BARRIERS TO DIGITAL INCLUSION

Digital access barriers for Americans who are blind, have low vision, or are deafblind.

AUTHORS:
Arielle M. Silverman, Ph.D. | Sarahelizabeth J. Baguhn, Ph.D.
Bia B. Amorosino, B.A. | Rosalba R. Carranza, Ph.D.

AFB American Foundation® for the Blind

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AFB American Foundation® for the Blind

EXECUTIVE SUMMARY

The Americans with Disabilities Act (ADA) established four overarching goals for people with disabilities: equal opportunity, full participation, independent living, and economic self-sufficiency. In the 21st century, all people with disabilities must have full access to the digital environment in order to achieve these goals. People with a wide range of sensory, physical, and cognitive disabilities face significant barriers to accessing digital information and services. AFB conducted the Barriers to Digital Inclusion Survey (BDIS) in November-December of 2022 to specifically investigate the barriers faced by Americans who are blind, have low vision, or are deafblind with websites, mobile apps, and video programming. Millions of people with other disabilities face additional barriers.

This report summarizes survey data from 398 participants who shared information about the daily tasks they perform using websites and mobile apps, how often they encounter barriers, and the impacts of those barriers as well as the barriers they encounter with video programming.

The results indicate that blind, low vision, and deafblind people, like sighted people, seek goods and services from businesses using websites and mobile apps. However, they face pervasive challenges in the digital environment.

In the study, a majority of the participants reported facing access barriers at least some of the time while using websites and apps for important activities like shopping, applying for jobs, or interacting with schools. These access barriers limit independence, influence consumer decision making, and lead to frustration, exclusion, and lost productivity. Businesses, technology vendors, government agencies, schools, and service providers must make their websites and applications fully accessible to people with disabilities. Furthermore, the federal government must issue clear laws and regulations that make businesses, government agencies, and funding recipients accountable for the accessibility of the virtual environment through which they deliver their goods, services, programs, and activities. The recommendations in this report provide actionable steps that business leaders, policymakers, and computing educators can take to remove barriers and ensure full digital inclusion.

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BREAKING BARRIERS TO DIGITAL INCLUSION

BARRIER PREVALENCE

The nine tasks that presented the most common access barriers for individuals trying to use websites and mobile apps cover a wide spectrum of essential activities from travel and shopping to dating and education.

The percentages describe how many survey participants who have used websites or apps for a given task reported having at least occasional access issues.

1. Booking train or bus travel:
   91% of website users, **87%** of app users

2. Booking air travel:
   94% of website users, **85%** of app users

3. Ordering food:
   88% of website users, **87%** of app users

4. Applying for jobs:
   90% of website users, **80%** of app users

5. College coursework:
   88% of website users, **84%** of app users

6. Accessing information from a child's school:
   85% of website users, **87%** of app users

7. Online shopping:
   86% of website users, **79%** of app users

8. Locating job opportunities:
   86% of website users, **78%** of app users

9. Online dating:
   82% of website users, **80%** of app users

Overall, 21% of participants said they dealt with access barriers on the Web at least once a day while 28% of participants said they dealt with an inaccessible app at least once a day.

44% of website users and 41% of mobile app users said they will switch to a different business for service if they encounter access barriers from a business's website or mobile app.

BREAKING BARRIERS TO DIGITAL INCLUSION

CONSEQUENCES OF BARRIERS

- When asked how they respond to access barriers, 44% of website users and 41% of mobile app users said they will switch to a different business for service if they encounter access barriers from a business's website or mobile app.

- When asked how digital access barriers impact their lives, 79% of website users and 78% of app users said they feel frustrated because they don't have as much independence as a sighted person when completing digital tasks.

- In response to the same question, 59% of website users and 63% of app users said they have less choice in which businesses to use for digital services compared to a sighted person because of access barriers.

OTHER FINDINGS

- When asked what specific access barriers occur most often, many participants described encounters with unlabeled buttons or other elements, as well as undescribed images, elements that do not interact with screen readers, and poor contrast or text being too small to read with low vision.

- About 60% of participants reported that television viewing platforms they use lack Audio Description (AD) and about half reported that menus on their televisions or streaming platforms are difficult to navigate.

RECOMMENDATIONS

The federal government must issue and enforce clear laws and regulations that require websites and applications to be accessible. It should:

• Issue and vigorously enforce regulations under the Americans with Disabilities Act as well as Sections 504 and 508 of the Rehabilitation Act requiring covered entities to make all of their websites and software applications accessible to customers, clients, and employees with disabilities.

• Provide covered entities with clear, free, and easily understood technical assistance that enables compliance with digital accessibility regulations and law.

• Pass the Websites and Software Applications Accessibility Act to modernize requirements for accessible technology, including requiring technology vendors to make their products accessible.

Businesses and organizations that use or make websites and applications should:

• Test for and adhere to the most recent standards for web and software accessibility.

• Hire website and software engineers, designers, and project managers who are knowledgeable about how people with disabilities use digital technologies and accessible and inclusive design practices.

• Institute internal accessibility policies (including procurement policies) to ensure that any web or app-based products that the organization buys, deploys, or sells are accessible to people with disabilities.

• Provide clear channels for clients with disabilities to offer feedback about accessibility and seek support when they are experiencing barriers.

Computing educators must incorporate accessibility knowledge and practices in technology design, engineering, and content creation training courses, including boot camps, corporate trainings, and academic computer science curricula.

FINAL THOUGHTS

Access to digital information is critical for full participation in a wide assortment of modern life activities. For people with disabilities, including those who are blind, have low vision, or are deafblind, digital access barriers limit equal opportunity, full participation, independence, and economic self-sufficiency. Policymakers, business leaders, and website and software developers must work together to remove barriers and foster full digital inclusion for all people with disabilities.

INTRODUCTION

The expression *"There's an app for that"* is based in truth: In 2023, there is a website or app for just about any task, and these digital platforms offer convenience, cost savings, and efficiency. Reliance on digital tools has only increased in the aftermath of a pandemic that necessitated widespread telework, virtual education, and online shopping. Today, by one account, large companies deploy over 200 apps with purposes spanning the gamut from productivity and communications to security and design tools (Okta, 2023).

