Original Article

Digital Accessibility Guide for Aging Population

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Abstract
Target Audience

Senior digital users, Product Designers, Product Developers, Information Technology Business Analysts, Information Technology Compliance team partners.

In current situations, the use of the digital web is becoming more predominant as part of everyday routines. It is essential for web authors to ensure the web content can be accessible by everyone. On the other hand, it is also significant that the user becomes familiar with the existing assistive technologies, which plays a major role in accessing web content by people with disabilities. The primary objective of this article is to articulate the facts about the Aging population, how they relate to digital web accessibility, assistive technologies available to access web content, benefits of making accessible digital products, and best practices for creating accessible web solutions. This article also covers different types of disabilities challenged by people with ageing impairments in accessing the digital web content, as well as the remedies to be used from both the user's and web author's perspectives.

Keywords - *Digital accessibility, Web accessibility, Assistive technologies, High contrast, Zoom, Accessibility tools, Design principles, Development references.*

I. AGING POPULATION STASTICS IN THE USA

Aging is not the nature of the disability but a very common lifestyle that impacts almost everyone past the subjective age range. According to the United States Aging population statistics,

Fig. 1 "Disability is especially common in these groups. 2 in 5 adults aged 65 years and older have a disability."

Among different kinds of disabilities, ambulatory disability is the most common type of disability for older people aged 65 and over, with around 22.5% of them having it. The majority of senior users aged 65 and Over go online on a daily basis. The below graph shows the % of Internet users of age 65 plus-

- 71% of users who are 65 plus access the internet every day or almost every day
- 11% of who are 65 plus access internet access 3 to 5 times per week

II. DISABILITIES THAT AFFECT AGING POPULATION

Ageing could presumably bring in one or more impairments that could be more related to the overlapping needs of People with Disabilities. Many older people have age-related impairments that can affect how they use the web, such as declining

- vision — including reduced contrast sensitivity, colour perception, and near-focus, making it difficult to read web pages
- physical ability — including reduced dexterity and fine motor control, making it difficult to use a mouse and click small targets
- hearing — including difficulty hearing higher-pitched sounds and separating sounds, making it difficult to hear podcasts and other audio, especially when there is background music
- cognitive ability — including reduced short-term memory, difficulty concentrating and being easily distracted, making it difficult to follow navigation and complete online tasks

For example, let's talk about Color blindness with a few examples. The different types of colour blindness include red-green colour blindness, green colour blindness, blue colour blindness, no colour blindness. Here's a small example shown on how people with 'no colour blindness' see the normal picture that is represented by colour alone –
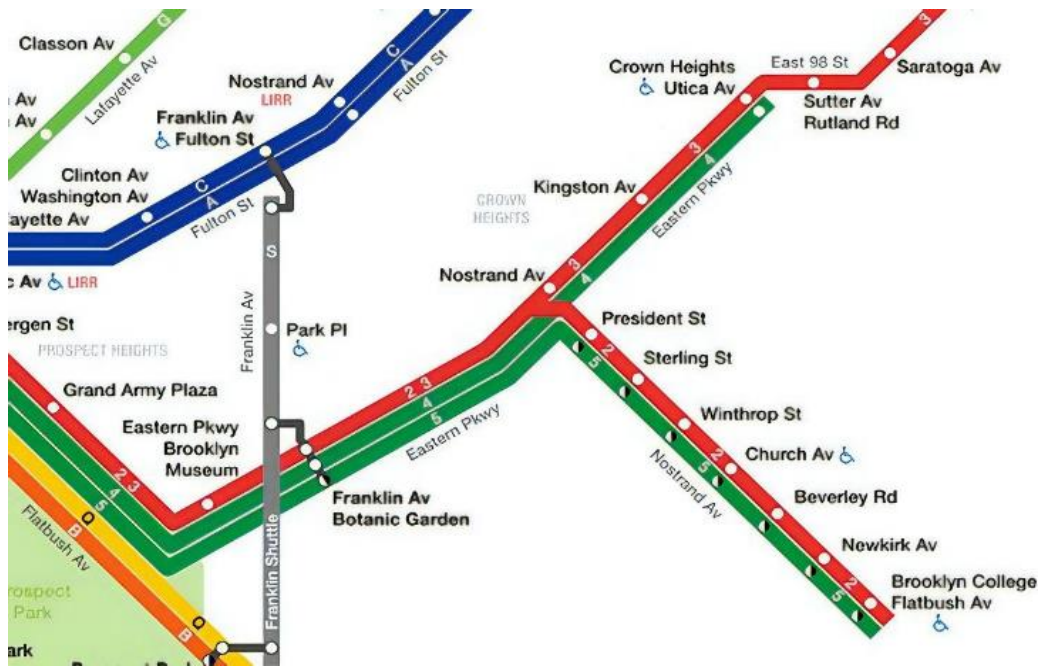
Image 1:

Fig. 2 New York train map that identifies different routes using colour alone (red, green, blue, yellow)
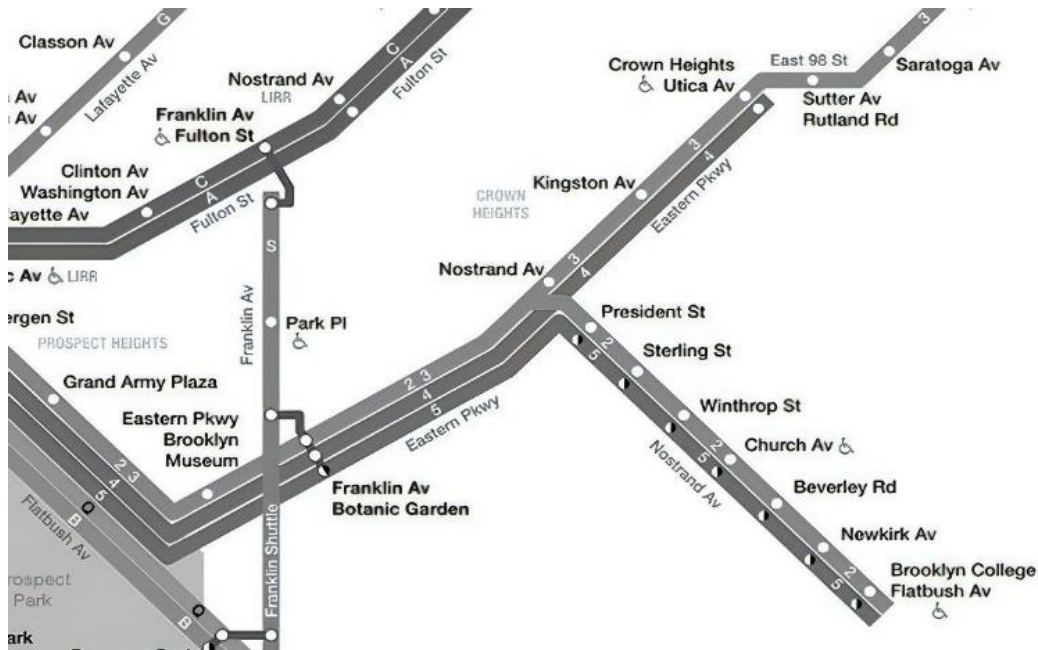
Image 2:

Fig. 3 The same New York train map shows the colours of the different routes as only grey, which will not help that person to identify the difference in routes by a person with colour blindness

III. AGING POPULATION AND INTERNET USE

Aging is one of a kind lifestyle that impacts each one of us at one point of time in the world population. At the same time, Aging does not impact or minimize the reasons for using the digital web in any negative ways. Once seniors join the online world, digital technology often becomes an integral part of their daily lives. Despite some of these unique challenges facing the older adult population when it comes to technology, most seniors who become internet users make visiting the digital world a regular occurrence. Among older adults who use the internet, 71% go online every day or almost every day, and an additional 11% go online three to five times per week. These older internet users also have strongly positive

attitudes about the benefits of online information in their personal lives. Fully 79% of older adults who use the internet agree with the statement that "people without internet access are at a real disadvantage because of all the information they might be missing," while 94% agree with the statement that "the internet makes it much easier to find information today than in the past."

