers and paragraphs. These sites have many drop-down menu items and pages that could make it difficult for people with sight impairments or learning disabilities to find what they need within a cluster of information that does not apply to them. These types of users may have a better experience with the website for the Sixth Judicial District of Minnesota, which has a tab system that enables people to find what they are looking for without leaving the home page. This kind of system makes it easier for someone to scan text. Fewer drop-down menus and pages are better, particularly for screen readers because they do not have to scan through unnecessary information.

5.2 Universal Design for Learning: Representation

Most of the information on each website is in the form of written text, making it difficult for someone with dyslexia or whose first language is not English. Short videos that visually explain where to find information, how to fill out a form, or how to complete procedures would be more beneficial to people

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[8] J. Treviranus (2018), *The Three Dimensions of Inclusive Design, Part Three*, *Medium*, available at: medium.com/@jutta.trevira/the-three-dimensions-of-inclusive-design-part-three-b6585c737f40.

with reading difficulties, but would also help anyone. Videos would need to have closed captions and audio descriptions in various languages. Users would hear a voice-over in sequence, describing the actions and visuals as videos were played. This would benefit people with sight loss, or those who are auditory learners.

5.3 Inclusive Design: Adaptive System

An accessibility panel that could be installed on the Southern District of Mississippi and the Sixth Judicial District of Minnesota courts' websites would enable people to change or adjust the color contrast, type size, and other formatting options on the pages that they were viewing, giving them more control over their web experience. Instead of featuring a single-color scheme, typeface, and formatting, which do not work for all populations, websites with accessibility panels (see Figure 4 for an example) would allow each citizen to customize the sites in a way that worked best for them. People who do not have assistive technology installed or attached to their computer will benefit the most from accessibility panels on websites. However, they must not interfere with the functionality of any assistive technology that anyone may be using. Otherwise, they will be another barrier.
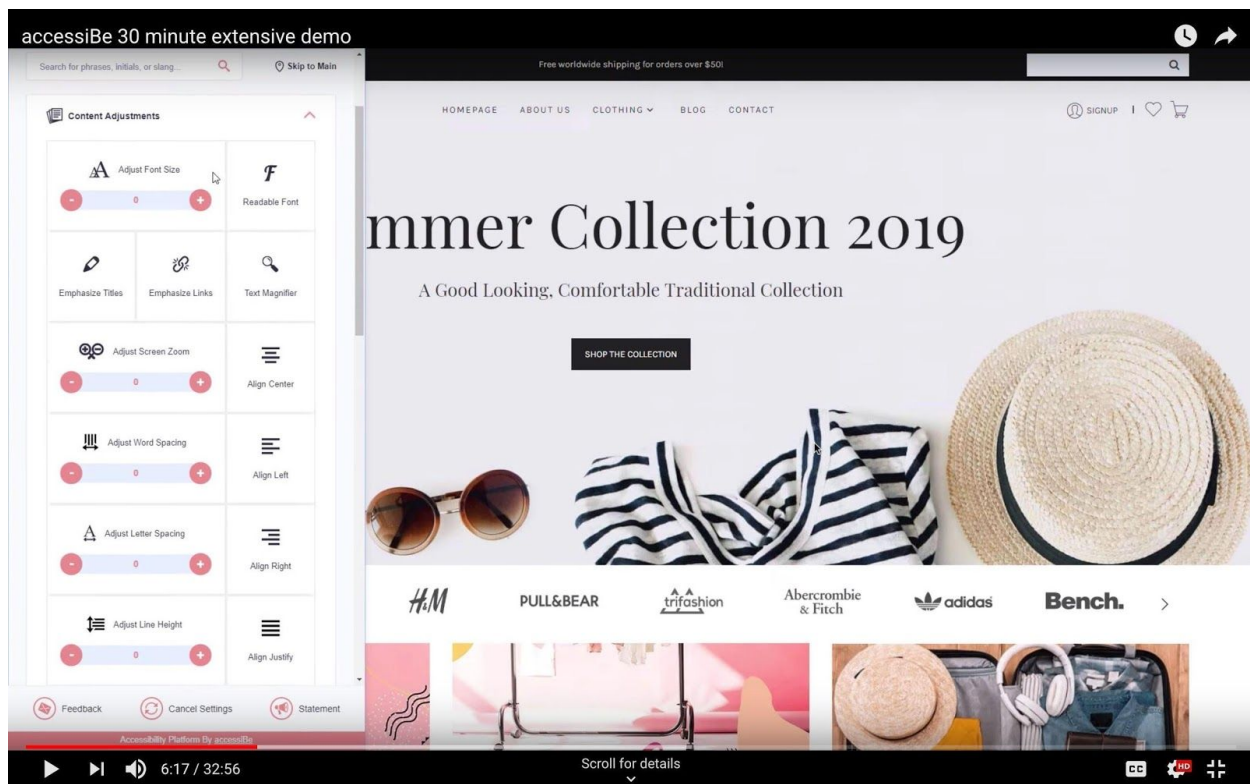

Figure 4. A screenshot of an accessibility panel made by AccessiBe.[9]

6. Overall Recommendations

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[9] AccessiBe (2020), *A 3-Minute Demo of the #1 Web Accessibility Solution for ADA and WCAG Compliance*, March 20, 2020, YouTube video, available at: youtu.be/zA4BBEkClHs.

The U.S. Web Design System (USWDS), a project by the U.S. General Services Administration (GSA), is a comprehensive system of design principles, components, utilities, and page templates used to design and build websites for federal government agencies, departments, and services (U.S. General Services Administration). The USWDS utilizes the maturity model to meet the requirements for the 21st Century Integrated Digital Experience Act (IDEA), signed into law to ensure that the federal government provides an effective digital experience for citizens on each of its websites (U.S. General Services Administration, 2020). It contains a library of Cascading Style Sheets, visual elements, and other resources for the purpose of making websites that meet Section 508 standards. The GSA also created Accessibility for Teams, a quick-start, online guide for executing accessibility and inclusive design practices to ensure that all federal government websites are accessible (U.S. General Services Administration).

The USWDS and the Accessibility for Teams are good resources for local and state governments as well as for businesses, organizations, and individuals who need to provide an accessible digital experience as use of the web increases. These resources will help web teams build and maintain consistent web experiences that take into account people's abilities.

7. Conclusion

The problem of lack of accessibility would have been solved long ago if it was simply a matter of enforcing laws, such as the ADA. The recommendations for how the U.S. Southern District of Mississippi and the Sixth Judicial District of Minnesota websites can better utilize Abilities Design are examples for other organizations to consider as they attempt to understand how to go beyond the laws and technical requirements. The importance of accessibility has led to education about the systemic and covert oppression of people with disabilities. It must be understood that undoing ableism is not a form of charity but rather a means to tap into the abilities that individuals with disabilities do have. Abilities Design provides the tools to make that happen. When the civil rights of marginalized people are honored, new possibilities for inclusion emerge.

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