Yet, the digital platforms have not been designed for everyone. According to the 2021 American Community Survey, there are more than eight million people in the United States who are blind or have low vision and many more who are deaf, have limited manual dexterity, or have cognitive or speech disabilities that affect how they use websites and apps. Many companies, organizations, and government agencies have begun to recognize the importance of serving this consumer segment, and in many cases, the internet has opened the doors to more accessible information and transactions. Nevertheless, the American Foundation for the Blind (AFB) has found in past studies and through its programmatic work that people who are blind or have low vision continue to face significant barriers—and even exclusion—when trying to use websites and apps.

The Barriers to Digital Inclusion Survey (BDIS) was created to better understand how common these digital accessibility barriers are, where they occur, and what the consequences of these barriers might be. This research builds on recent AFB research studies that have revealed digital access barriers in some of the most critical areas, such as education and healthcare. For example, in the fall of 2020, 60% of educators teaching students who are blind or have low vision reported that their students had to use at least one inaccessible digital tool for online learning (Rosenblum et al., 2020) and in 2021, 57% of blind and low vision survey respondents who attempted to use telehealth platforms reported facing accessibility challenges (Rhoads et al., 2022).

This current survey investigated the prevalence and impacts of digital accessibility barriers across a variety of important domains with a focus on how access barriers in websites, mobile applications, video content, and electronic books affect the daily lives of people who are blind, have low vision, or are deafblind. Specific research questions that guided the survey included the following:

1. How many blind, low vision, and deafblind individuals use websites and mobile apps to access various types of information and services?

2. How often do these individuals encounter access barriers while using websites and mobile apps?

3. What strategies do blind, low vision, and deafblind individuals use to work around access barriers?

4. What are the most prevalent barriers to accessing video content and electronic books?

5. What are the consequences of digital access barriers?

The Barriers to Digital Inclusion Survey (BDIS) was created to better understand how common these digital accessibility barriers are, where they occur, and what the consequences of these barriers might be.

BREAKING BARRIERS TO DIGITAL INCLUSION

DESCRIPTION OF SURVEY PARTICIPANTS

A total of 398 participants completed the BDIS between November 1 and December 15, 2022. Participants were eligible for the survey if they were at least 18 years old, lived in the United States, and self-identified as a person who is blind, has low vision, and/or is deafblind. The 398 participants resided in 49 U.S. states, with the three most represented states being California (n=41), New York (n=22), and Texas (n=21). Working-age adults were fairly evenly represented, with the exception of young adults, ages 18-25, who were under half as likely to respond as other age brackets. Adults over 75 also responded at lower rates. Women and men were both well represented, and 1.3% of respondents identified as non-binary, agender, or genderfluid. About 77% of the participants identified as White. About 65% reported having a bachelor's or postgraduate degree. Most participants (346) had high-speed internet access at home. Table 1 shows a breakdown of the respondents by age, gender, vision level, race/ethnicity, additional disabilities, education level, and internet access.

> This research builds on recent AFB research studies that have revealed digital access barriers in some of the most critical areas, such as education and healthcare.
>
> BREAKING BARRIERS TO DIGITAL INCLUSION

TABLE 1:

Participant Demographics (Overall Number of Participants = 398)

Age	
18-25 years	27 (6.8%)
26-35 years	77 (19.3%)
36-45 years	67 (16.8%)
46-55 years	68 (17.1%)
56-65 years	65 (16.3%)
66-75 years	77 (19.3%)
76-85 years	10 (2.5%)
Over 85 years	4 (1.0%)
Prefer not to answer	3 (0.8%)
Gender	
Female (incl. trans women)	243 (61.1%)
Male (incl. trans men)	136 (34.2%)
Prefer not to answer	14 (3.5%)
Other gender identity	5 (1.3%)
Vision Level	
Blind	266 (66.8%)
Low vision	97 (24.4%)
DeafBlind	35 (8.8%)

TABLE 1: CONTINUED

Participant Demographics (Overall Number of Participants = 398)

Race/Ethnicity	
White	306 (76.9%)
Multiracial	32 (8%)
Asian/Asian American	26 (6.5%)
Black/African American	26 (6.5%)
Hispanic/Latino/a	22 (5.5%)
Prefer not to answer	17 (4.3%)
Native American	15 (3.8%)
Native Hawaiian/Pacific Islander	4 (1%)
Additional Disabilities	
d/Deaf/Hard of hearing	37 (9.3%)
Limited use of my arms, hands or fingers	22 (5.5%)
Neurological disorder	18 (4.5%)
Learning or cognitive disability	15 (3.8%)
Prefer not to answer	4 (1%)
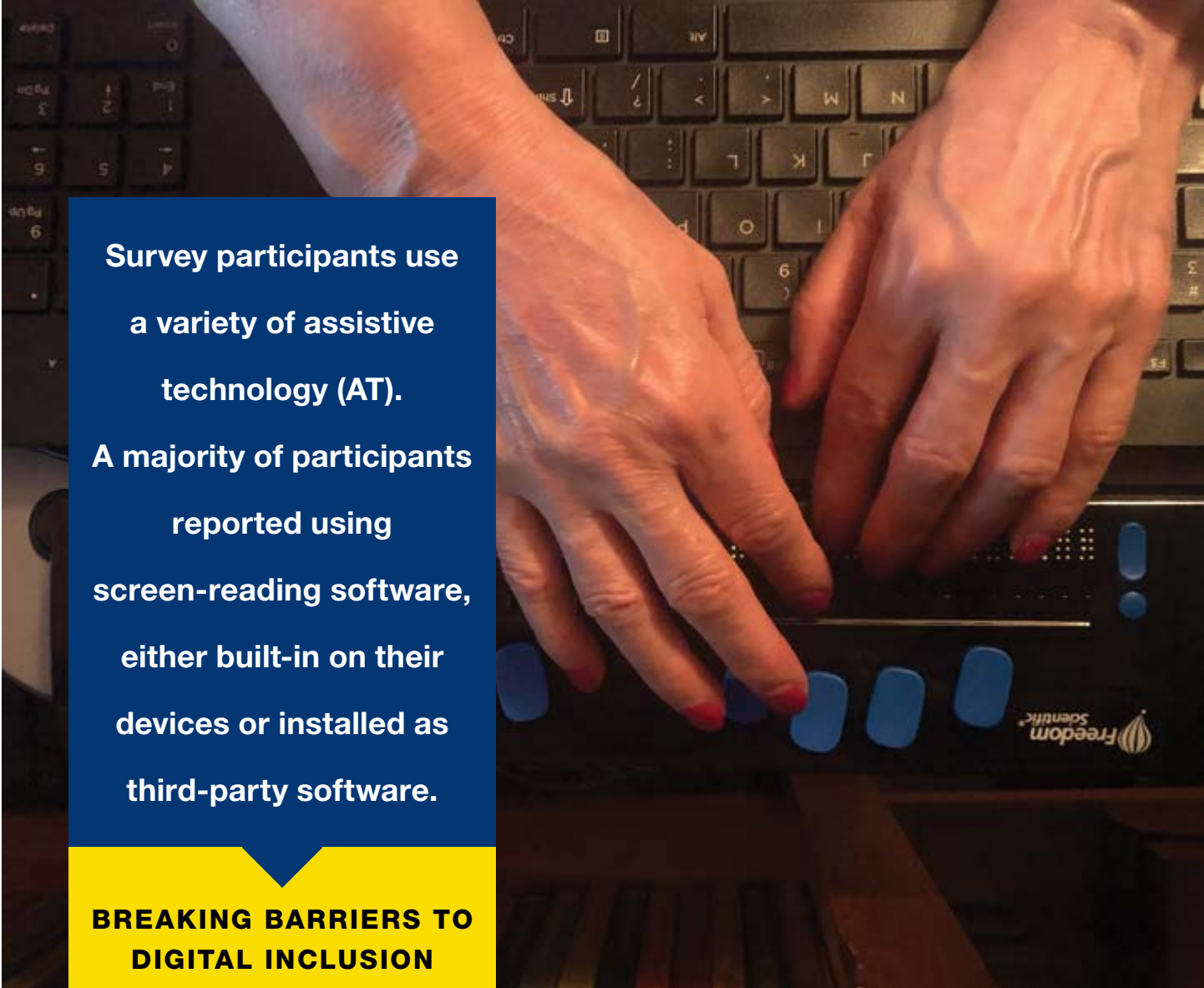
TABLE 1: CONTINUED