IV. HOW AN ACCESSIBLE WEBSITE COULD SAVE TRIPS FOR PEOPLE OF ADVANCED AGE?

One of the major life transitions for the ageing population is the loss of the ability to navigate swiftly, say driving every day or waiting in a long queue. We can talk from many day-to-day routines such as Ordering groceries, food, clothes online to entertainment events like visiting theme parks, finding hours and directions of places, and so on. Especially, the senior people would like to keep their digital access on reach for their day to day activities that help them save a trip to the physical location itself by accessing, for example -

- Healthcare websites (to schedule doctor appointments, fill out patient forms, see the lab reports, pay bills online)
- Pharmacy websites (to order prescriptions online, check the status of prescription delivery)
- Banking websites or mobile apps (to complete most of the banking-related activities, e.g. Transfer money, Deposit cheque, File dispute claims, Report fraud)
- Financial websites or mobile apps (to track financial information like retirement savings accounts, taxes, housing loans)
- Food delivery websites or mobile apps (e.g. Uber Eats, Pizza - to order food, pay bills online, track delivery)
- Entertainment websites (e.g. Theme parks, Concerts, Movies – to book tickets online, check the showtimes)
- Travel websites or app (e.g. Airlines, Cruises – to check itinerary, fares, book tickets, boarding pass in mobile app)
- Travel navigation guide (e.g. Google Maps) for the route assistance

For people with disabilities, it is essential to learn about and be familiar with different types of assistive technologies available in the digital devices that come in handy in various situations based on their needs.

V. ASSISTIVE TECHNOLOGIES USEFUL FOR OLDER ADULTS IN DIGITAL ACCESS

People of advanced age experience various forms of disabilities, though one of the common disabilities is related to vision. Navigating the world as a person with visual impairment is hard. Browsing the internet world is no different! But with, dedicated assistive devices or assistive technologies helps to create a positive environment and make it easier that provide the opportunity for independent living or access.

The usability of the assistive technologies available in the market varies from person to person based on their needs and abilities. There are various cases for the elderly population reporting issues related to (not limited to) hearing impairment in need of a hearing aid, or a person who is developing guacamole may lead to colour blindness or blurry vision, neuro disorder experiences that could bring in mobility challenges, and so on.

When considering digital access, the assistive devices or technologies that are most likely to help elders are electronic gadgets, computer software, and even specific settings in Computers. Let's discuss key easy-to-access assistive technologies that are available in the form of software, plugin, devices that are most useful in accessing computers & digital content.

VI. WINDOWS OPERATING SYSTEMS BUILT-IN ASSISTIVE TECHNOLOGIES FOR EASE OF ACCESS

A. High Contrast

Go to Windows Settings -> Ease of Access -> High Contrast. Choose a High Contrast theme as your preference for better display

B. Magnifier

Go to Windows Settings -> Ease of Access -> Magnifier. Change Zoom Level that meets your vision requirements. There are various options of whether you would like to set up the zoom level at Windows Start or after signing in to choose

C. Narrator

(for people who are blind or experiencing low vision): Screen reader (also known as text-to-speech software) that read aloud the text on the computer. The Screen reader will work, which means this will read aloud all your interactions with your computer, say from logging into the computer, accessing any web page contents or preparing your article with Microsoft word document. There are also voice modulation and speech rate settings available to customize. The reference site for Narrator reader is https://support.microsoft.com/en-us/windows/appendix-b-narrator-keyboard-commands-and-touch-gestures-8bdab3f4-b3e9-4554-7f28-8b15bd37410a

D. Speech recognition

(for people who are hearing impaired): The Speech recognition technology converts speech-to-text & speech-to-action. An easy to use feature that allows you to control your computer with your speech. A few of the organizations that are offering voice recognition services are Nuance Communications and OpenText, and Verint Systems. Nowadays, mobile recognition like Siri on iPhones is very popular among Senior users.

