



Gaining competitive advantage through accessible web applications

A business-case and practical guide for growing and defending your market share by meeting accessibility expectations and legal requirements in 2021 and beyond.



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Want to expand your total addressable market by 13%?

According to the World Health Organization, over 1 billion people, or approximately 13% of the world's population, live with a disability. Of those affected, 285 million people are estimated to live with a visual impairment, such as blindness. In the age of visual communications, this represents a huge untapped market. Furthermore, about 200 million people have a cognitive disability and require content and applications adapted to their way of consuming content.¹

And let us not forget that as we age, most of us will develop some kind of age-related disability - including loss of movement, hearing, vision, or cognitive abilities. Accessibility is not just about "them", but all of us.

Globally, not all people with disabilities represent a financially viable market. The W3C estimates, however, that the spending power of people with disabilities totals more than \$6 trillion.²

For software makers seeking to serve all customers, regardless of disability, this represents a huge, untapped market for most companies.

Over the last several years, we have seen a tremendous growth in digital products and

¹ World Report on Disability, World Health Organization
https://www.who.int/disabilities/world_report/2011/report.pdf

² <https://www.w3.org/WAI/business-case/>

services designed for everyone, including people with disabilities. Tech leaders like Apple³ and Microsoft⁴, are actively promoting and strengthening their brand due to their inclusive design processes. Smaller tech companies have also embraced accessibility as a way to establish a competitive edge in their markets.

This is a fantastic trend, not just for people with disabilities and the companies who employ them. According to research firm Gartner, three years from now, three times as many people with disabilities will be employed, thanks to advancements in AI and other technologies.⁵

Will your company be part of this new wave, or will you be left behind?

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<https://developer.apple.com/design/human-interface-guidelines/accessibility/overview/best-practices/>

⁴ <https://www.microsoft.com/design/inclusive/>

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https://www.gartner.com/document/3906869?ref=solr_A11&refval=256299977



Background

As society becomes increasingly knowledge- and data based, modern web technology has enabled content creators to share this wealth of information through interactive and immersive applications for consumers and business users. In particular, we're seeing a massive proliferation of data-visualizations and infographics that help us better understand the world of data around us. The irony is, that at a time when we have so much knowledge and data at our fingertips, a large segment of end users cannot consume it in a meaningful way, if at all.

The "old" Web, which was largely text-based, could easily be read aloud and explored by screen-reader technology. This is made harder today, where visual communications - images, animations, videos, modal windows - have replaced much of what used to be linear textual information. By locking information into media that is inaccessible to people with disabilities, we exclude a significant part of our population from participating in society. And this we cannot allow.

Across the world, software vendors now realize it is imperative to make their websites, digital services, and technology accessible to all.

The good news is that it is becoming easier to incorporate inclusive design into their development process. There is a plethora of tools and services you can employ to make the products you develop more inclusive, including tools for making charts accessible to assistive technologies, such as screen readers.

Digital accessibility history

Web accessibility is about making your software, apps, and websites usable for everyone. This includes making these services usable for people who are unable to use a keyboard or mouse, or who may

be colorblind or have no vision at all. It is also about making sure your content is understandable and operable to all users.

Web accessibility started when the web started, and it was fairly easy. With no graphics, tables, or charts, the content was easy to consume for everyone. Later on Javascript, Flash, and complex layouts became commonplace. Assistive technologies struggled to parse the content in a meaningful way. One response to this was the W3C's ARIA (Accessible Rich Internet Applications) specification. Developers tagged rich content with accessible information that helped assistive technologies better describe and interact with what was happening on the screen.

Today, in a template and framework-driven development process, it is critical to make sure accessibility is built into the tools you choose. Your project will meet accessibility standards, and developers will not have to become accessibility experts.

Finding accessible template and framework systems remains a challenge, but the Open Source nature of many of these frameworks, as well as out-of-the-box accessible components such as Highcharts for charts and diagrams, bodes well for the future.

For a more comprehensive account of the history of digital accessibility, take a look at the article "The History of Digital Accessibility and Why it Matters" from the Paciello Group.⁶

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<https://www.paciellogroup.com/the-history-of-digital-accessibility-and-why-it-matters/>



The business case for accessible software products

Making your software products usable for everyone, including people with disabilities, makes good business sense.

Drive Innovation:

We need to think about inclusive design and accessibility as an innovative feature for content discovery, rather than a development burden. Accessibility features in products and services often solve unanticipated problems for all users. Multiple ways to access information will benefit all users and not just those who happen to have a disability. In fact, many of the advances we see in AI, Voice Recognition, Search Engine Optimization, Sonification, and UX design stem from accessibility initiatives.

Enhance Your Brand:

Diversity and inclusion efforts important to business success are accelerated with a clear, well-integrated accessibility commitment.⁷ Excluding people with disabilities will result in negative word-of-mouth, reporting, and potentially lawsuits, resulting in deteriorating customer loyalty and brand erosion.

Extend Market Reach:

The global market of people with disabilities is over 1 billion people with a spending power of more than \$6 trillion.⁶ Making your product accessible will not only benefit customers who rely on assistive technologies, but your product will be more usable in a wide array of use cases. You will enjoy increased consumption of your

content, and increased usage of your services.