Participant Demographics (Overall Number of Participants = 398)

Educational Level	
Some high school	9 (2.3%)
High school graduate	29 (7.3%)
Some college	59 (14.8%)
Associate degree	33 (8.3%)
Bachelor's degree	114 (28.6%)
Postgraduate degree	147 (36.9%)
Prefer not to answer	7 (1.8%)
Internet Access	
I have broadband (high-speed) Internet access at home.	346 (86.9%)
I access the internet at home using mobile data on a tablet or smartphone.	26 (6.5%)
I access the internet outside my home at a place such as my workplace or the library.	17 (4.3%)
I prefer not to provide this information.	9 (2.3%)

ASSISTIVE TECHNOLOGY USE

Survey participants use a variety of assistive technology (AT). A majority of participants reported using screen-reading software, either built-in on their devices or installed as third-party software. One hundred nine (27.4%) of the participants use built-in visual access features, and fifty-one (12.8%) use some form of screen magnification. Fifty-two participants reported using AT related to being d/Deaf or hard of hearing, most commonly screen-reading software with hearing support, while 22 participants reported using AT related to a physical disability, most commonly voice recognition software. Other commonly used AT included voice assistants (such as Siri or Google Assistant) and remote visual interpreting services. Table 2 lists the AT technologies participants use.

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BREAKING BARRIERS TO DIGITAL INCLUSION

TABLE 2:

AT Devices Used

AT for People Who Are Blind or Have Low Vision	n = 398
Third-party screen reading software	270 (67.8%)
Built-in screen reading software	259 (65.1%)
Built-in voice assistant	258 (64.8%)
Visual interpreting service	142 (35.7%)
Built-in visual access features	109 (27.4%)
Refreshable braille display	92 (23.1%)
Braille notetaker	71 (17.8%)
Large monitor	56 (14.1%)
Handheld magnifier	53 (13.3%)
AT for People Who Are Blind or Have Low Vision	**n = 398**
Screen magnification software	51 (12.8%)
Video magnifier/CCTV	40 (10.1%)
Combined screen reader and magnification software	16 (4.0%)
AT for People Who Are Deaf / Hard of Hearing	**(n = 52)**
Screen reader with hearing support	41 (78.9%)
Teletypewriter (TTY) with standard print output	3 (5.8%)
TTY with screen magnification	3 (5.8%)
TTY with braille output	3 (5.8%)
Home alert system	1 (1.9%)
AT for People with Physical or Motor Disabilities	**(n = 22)**
Screen reader with hearing support	19 (86.4%)
Teletypewriter (TTY) with standard print output	1 (4.5%)
TTY with screen magnification	7 (31.8%)

ACCESS BARRIERS IN WEBSITES AND MOBILE APPS

To determine the prevalence of access barriers in websites and mobile apps, participants were shown a list of tasks that people commonly perform using websites, mobile apps, or both. For each of the tasks they performed within the past year using a website, they were asked how often they encountered accessibility issues while performing the task with the option to select from the following responses: "Never," "Less than half the time," and "At least half the time." Responses were coded as "Occasional barriers" if the participant reported having accessibility issues less than half the time, and "Frequent barriers" if the participant reported having accessibility issues more than half the time. Participants answered the same set of questions for tasks they performed within the past year when using mobile apps.

The tasks presented to the participants were organized in the following seven types of activities—commerce, employment, information, transportation, healthcare, education, and miscellaneous tasks. The following sections will report the prevalence of access barriers in websites and mobile apps while performing specific tasks in these categories of activities as reported by survey participants. The top nine tasks that presented the most common barriers for both website and app users will then be identified.

COMMERCE-RELATED TASKS

"The worst part of many mobile apps is that it's often just one small feature that stops the entire process of using them. A button to place an order or select a quantity for example."—Study Participant

A majority of participants reported using websites and apps for shopping, including meal and grocery delivery, as well as banking and finance. Some participants also used websites and apps for selling goods or services, scheduling personal services, or online dating. A small number also reported using websites(20 participants) and mobile apps (23 participants) to manage cryptocurrency.

Of the 317 participants who shopped on websites, 184 (58%) reported occasional access barriers and 89 (28.1%) reported frequent barriers. Among the 255 who shopped using mobile apps, 125 (55.6%) reported occasional barriers and 53 (23.6%) reported frequent barriers. Online dating also presented particularly common access barriers; for example, although only 49 participants reported using a dating app, nearly half (24, 49%) of those participants reported frequent access barriers. Table 3 lists the number of participants who reported using websites or mobile apps to perform each task, and among those users, the percentages who reported no barriers, occasional barriers, and frequent barriers.