VII. CHROME BROWSER ACCESSIBILITY SETTINGS

A. Zoom

Go to Chrome Settings -> Advanced -> Page Zoom -> Set to recommended zoom size (the default is 100%). This will show the page content zoomed for a better view

B. Font Size

Go to Chrome Settings -> Appearance -> Font Size -> Set to recommended Font size (the default is Medium). This feature makes the content font size enlarged for improved view

C. Focused Objects

Go to Chrome Settings -> Appearance -> Accessibility -> Turn on the toggle 'Show a quick highlight on the focused object'. This feature allows the display of a clear focus ring on the focused objects (when using keyboard tabbing)

D. High Contrast (Chrome browser plugin)

This is a free browser plugin or extension that anyone can add to their Chrome browser

VIII. BAKING DIGITAL ACCESSIBILITY PRACTICE in PRODUCT DEVELOPMENT

Digital Accessibility is an inclusive practice of user experience. The user experience is an essential factor of product development which is not only making the website look beautiful but also increasing the reach to the customers. Say the product is related to financial retirement services, the targeted customer base are the users of advanced age who are retired, i.e. 65 or older. Many of the organizations still seeing Digital Accessibility as a quality check which happens at the end of the development phase, which is not accurate. The sooner integrating the Accessibility Standards into product development, the more benefits in terms of saving cost and efforts of running into user experience issues in the final product. Let's discuss the 5 process steps to bake digital accessibility practice in product development -

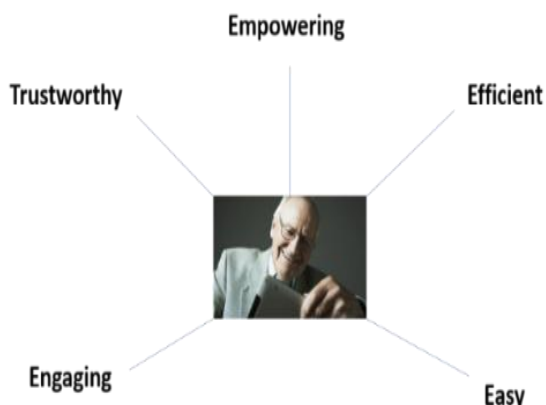## IX. FIRST: UNDERSTAND THE COMPONENTS OF A GOOD USER EXPERIENCE

Fig. 4 A user enjoying watching a digital website on his phone as it involves five core components Empowering, Efficient, Easy, Engaging, and Trustworthy

The above image showing a happy user experience involves the below listed five core components –
- **empowering** – it does what I want (functionality)
- **efficient** – it doesn't waste my time (simple and classic)
- **easy** – it's easy to learn and use (intuitive)
- **engaging** – it's a pleasant experience (articulate)
- **trustworthy** – I don't have any concern (feeling secured)

Identify the Digital Accessibility scope by asking your organization's digital team to know
that your company's website is accessible

- For your customers with vision loss of different degrees?
- For your customers with colour vision blindness?
- For your customers who are hearing disabilities or loss of hearing?
- with Keyboard-only for all users
- with target areas that work for all users of different devices like Desktop, Mobile, Tablet

X. SECOND: UNDERSTAND WCAG STANDARDS

Designing products that are easier for older people to use is like designing for people with disabilities. Guidance on how to make your websites, web applications, and web tools work better for older users are covered in existing international accessibility standards from the W3C, including Web Content Accessibility Guidelines (WCAG). WCAG is the best and core foundation for making Digital products accessible to all users. WCAG 2.1 best practices offer success criteria for accessible developments using web technologies that satisfy the settings and requirements for people using different types of assistive technologies like screen readers, screen magnifiers, zoom feature, colour contrast tools, directly or relate to the benefits for the below listed types of disabilities.