Minimize Legal Risk:

You or your customers might be facing a lawsuit if your software products are not accessible. So far, legal action has been taken mostly in Europe, Australia, and the USA, but the rest of the world will follow as global markets adapt to compete.

It is estimated that by 2025, all G20 countries, which represent 90% of the global tech trade, will establish enforceable legal standards for digital accessibility, leading to a shockwave in which businesses scramble to achieve compliance.⁸

Save Development Cost and Time:

If you design your software with a narrow focus on functionality for the mainstream audience, making it accessible afterwards will be very expensive in comparison to making it accessible from the start.

While some people with disabilities may have very specialized needs, a more usable application benefits everybody and is often a small investment into an application that you have already spent significant resources on bringing to market.

Improve Organic Search Results:

Digital accessibility best practices lead to web content that is highly structured, organized, and annotated, resulting in the highest possible organic search rankings. Conversely, digital products that are not accessible will be penalized, resulting in suboptimal organic search engine rankings.

⁷ <https://www.w3.org/WAI/business-case/>

⁸ "G20, Group of Twenty," Wikipedia/Wikimedia Foundation, 2020



Types of disabilities

There are four different categories of disabilities that your application must be prepared to support: Visual, Motor, Cognitive, and Auditory (hearing).

Visual impairments are perhaps the most challenging disability to overcome with accessibility aids. No matter what solution you go for, it needs to replace visual communications, such as images, charts and infographics, with information that can be reduced to words, audio, or some kind of tactile or haptic feedback, such as an embossed graphic.

Motor impairments for web users primarily refer to the reduced ability to use hands and fingers, as keyboard, mouse, and touch access are the primary interfaces to digital products and services. Arthritis and Parkinson's disease are common conditions that affect users' ability to interact with web content. Note, however, that while it is easy to think of a motor disability as a permanent handicap, this is often not the case. A work-at-home parent holding a child with only one hand available, a person wearing a cast on their arm, or someone with both hands on the wheel while driving a car, are also impaired, even if temporarily.

Cognitive impairments, such as dyslexia, ADD, ADHD, dementia, autism, and many others, call for solutions that make content less confusing, overwhelming, and more easily digested. Content often has to be created with cognitive accessibility in mind from the beginning. Content designers employ many techniques to achieve this, including using simple language, using intuitive and familiar layouts, using fonts that are easier to read for people with dyslexia, and avoiding animations that can not be paused or can cause seizures or confusion.

Hearing loss and deafness, is an increasingly relevant disability for web content creators, given

the prevalent use of video and multimedia content with sound. Live-streamed content is particularly challenging in this regard. Thankfully tools are emerging that can help creators add accessible captions to their content with the help of AI and voice recognition, gradually reducing the need for manual captioning.

Solutions

In this paper, we will focus on how to build inclusive solutions for people with visual and motor disabilities, as these are the two areas that may be natural to look for a scalable solution for, as they must, by and large, be automated.

Solving for visual impairments

As far as images go, the current solution is simple: Images need to be tagged with a description. This solution will never be a complete alternative to a photo or illustration - "an image says more than a thousand words", but a few choice words can greatly improve the experience for someone unable to see the image.

Dynamic content, such as live charts and graphs, is far more challenging. A financial chart displaying complex data-relationships designed to be understood at a glance means nothing if the reader is unable to see it. The optimal solution would be an Artificial Intelligence capable of not only reading the chart title, axes and structural elements, but also explaining the significance of the data, like a person trained in statistics and image description.

No such robust solution exists as of yet, but there are some good alternatives. For example, Highcharts allows assistive technologies such as screen readers to not only explore the data rendered in a chart, but also lets end-users navigate through the data using voice commands or keyboard navigation.



In this use case, sonification - the use of non-speech sounds to express data, which Highcharts also supports, may be used alone or in conjunction with screen reader technologies.

Another existing alternative is tablets or printers that can render the visual outlines of the chart in a tactile format, an accessibility feature that charts created with Highcharts supports.

For low-vision users or users who are colorblind, rendering charts in high-contrast colors or using patterns and gradients instead of solid colors, is an available and sometimes a viable option.

Solving for motor impairments

Most tools aimed at assisting with motor impairments on the web are based around keyboard navigation. This means that making your web application keyboard accessible, and using components with keyboard accessibility, is the most important thing you can do for accessibility for people with motor impairments. The WCAG⁹ standard outlines several guidelines for making web content more suited to people with motor disabilities in general, including specifying a minimum size for actionable elements.

How sonification works

Sonification is the use of non-speech sound to convey data. In data visualization, sonification allows a large dataset to be conveyed in a short timespan, and can enable users to quickly get an overview of trends or patterns in the data.