TABLE 3:

Prevalence of Access Barriers to Commerce-Related Tasks

Task	Users	No Barriers	Occasional Barriers	Frequent Barriers
Website Users				
Online shopping	317	44 (13.9%)	184 (58%)	89 (28.1%)
Banking/Finance	257	57 (22.2%)	156 (60.7%)	44 (17.1%)
Ordering food	214	26 (12.1%)	141 (65.9%)	47 (22%)
Scheduling personal services	110	33 (30%)	52 (47.3%)	25 (22.7%)
Online selling	91	19 (20.9%)	46 (50.5%)	26 (28.6%)
Online dating	63	11 (17.5%)	27 (42.9%)	25 (39.7%)
Cryptocurrency	20	8 (40%)	7 (35%)	5 (25%)
App Users				
Online shopping	225	47 (20.9%)	125 (55.6%)	53 (23.6%)
Banking/Finance	215	66 (30.7%)	129 (60%)	20 (9.3%)
Ordering food	209	28 (13.4%)	126 (60.3%)	55 (26.3%)
Scheduling personal services	84	26 (31%)	38 (45.2%)	20 (23.8%)
Online selling	65	17 (26.2%)	34 (52.3%)	14 (21.5%)
Online dating	49	10 (20.4%)	15 (30.6%)	24 (49%)
Cryptocurrency	23	6 (26.1%)	12 (52.2%)	5 (21.7%)

EMPLOYMENT-RELATED TASKS

Among the 200 participants who reported using a website to look for job opportunities, 106 (53%) reported occasional barriers and 66 (33%) reported frequent barriers. Among the 193 who reported applying for jobs on websites, 101 (52.3%) reported occasional barriers and 72 (37.3%) reported frequent barriers. Although the use of mobile apps for job searching was less common, with 85 participants using mobile apps to look for jobs and 64 to apply for jobs, both tasks were reported by app users to have similar prevalence of access barriers. Table 4 lists the number of participants who reported using websites or mobile apps to perform each task, and among those users, the percentages who reported no barriers, occasional barriers, and frequent barriers for each task.

TABLE 4:				
Prevalence of Access Barriers to Employment-Related Tasks				
Task	Users	No Barriers	Occasional Barriers	Frequent Barriers
Website Users				
Looking for jobs	200	28 (14%)	106 (53%)	66(33%)
Applying for jobs	193	20 (10.4%)	101 (52.3%)	72 (37.3%)
App Users				
Looking for jobs	85	19 (22.4%)	42 (49.4%)	24 (28.2%)
Applying for jobs	64	13 (20.34%)	29 (45.3%)	22 (34.4%)

INFORMATION-RELATED TASKS

"Overall, the lack of accessibility of online services hinders my ability to access information in a timely, self-sufficient manner, and often requires me to spend extensive time seeking out alternative methods for accessing the same information as my sighted and hearing peers."—Study Participant

Websites and mobile apps play a critical role in ensuring access to information. Most participants reported using websites or mobile apps to follow the news. Although a small number of participants reported frequent barriers with following the news, occasional barriers were reported by 125 (51.2%) of the 244 participants who follow the news on websites and 126 (53.4%) of those who do so on mobile apps. The same is true for participants who rely on websites for emergency alerts in which the reports of frequent barriers are small but reports of occasional barriers are higher. Of the 163 website users, 78 (47.9%) reported occasional barriers as did 62 (38.3%) of mobile app users. One hundred eighty-four participants reported using websites to learn about public benefits (such as SSI or SNAP benefits) with 53 (28.8%) reporting frequent barriers. Of the 70 who access the same information through mobile apps, 18 (25.7%) reported frequent barriers. Of the 168 who access information about housing listings on websites, 45 (26.8%) reported frequent barriers and of the 68 who access them on mobile apps, 15 (22.1%) reported frequent barriers. Table 5 lists the number of participants who reported using websites or mobile apps to access information, and among those users, the percentages who reported no barriers, occasional barriers, and frequent barriers to access each type of information.

BREAKING BARRIERS TO DIGITAL INCLUSION

TABLE 5:

Prevalence of Access Barriers to Obtaining Information by Type

Task	Users	No Barriers	Occasional Barriers	Frequent Barriers
Website Users				
News	244	82 (33.6%)	125 (51.2%)	37 (15.2%)
Benefits info	184	46 (25%)	85 (46.2%)	53 (28.8%)
Housing info	168	34 (20.2%)	89 (53%)	45 (26.8%)
Emergency alerts	163	57 (35%)	78 (47.9%)	28 (17.2%)
App Users				
News	236	83 (35.2%)	126 (53.4%)	27 (11.4%)
Benefits info	70	15 (21.4%)	37 (52.9%)	18 (25.7%)
Housing info	68	20 (29.4%)	33 (48.5%)	15 (22.1%)
Emergency alerts	162	76 (46.9%)	62 (38.3%)	24 (14.8%)

TRANSPORTATION-RELATED TASKS

One hundred and eighty-five participants used a website to book air travel in the last year, and 125 used a website to book interstate bus or train travel. Mobile app usage was less common for these activities, but was much more common for scheduling rideshare, with 209 participants using a rideshare app in the last year. One hundred fifty-nine participants reported using a website and 149 used a mobile app to look up local transit information, such as bus schedules. Websites and apps for booking air, bus, or train travel and local transit information presented relatively frequent access issues, while rideshare apps were rated as relatively accessible. Table 6 lists the number of participants who reported using websites or mobile apps to perform transportation-related tasks, and among those users, the percentages who reported no barriers, occasional barriers, and frequent barriers.

TABLE 6:

Prevalence of Access Barriers to Transportation-Related Tasks

Task	Users	No Barriers	Occasional Barriers	Frequent Barriers
Website Users				
Booking air travel	185	11 (5.9%)	107 (57.7%)	67 (36.2%)
Looking up local transit info	159	31 (19.5%)	80 (50.3%)	48 (30.2%)
Booking bus/train travel	125	11 (8.8%)	65 (52%)	49 (39.2%)
Scheduling rideshare	114	41 (36%)	56 (49.1%)	17 (14.9%)
App Users				
Booking air travel	117	17 (14.5%)	58 (49.6%)	42 (35.9%)
Looking up local transit info	149	39 (26.2%)	76 (51%)	34 (22.8%)
Booking bus/train travel	88	11 (12.5%)	50 (56.8%)	27 (30.7%)
Scheduling rideshare	209	76 (36.4%)	117 (56%)	16 (7.7%)

HEALTHCARE-RELATED TASKS

"I missed critical health information because Captcha barriers prevented me from accessing my doctor's health portal."—Study Participant

Many participants reported using websites or apps to manage their health. For example, 255 participants reported using a website to review their medical records or test results, or to access healthcare service information like finding a doctor. Similarly, 128 participants used a mobile app to look for healthcare service information. One hundred ninety-eight participants used a website to schedule healthcare appointments and 129 used a mobile app, while 185 used a website to receive services and 141 used a mobile app. Smaller numbers of participants used websites or apps for wellness management (such as meditation and fitness) or mental health services. Across the healthcare tasks, about 40%-50% of participants reported occasional barriers while 20%-30% reported frequent barriers. Table 7 lists the number of participants who reported using websites or mobile apps to perform healthcare-related tasks, and among those users, the percentages who reported no barriers, occasional barriers, and frequent barriers when performing those tasks.