The detailed reference for WCAG 2.1 guidelines can be found at https://www.w3.org/TR/WCAG21/

XI. THIRD: FOLLOW THE WEB DESIGN BEST PRACTICES

Web accessibility is often something that gets pushed to the side. It's easy to assume that all users can see, use a keyboard, use a mouse or touch screen, and overall interact with your website or product containing the same way you do. But this simply isn't true. Assuming everyone can use things in the exact same ways leads to an experience that works well for some people but creates major issues or barriers for others.

Accessibility is an inclusive practice of UX (called User Experience) design. The best practices crafted by Web Content Accessibility Guidelines are widely available and satisfy design requirements for those with Aging impairments of different degrees

Design Technique # 1: Avoid alone colour indications in your web design

Best Practice: Add additional patterns along with colour to indicate the differences

Bad Example*:* Inaccessible error indication (using colour alone) on 'Street Name' field showing red colour border on the field

Fig. 5 A sample login screen with 'Street Name' shown highlighted in red, indicating the error field

Good Example: Accessible error indication using the! mark along with error text showing below the field as 'Last name is required.'
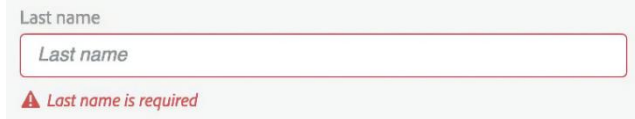

Fig. 6 A sample 'Last Name' field shown with! mark along with error text showing below the field as 'Last name is required.'

Design Technique # 2: Make the colour contrast between foreground and background content legible to read

Best Practice: The visual text has a colour contrast of 7:1 (or at least 4.5:1)

Examples:
Bad Example: Inaccessible text (showing poor colour contrast the ratio of 2.4:1)

Fig. 7 The text 'Am I legible to read?' in black colour on the dark blue background colour shown

Good Example: Accessible text (showing required colour contrast ratio of 14.1:1)
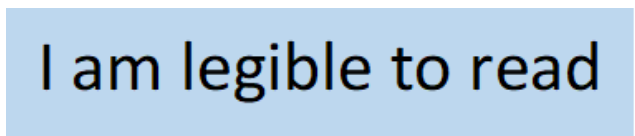

Fig. 8 The text 'Am I legible to read?' in black colour on the light blue background colour shown

Design Technique # 3: Show the focus ring legible to identify the focus location

Best Practice:
- Wherever possible, use the default browser focus ring
- If the website shows a vast variety of colour differences, for example, both light and dark colours in the page content, then use a custom coloured focus ring that best goes with all the page colours

- Make sure the contrast ratio of the focus ring with its background colour meet at least 3:1 (for both default and custom focus ring colour)

Examples:

Bad Example: Inaccessible focus ring (showing both unfocused and focused buttons visually same except the colour shade change with no focus ring shown)

Fig. 9 There are two buttons with the same text '* BUTTON' shown, one unfocused and the other as focused state

Good Example: Accessible focus ring (showing clear blue outline focus ring of contrast ratio greater than 3:1)

Fig. 10 There are two empty form fields shown, one unfocused and the other as focused state

Design Technique # 4: Page reflow is not causing overlapping or loss of content

Best Practice:

- Build responsive website design approach to achieve the best reflow result
- Reflow the content for up to 400% zoom with no overlapping or loss of content

Good Example:
Menus shown as vertical lists in standard zoom 100% of Desktop Chrome browser