Highcharts collaborator Dr. Bruce Walker, Professor at Georgia Institute of Technology School of Psychology and School of Interactive Computing, explains sonification this way: *“Sonification is the intentional use of sound to convey information. Rather than speech synthesis, we are using musical tones to*

illustrate what is going on in a dataset. The use of sound to represent data not only helps people who are blind, but other people who don't have access to a visual representation of data, for example, when driving, in a meeting, or when one is busy looking at a different screen. More channels for presenting information means more ways to experience and process information, which is usually a good thing.”

How screen-reader assistive technology works:

Screen readers typically work by analyzing the content on the screen and reading it out to the user using speech synthesis, or making it available on a braille display. The user is given control over navigation, and can interact with elements on the screen. In order to do this, the screen reader is dependent on the content to be structured according to established standards.

Øystein Moseng, Head of Accessibility for Highcharts, explains it this way: *“Typically when a screen reader user comes across a chart it's in the form of an image, that image is nothing but a black box to the screen reader, especially if there is no metadata describing the image other than maybe a text description. And what we've done with our charts is to make the actual data in the charts accessible in a structured way. This allows the user to go through and interact with that information much like you would as a visual user.”*

How to get started with an accessibility program at your organization

You are unlikely to accidentally make your website or product accessible. You have to

⁹ <https://www.w3.org/TR/WCAG21/>



be deliberate about it, and make it part of your regular development process.

In this area, software companies in the USA have made great progress when it comes to putting accessibility into action. While no specific standard has been written into federal law regarding web accessibility outside of the public sector, many companies have turned to the Web Content Accessibility Guidelines (WCAG) from the World Wide Web Consortium (W3C) to determine what they need to offer.¹⁰ We would expect the rest of the world to take a similar approach.

The focus of the W3C guidelines is ensuring that digital apps and content meets the following four criteria:

Perceivable, meaning that the content can be processed by all users in one way or another, including by using a screen reader to explore the content, or reading closed-captions to understand audio content.

Operable, meaning that any interactive UI components are made accessible to all users, including those using a keyboard or other devices instead of a mouse.

Understandable, meaning that users need to not only perceive the content, but must be able to understand the information and how to interact with it.

Robust, meaning that the content can be explored and interacted with across a number of devices, platforms, and browsers, and supports the relevant assistive technologies.

Usable.net, a consultancy focusing on accessibility, recommend these five steps in order to bring inclusive design and development practices into your company:¹¹

Plan. Create a plan for what your accessibility goals are, what channels you'll need to focus on, and your timeline. This will likely involve multiple departments.

Implement. Set up an accessibility policy and statement, explaining why accessibility is so important to your operations. This should speak to team members, customers, the general public, and board members alike.

Test. Realistically and honestly evaluate your current accessibility. You can check out a free, automated online testing tool to give you a basic idea, but we also strongly recommend hiring users who can offer in-depth manual audits, too. They will catch issues that the automated tests will not.

Review & remediate. Look at the findings of your tests, and make any necessary changes as soon as possible.

Maintain. Just because your site is fully accessible as it is now does not mean nothing will ever change. New updates and standards are rolled out, as are new technologies. Stay up to date to ensure your site is, too.

To this list we would like to add that when you create your accessibility statement, make sure it is written so that every stakeholder understands it and can embrace it. WAI's accessibility statement generator could be a good place to start.¹² Also see the guide "Web Accessibility Policy Statements: Best Practices" from Accessibility.works.¹³

¹⁰ <https://www.w3.org/TR/WCAG21/>

¹¹ <https://blog.usablenet.com/30-years-of-the-ada-where-we-are-now-what-businesses-need-to-know>

¹² <https://www.w3.org/WAI/planning/statements/generator/#create>

¹³ <https://www.accessibility.works/blog/web-accessibility-policy-statements-best-practices/>



Don't forget to get people onboard with your mission

Hire people with disabilities into your organization. Their diverse needs and backgrounds will help build empathy in the organization and get direct access to the users who are the de-facto subject matter experts in assistive technology and how to best make use of it.

Ted Gies, who leads the web accessibility initiative at Elsevier, offers the following advice: *“Challenge your engineers to demonstrate how good they are at building world class applications that are not just accessible, but better for everyone because of it. Challenge your developers to get interested in accessibility whether it's having a person actually try to use their product with a screen reader and seeing how they may or may not struggle using their application.”*

Lucy Greco, Web Accessibility Evangelist at UC Berkeley, says *“As a blind person I can tell you that you should not feel sorry for a person with a disability. This does them a disservice. Instead,*

use empathy to understand how they can best process information and how you can help them with that task. Because they want to use technology to work and live as independently as possible.”

About Highsoft and Highcharts



HIGHSOFT

Highsoft is the company behind

Highcharts, the leading solution for standards-based charting tools for web and mobile developers. With over 80% of the Fortune 100 as clients we feel a great responsibility to lead in the area of inclusive data visualization design. With Highcharts, we have spent years pushing the limits of web standards and modern browsers by building solutions for different disability personas. We have opened up the chart and the content to be accessible to anything from a blind screen reader user to somebody who is mobility impaired and uses voice input to navigate the web.

Learn more at highcharts.com



Don't miss this mini-documentary about Highsoft's Accessibility program: Visit <https://youtu.be/VIRYFaYVxOc>