BREAKING BARRIERS TO DIGITAL INCLUSION

TABLE 7:

Prevalence of Access Barriers to Healthcare-Related Tasks

Task	Users	No Barriers	Occasional Barriers	Frequent Barriers
Website Users				
Obtaining healthcare info	254	63 (24.8%)	130 (51.2%)	61 (24%)
Reviewing medical records	255	71 (27.8%)	124 (48.6%)	60 (23.5%)
Scheduling appointments	198	51 (25.8%)	93 (47%)	54 (27.3%)
Receiving telehealth services	185	43 (23.2%)	98 (53%)	44 (23.8%)
Managing wellness		28 (20.9%)	68 (50.7%)	38 (28.4%)
Accessing mental health info	113	35 (31%)	46 (40.7%)	32 (28.3%)
App Users				
Obtaining healthcare info	128	42 (32.8%)	59 (46.1%)	27 (21.1%)
Reviewing medical records	159	60 (37.7%)	66 (41.5%)	33 (20.8%)
Scheduling appointments	129	46 (35.7%)	53 (41.1%)	30 (23.3%)
Receiving telehealth services	141	39 (27.7%)	67 (47.5%)	35 (24.8%)
Managing wellness	113	30 (26.5%)	51 (45.1%)	32 (28.3%)
Accessing mental health info	56	15 (26.8%)	25 (44.6%)	16 (28.6%)

EDUCATION-RELATED TASKS

One hundred thirty-seven participants reported using a website to access college or university coursework within the last year, with eighty-one (59.1%) reporting occasional barriers and 39 (28.5%) reporting frequent barriers. Of the 69 who accessed college or university coursework on mobile apps, 32 (46.4%) reported occasional barriers and 26 (37.7%) reported frequent barriers. Some participants also reported using websites or apps for other types of adult learning, such as language learning or Data Camp. Sixty-six participants reported using a website to access information from a child's school, while 39 reported using an app. Twenty-six (39.4%) reported frequent barriers when accessing a child's school information on the web and 12 (30.8%) reported frequent barriers when doing so with a mobile app. Table 8 lists the number of participants who reported using websites or mobile apps to perform tasks related to education, and among those users, the percentages who reported no barriers, occasional barriers, and frequent barriers when performing those tasks.

TABLE 8:

Prevalence of Barriers to Education-Related Tasks

Task	Users	No Barriers	Occasional Barriers	Frequent Barriers
Website Users				
Taking college courses	137	17 (12.4%)	81 (59.1%)	39 (28.5%)
Self-learning	99	22 (22.2%)	52 (52.5%)	25 (25.3%)
Accessing information in child's school	66	10 (15.2%)	30 (45.5%)	26 (39.4%)
App Users				
Taking college courses	69	11 (15.9%)	32 (46.4%)	26 (37.7%)
Self-learning	90	22 (24.4%)	52 (57.8%)	16 (17.8%)
Accessing information in child's school	39	5 (12.8%)	22 (56.4%)	12 (30.8%)

MISCELLANEOUS TASKS

Participants were asked about five additional tasks: email or instant messaging, social media, use of digital maps, games, and photography or art. Most participants used websites or apps for email and instant messaging with few access barriers. Most participants also used websites or mobile apps for social media and digital maps. One in four participants (25%) reported frequent access barriers using mobile apps for maps, while 42% reported frequent barriers with map-related websites. Table 9 lists the number of participants who reported using websites or mobile apps to perform each of the five tasks, and among those users, the percentages who reported no barriers, occasional barriers, and frequent barriers when performing these tasks.

TABLE 9:
Prevalence of Barriers to Miscellaneous Tasks

Task	Users	No Barriers	Occasional Barriers	Frequent Barriers
Website Users				
Email/IM	280	116 (41.4%)	138 (49.3%)	26 (9.3%)
Social media	254	50 (19.7%)	141 (55.5%)	63 (24.8%)
Digital maps	152	25 (16.4%)	63 (41.4%)	64 (42.1%)
Games	123	39 (31.7%)	49 (39.8%)	35 (28.5%)
Photo/design/art	52	11 (21.2%)	21 (40.4%)	20 (38.5%)
App Users				
Email/IM	272	121 (44.5%)	131 (48.2%)	20 (7.4%)
Social media	237	52 (21.9%)	137 (57.8%)	48 (20.3%)
Digital maps	188	43 (22.9%)	98 (52.1%)	47 (25%)
Games	156	52 (33.3%)	61 (39.1%)	43 (27.6%)
Photo/design/art	64	19 (29.7%)	29 (45.3%)	16 (25%)

TASKS WITH THE MOST PREVALENT BARRIERS

After gathering the responses of all the survey participants, all the tasks were rank ordered by the percentage of website and app users who reported experiencing any barriers (either occasional or frequent barriers). The top ten tasks with the most frequent barriers for websites and for mobile apps, separately, were identified and the list was narrowed down to nine tasks that appear in the top ten on both lists. The list below represent the percentage of website and app users who expressed that they face either occasional or frequent barriers with each of the top nine tasks.

1. Booking train or bus travel: 91% of website users, 87% of app users

2. Booking air travel: 94% of website users, 85% of app users

3. Ordering food: 88% of website users, 87% of app users

4. Applying for jobs: 90% of website users, 80% of app users

5. Doing college coursework: 88% of website users, 84% of app users

6. Accessing information from a child's school: 85% of website users, 87% of app users

7. Shopping online: 86% of website users, 79% of app users

8. Locating job opportunities: 86% of website users, 78% of app users

9. Online dating: 82% of website users, 80% of app users

The federal government must issue and enforce clear laws and regulations that require websites and applications to be accessible.