Fig. 11 A list of four menus shown arranged in a single horizontal row

The same Menus collapsed into a single Menu button in enlarged zoom 200% of Desktop Chrome browser (as it changed to mobile layout)
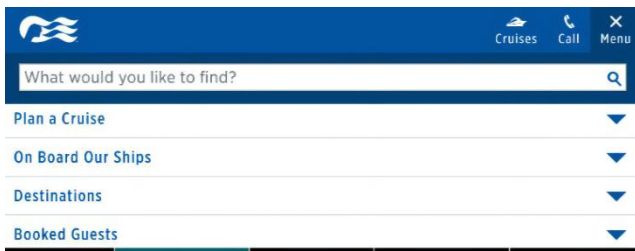
Fig. 12 A list of four menus shown arranged as each vertical rows

Design Technique # 5: Provide visual labels

Best Practice: Avoid showing placeholders in place of visual labels. The placeholders will be replaced by the field entry, which does not remind of the purpose of the entry!

Examples:

Bad Example: Inaccessible label 'Email' (showing only as placeholder text which vanishes once the value entered in the field)
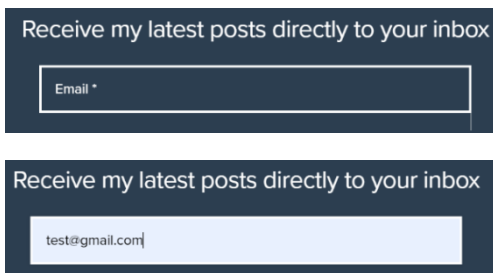

Fig. 13 There are two images shown, the first one showing the 'Email' text in an input field, and the second one showing the email address entered as test@gmail.com

Good Example: Accessible labels 'First name' and Floating labels 'Email address', 'Password' shown as a visual the label that remains on the screen all the time
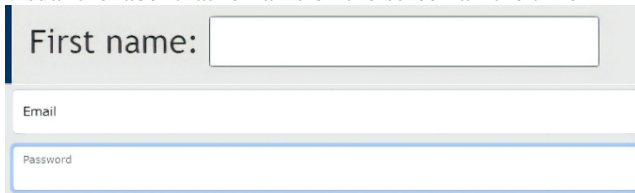

Fig. 14 There are two images shown, the first one showing the 'First name' as a label along with the input field beside the label, and the second one showing the 'Email address' and 'Password' as floating labels

Design Technique # 6: Flux the reading and focus order in a logical order

Best Practice: The default recommended reading and focus order is "Left-to-Right" and "Top-to-Bottom."

Design Technique # 7: Articulate Semantics of page content with headers, landmarks, lists, reading order, focus order to understand the page structure.

Best Practice:
- Define the heading structure in a logical order
- Define the reading order from left to right and top to bottom without losing its sequence
- Define the focus order as meaningful to understand the page flow

Good Example: The headers are programmatically coded in logical order as <h1> for the main heading and <h2>s for the sub headers and <h3> for the next level sub-headers for the screen reader to interpret the page structure
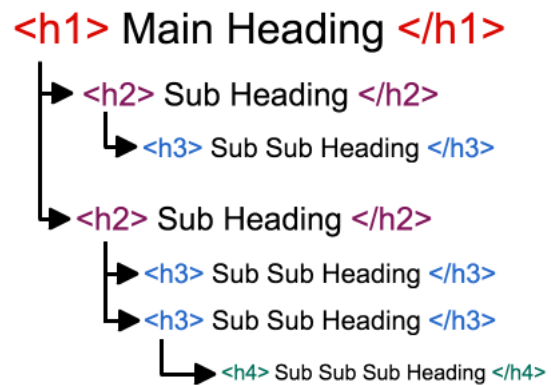

Fig. 15 The headings hierarchy tree shown with one <h1> as Main Heading, two <h2> as Sub Headings and three <h3> nested under <h2> and one <h4> nested under <h3>

XII. FOURTH: INTEGRATE ACCESSIBILITY BEST PRACTICES INTO PRODUCT DEVELOPMENT

It may not be possible to think about how people with different abilities experience the web content. However, with the trend of world digitalizing, this is now made easy with many best practices and references in place for the developers to refer, understand and implement in the product technology coding practices.