BREAKING BARRIERS TO DIGITAL INCLUSION

OVERALL BARRIER FREQUENCY

Finally, participants were asked, overall, how often they typically encounter any kind of accessibility issue while using websites and again while using mobile apps. In response, 21% of participants reported facing accessibility barriers with websites at least once daily and 28% reported access barriers with mobile apps at least once a day. Approximately 20% of website and app users reported facing barriers at least once a week but not every day; 30% of website users and 23% of app users reported facing barriers at least once a month but not every week. Only about 25% of participants reported encountering access barriers with websites or mobile apps less than once a month. Table 10 lists the overall barrier frequency experienced by participants when using websites and apps.

TABLE 10:
Barrier Frequency in Websites and Apps

Frequency	Websites	Apps
At least once a day	74 (21.1%)	85 (28.2%)
Nearly every day	31 (8.9%)	31 (10.3%)
3-5 times a week	21 (6%)	20 (6.6%)
Frequency	Websites	Apps
1-2 times a week	21 (6%)	22 (7.3%)
3-4 times a month	61 (17.4%)	43 (14.3%)
1-2 times a month	48 (13.7%)	28 (9.3%)
Less than once a month	94 (26.9%)	72 (23.9%)

STRATEGIES FOR COPING WITH BARRIERS

Participants were asked to report which strategies they use when they encounter accessibility issues with a website or mobile app. They were provided a list of options and were allowed to check as many strategies as they wished. A total of 355 participants responded to this question regarding their experience with websites, while 304 participants responded regarding mobile apps. One hundred fifty-five participants (43.7%) indicated they have done business elsewhere if they encountered an inaccessible website while seeking goods or services, while 125 participants (41.3%) reported doing business elsewhere when they encounter an inaccessible mobile app. For websites, other common strategies included switching browsers, getting in-person help from a sighted person, and trying the mobile version of the website. Using residual vision to access the site was the least common strategy used, with 53 people referencing it. Other less commonly selected strategies included trying a different screen reader mode, selected by 106 participants, and using a visual interpreting service, selected by 111 participants. For access barriers in mobile apps, nearly 196 participants tried updating the app or switching to a web version. Many also sought in-person help from a sighted person. Table 11 lists some of the coping strategies used by both web and app users.

> Several participants stated that improved AT has led to an increase in access to information and opened more doors for those with accessibility needs.
>
> **BREAKING BARRIERS TO DIGITAL INCLUSION**

TABLE 11:

Coping Strategies

Website Strategies	Survey Respondents
Switching to another browser	228 (64.2%)
Getting in-person help from a sighted person	213 (60%)
Switching to a mobile version	197 (55.5%)
Switching to another AT	184 (51.8%)
Using a different device	180 (50.7%)
Switching to a mobile app	161 (45.4%)
Doing business elsewhere	155 (43.7%)
Seeking guidance from others with BVI	140 (39.4%)
Utilizing services via phone	140 (39.4%)
Contacting the company	133 (37.5%)
Using a visual interpreting service	111 (31.3%)
Switching to screen reader mode	106 (29.9%)
Using my remaining vision	53 (14.9%)
App Strategies	Survey Respondents
Switching to web version instead of mobile app	197 (65%)
Upgrading the app	196 (64.7%)
Getting in-person help from a sighted person	186 (61.4%)
Updating my OS	139 (45.9%)
Seeking guidance from others with BVI	135 (44.6%)
Doing business elsewhere	125 (41.3%)
Contacting the company	85 (28.1%)
Utilizing services via phone	84 (27.7%)
Using different AT	75 (24.8%)
Using the mobile app on a different device	71 (23.4%)
Using a visual interpreting service	71 (23.4%)
Using my remaining vision	37 (12.2%)

OPEN-ENDED DESCRIPTIONS OF BARRIERS TO ACCESS

Participants were asked to describe the top three challenges they most frequently encounter during website usage. A large number of participants mentioned unlabeled items, especially buttons and links, as a barrier to access (n=298). Another 113 participants mentioned issues with screen reader navigation. Fifty-two participants described poor contrast in text or images. Other issues included enlarged fonts which made it difficult to access all the information on the screen, being unfamiliar with how to use websites (especially when they change or have confusing layouts), difficulty completing Captchas, voiceover being unable to read foreign languages, and being unable to zoom.

Participants were also asked to describe the top three barriers they encountered with mobile apps. Overall, responses were similar to those provided for website barriers. A large number of participants mentioned unlabeled or mislabeled elements, particularly buttons, as a barrier to access (n=129). Another 56 participants mentioned images or graphics that lacked text descriptions, and 42 participants mentioned difficulty interacting with controls, such as buttons or edit fields that did not respond appropriately when tapped. Other issues included difficulties with poor contrast or text being too small to read for those who have low vision; apps losing accessibility when updated; apps spontaneously refreshing or having focus jump around the screen; and apps with cluttered layouts that were difficult to navigate with AT.

Others described the methods they implemented to circumvent accessibility challenges, including seeking sighted assistance; avoiding inaccessible apps; enlarging screens with external magnifiers; and using laptops instead of mobile devices. Fifteen participants identified lost time and reduced productivity as additional negative impacts.

ACCESS BARRIERS IN VIDEO PROGRAMMING AND EBOOKS

In the survey, participants were also asked about access barriers they encountered when using devices to access video programming (specifically, television and movies) and eBooks. Follow-up questions for those who did use a device explored how frequently the service posed barriers to accessibility, and what specific barriers were encountered.

VIDEO PROGRAMMING

Participants were asked about the barriers they encountered when using various types of video programming devices. Table 12 lists the number of users and the percentage of occasional barriers and frequent barriers for each video programming device. A majority of participants reported at least occasional barriers with each method.

TABLE 12:

Prevalence of Barriers to Video Programming by Device

TV Devices	Users	Occasional Barriers	Frequent Barriers
Smart TV (app or dedicated device)	155	82 (54.3%)	50 (33.1%)
Cable TV	151	82 (54.4%)	47 (31.5%)
Streaming through tablet/phone app	144	95 (68.8%)	22 (15.9%)
Conventional TV/On-Air Broadcasting	134	66 (50.8%)	44 (33.8%)
Streaming through a web browser	119	75 (64.7%)	27 (23.3%)
Other ways	47	17 (38.6%)	12 (27.3%)

Across devices, the most common barriers reported by participants included a lack of available audio description (AD), difficulty navigating menu options, and inability to find and turn on AD when it was available. Table 13 shows the numbers of participants who reported specific barriers with each type of television device.

TABLE 13:
Specific Telecommunication Barriers

| Barrier	Cable (n=130)	Conventional TV (n=118)	SmartTV (n=135)	Web Streaming (n=102)	App Streaming (n=121)
AD unavailable	85 (65.4%)	73 (61.9%)	85 (63.0%)	59 (57.8%)	80 (66.1%)
Menu navigation	66 (50.8%)	64 (54.2%)	80 (59.3%)	49 (48.0%)	64 (52.9%)
Can't turn on AD	64 (49.2%)	57 (48.3%)	67 (49.6%)	47 (46.1%)	52 (43.0%)
Can't access settings menu	64 (49.2%)	63 (53.4%)	55 (40.7%)	33 (32.4%)	33 (27.3%)
Can't select channel/show	38 (29.2%)	23 (19.5%)	44 (32.6%)	30 (29.4%)	41 (33.9%)
AD hard to hear	32 (24.6%)	27 (22.9%)	27 (20.0%)	18 (17.6%)	29 (24.0%)
Size/contrast of menu	29 (22.3%)	20 (16.9%)	31 (23.0%)	26 (25.5%)	20 (16.5%)
AD is not effective for the content	30 (23.1%)	23 (19.5%)	24 (17.8%)	18 (17.6%)	29 (24.0%)
Can't turn on captions	23 (17.7%)	25 (21.2%)	25 (18.5%)	16 (15.7%)	15 (12.4%)
Sum of barriers	**431**	**375**	**438**	**296**	**363**

An additional 33 participants reported on barriers they encountered with television devices not listed above. These barriers were similar and included audio description unavailable (20, 60.6%), Can't turn on audio description (19, 57.6%), Can't access settings menu (14, 42.4%) and Can't navigate the menus (13, 39.4%). Other barriers were reported by less than one-third of participants in this area.

Finally, participants were invited to share open-ended feedback about their experiences accessing video content. Some participants reported that having missing or inconsistent audio descriptions was very frustrating (n=7). Other participants discussed how every application and remote control is different, thereby making it difficult to navigate (n=4). One participant wrote, *"Too many remote controls...too much navigation... too much to figure out. It's easier not to watch television or movies... I'll read a book."*

EBOOKS

About two-thirds of participants reported that they read electronic books, or eBooks (n=210). Of those, 53 (25.2%) use a dedicated eBook reader. One hundred sixty-eight (80%) participants use smartphones to read eBooks. Computer apps were used by 75 (35.7%) people and websites by 87 (41.4%) people. Some participants also reported using BARD (Braille and Audio Reading Download) Services and blindness-specific devices such as the Victor Reader Trek. Overall, only 30.2% of respondents were consistently able to access eBooks without accessibility barriers. Barriers were encountered less than half the time by 53.3% of users, and more than half the time by 15.6%.

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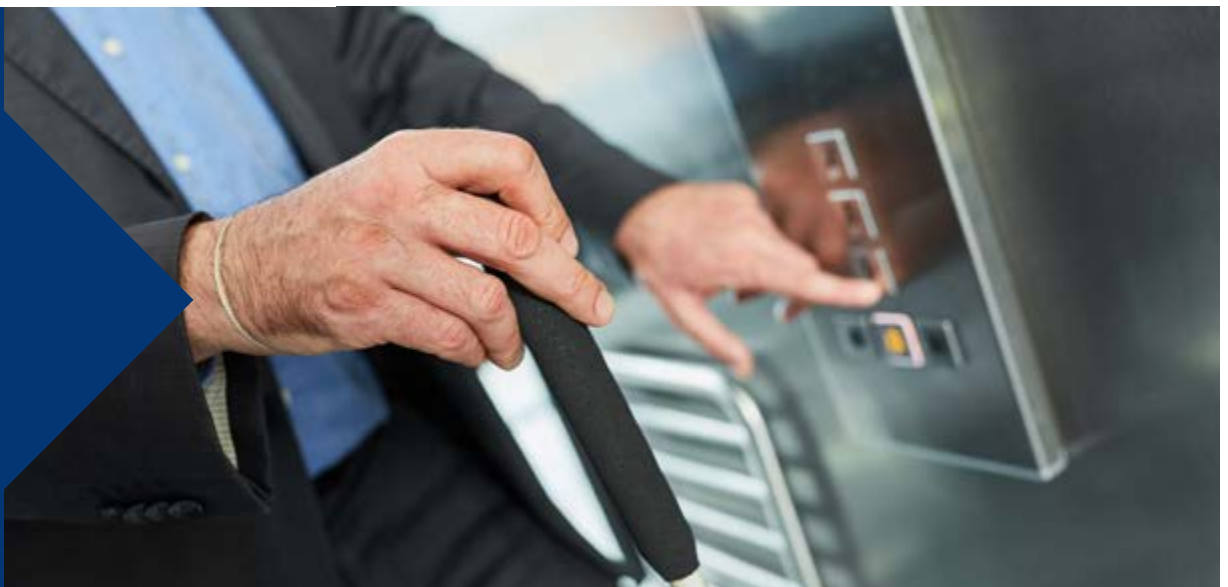
CONSEQUENCES OF ACCESS BARRIERS

Participants next indicated which negative impacts they experienced as a result of digital access barriers, and could check as many as they wished. The three most commonly cited negative impacts included (1) taking longer than a sighted person to complete tasks; (2) frustration with inability to complete tasks independently; and (3) missing out on important information due to accessibility issues. More than 60% of participants affirmed that they have less choice in which companies to utilize than their sighted peers do because of accessibility concerns. Other impacts cited by at least half the sample included needing to wait for a sighted person to assist with websites or apps or losing privacy because they needed to get human support with personal tasks. Additionally, about one-fourth of participants cited the need to pay for human assistance with inaccessible websites or apps as a consequence of access barriers. Table 14 lists the percentage of participants who endorsed each consequence.