Technically, the development technologies to achieve Accessibility Solutions in Websites include proper usage of front-end technologies HTML, CSS, scripting technology JavaScript and ARIA (Accessible Rich Internet Applications) framework. And the mobile applications have a different set of Application Program Interfaces (API's) for Windows (MSAA/IAccessible, UIAExpress, IAccessible), Mac OS X (NSAccessibility), Linux (AT-SPI), Android (Accessibility framework), iOS (UIAccessibility). Below listed are some of my handpicked best sources for Accessibility development techniques or best practices –

- First of all, this link is for https://www.w3.org/TR/WCAG21/ that details all the A, AA and AAA guidelines
- Reference to the https://www.w3.org/TR/wai-aria-practices-1.2/ applicability, which details the ARIA specifications along with examples
- Reference to the https://www.w3.org/WAI/tutorials/
- https://www.w3.org/WAI/tips/developing/sharing basic considerations for web-accessible development along with code snippets
- https://developer.mozilla.org/en-US/docs/Learn/Accessibility/HTMLreferences the Mozilla development team sharing Web Content Accessibility best practices implementation
- https://developer.mozilla.org/en-US/docs/Learn/Accessibility/CSS_and_JavaScriptsources the Mozilla development team sharing CSS and JavaScript best practices for Web Accessibility
- https://reactjs.org/docs/accessibility.htmldetails the React framework Accessibility components
- https://developer.mozilla.org/en-US/docs/Learn/Tools_and_testing/Client-side_JavaScript_frameworkshighlights the best practices for different client-side JavaScript frameworks like EMBER, Reacts, Vue, etc.

XIII. FIFTH: DO ACCESSIBILITY CHECKS BEFORE MAKING IT GUEST-FACING

It is always important, and an ethic followed in the product development life cycle is to quality check the product before releasing it to live for customers. If your organization is full-scale service-based, it is recommended to form an Accessibility testing team that can perform Digital Accessibility audits for the products entering the portfolio. In case your Organization is product-based, it is the responsibility of every team member involved in the creation of digital content (designer, developer, business analyst, compliance professional) to proactively integrate Accessibility best practices and deliver the Accessible content to the customers.

For novice Digital Accessibility team members, here are some tools that can be extensively useful in performing quick checks on websites –

- https://wave.webaim.org/extension/ that can be installed in both Chrome and Firefox browsers
- https://chrome.google.com/webstore/detail/axe-devtools-web-accessib/lhdoppojpmngadmnindnejefpokejbdd?hl=en-USthat can be installed in Chrome & Firefox browser
- https://www.tpgi.com/color-contrast-checker/ tool that can be installed on the computer or use the online version to check the contrast ratio
- Page Zoom feature in browser to check the reflow of page content
- High contrast mode that can be installed as a Chrome plugin

- Keyboard only testing to check for all actionable elements are operable with keyboard
- Testing with screen readers (NVDA, JAWS) on Desktop websites
- Testing with in-built screen readers (Voice Over, Talkback) on Mobile websites or apps

XIV. CONCLUSION

Digital Accessibility was proving as a game-changing aspect in the current digital world in order to expand the product reach to many users, especially for the ageing population. The existing potential generation of the digitalized world certainly must include the Aging population in scope while designing and developing public-facing products or applications. Though the statistics show a minor percentage of users in the Aging population, it will take just one user to file a lawsuit if he or she does not find your products accessible in any digital ways. If the digital product team considers the Aging population and people with disabilities in mind while designing and developing, there is a minimum of 40% of the whole development time and effort will be saved. Even not, it is fine to be better than never! Start understanding the issues and implement the best practices to be addressed to make your product inclusive of all customers. Appreciate all your efforts in making your digital products accessible to everyone!

Thank you for reading my article, hope this article provides you with some or all the directions you were looking for in the digital accessibility for ageing population guide. Please feel free to reach out to my email mailto:psubramanian@hagroup.com for any questions you may have on this topic.

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