TABLE 14:

Consequences of Access Barriers

Consequences	Websites	Apps
It takes me longer.	309 (88.8%)	246 (83.1%)
I'm frustrated that I can't complete tasks independently.	275 (79%)	230 (77.7%)
I miss information.	234 (67.2%)	190 (64.2%)
I can't complete tasks.	231 (66.4%)	187 (63.2%)
I have to wait for a sighted person.	228 (65.5%)	199 (67.2%)
I have less choice in companies.	204 (58.6%)	185 (62.5%)
I have less privacy.	191 (54.9%)	165 (55.7%)
I feel socially excluded.	156 (44.8)	146 (49.3%)
I'm less productive at work.	115 (33%)	94 (31.8%)
I have to pay for assistance.	94 (27%)	70 (23.6%)

Participants were also invited to share open-ended comments on how website and app accessibility or usability challenges impact their everyday lives. Again, patterns of response were similar for websites and mobile apps. Regarding websites, 16 participants mentioned being unable to complete or taking longer to complete work, school, or trainings due to lack of accessibility, and 13 participants mentioned feeling ashamed, frustrated, or being reminded that they are not "equal" to their sighted peers, especially when it takes them longer or they are unable to complete given tasks. One participant wrote that *"Inaccessible Web sites make me feel ashamed because I can't understand the site as sighted people can. I feel inferior to sighted people. They also make me feel inadequate."* Another participant stated that *"the difficulty in accessibility means that I have to spend many hours doing something that should take minutes and many times I end up not doing [it] out of frustration. There have been many times when I am trying to purchase an item and I end up not getting it or switching to another company because of the inaccessibility of the website or application."* Regarding an experience with mobile apps, another participant provided this example, *"It's frustrating when I have filled my shopping cart with groceries and other items, only to find that I am unable to access my cart and check out because ads are in my way, and there's no way to get past them."*

FINAL REFLECTIONS FROM PARTICIPANTS

Participants were asked to share how, if at all, technology changes have impacted and/or impeded their access to information. Several participants stated that improved AT has led to an increase in access to information and opened more doors for those with accessibility needs (n=27). Twenty-three participants spoke to how new technology has come a long way and improved access with, of course, certain exceptions, and 10 participants noted how the level of AT accessibility really depends on the device and technology being used. Improved assistive technology has also helped people regain independence and improved people's quality of life (n=7). Other comments spoke to the support that assistive technologies offer to enhance work and school productivity, while also discussing certain limitations of AT, such as a need to improve brightness and contrast on devices.

Participants were asked to share what they want technology developers to know about their needs as persons who are blind, have low vision, or are deafblind. Seventy-five participants communicated a need for integrating features that optimize access across websites and mobile applications (reduce visual clutter, adjust contrast, label buttons, provide image descriptions, etc.). Many others want technology developers to include accessibility from the beginning. *"Nothing created without us in mind from the floor up,"* is how one participant communicated this message. Others (n=32) called for equal access, *"We want the same opportunities to enjoy, learn, and benefit from useful technology."*

FINAL THOUGHTS

"Keep asking questions and updating your sites and apps. Don't give up and please don't leave us out."

Access to digital information is critical for full participation in a wide assortment of modern life activities. Americans who are blind, have low vision, and are deafblind, like Americans who are fully sighted, use digital tools for many daily activities, from shopping and planning trips to job-searching and dating. Across these tasks, however, participants reported significant, pervasive gaps in the accessibility of websites, mobile apps, and video programming services. More than 80% of participants who use websites and apps to order food, find and apply for jobs, book travel, or shop online reported at least occasional difficulties, and across most digital tasks, 20%-30% reported having difficulties at least half the time when they tried to perform these tasks. Multiple types of barriers were identified, impacting both screen-reader and screen-magnification users. Furthermore, participants reported inconsistent availability of audio description and difficulties navigating menu-based features on television and while using TV streaming websites and apps.

Participants reported a variety of negative impacts that they linked with the experience of access barriers, including limited independence and privacy, as well as restricted freedom of choice in which companies to utilize. Although participants reported using a variety of strategies to overcome access barriers, more than 40% reported switching companies if they encountered an access barrier while trying to obtain goods or services online.

When digital information and tools are accessible, however, they have great potential to level the playing field and afford full access to people who are blind, have low vision, and are deafblind. As one participant stated, *"Accessible websites, PDFs, and thoughtful design free me up to participate, recreate, and work to my full potential."*

RECOMMENDATIONS

Businesses, technology vendors, government agencies, schools, and service providers must make their websites and applications fully accessible to people with disabilities.

• Test for and adhere to the most recent standards for web and software accessibility. The Web Accessibility Initiative creates international standards that explain how to make content more accessible to people with disabilities, including the Web Content Accessibility Guidelines, the Authoring Tool Accessibility Guidelines (ATAG) and the User Agent Accessibility Guidelines (UAAG).

• Hire website and software engineers, designers, and project managers who are knowledgeable about how people with disabilities use digital technologies and accessible and inclusive design practices. Hire people with disabilities for key testing and design roles that impact the accessibility of the product.

• Institute internal accessibility policies (including procurement policies) to ensure that any web or app-based products that the organization buys, deploys, or sells are accessible to people with disabilities.

• Assign responsibility for delivering accessibility to specific individuals throughout the organization (e.g., human resources, product development, procurement, etc.) and where appropriate, designate a Chief Accessibility Officer to coordinate accessibility implementation.

• Designate resources and budget for accessibility activities, including training, evaluations, product updates, and customer support.

• Provide clear channels for clients with disabilities to offer feedback about accessibility and seek support when they are experiencing barriers.

• Conduct regular standardized product reviews to monitor the accessibility of websites and software applications on an ongoing basis.

Computer educators must incorporate accessibility knowledge and practices in technology design, engineering, and content creation training courses, including boot camps, corporate trainings, and academic computer science curricula.

The federal government must issue clear laws and regulations that make businesses, government agencies, and funding recipients accountable for the accessibility of the virtual environment through which they deliver all goods, services, programs, and activities.

• Issue regulations under the Americans with Disabilities Act requiring covered entities to make all of their websites and software applications accessible to customers and employees with disabilities.

• Issue regulations under Section 504 of the Rehabilitation Act to ensure that recipients of federal funding do not discriminate on the basis of disability in delivering services, programs, and activities through their websites and software applications.

• Provide covered entities with clear, free, and easily understood technical assistance that enables compliance with digital accessibility regulations and law.

• Pass the Websites and Software Applications Accessibility Act and other legislation to modernize requirements for accessible technology.

• Improve compliance with and enforcement of Section 508 of the Rehabilitation Act across the federal government to ensure that all federal agencies are accessible to constituents and employees with disabilities.

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EXECUTIVE OFFICE:

1101 Wilson Blvd, 6th Floor

Arlington, VA 22209

CONTACT INFORMATION:

Arielle Silverman

asilverman@afb.org