Gaining competitive advantage through accessible web applications

A business-case and practical guide for growing and defending your marketshare by meeting accessibility expectations and legal requirements in 2020 and beyond.

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Want to expand your total addressable market by 37%?

According to the World Health Organization, approximately 2 billion people, or 37.5% of the world's population, have a disability. Of those affected, 1.3 billion people report some form of blindness or visual impairment. That's 17% of the world's population, and in the age of visual communications, 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, many of us will develop some kind of age-related disability (loss of movement, hearing, vision, memory-loss, learning-disability.) Accessibility is not just about "them" - but all of us.

Globally, not all people with disabilities represent a financially viable market. However, the W3C estimates that 1 billion people with a spending power of more than $6 trillion do.[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 services designed for everyone, including people with disabilities. Tech leaders like Apple[3] and Microsoft[4], 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 as 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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[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/

[3] https://developer.apple.com/design/human-interface-guidelines/accessibility/overview/best-practices/
[4] https://www.microsoft.com/design/inclusive/
[5] https://www.gartner.com/document/3906869?ref=solrAll&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-visualization 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 by screen-reader technology. That's not so easy when the visual communications -- images, animations, videos, modal windows -- have replaced much of what used to be linear textual information. By locking information into media that's inaccessible to blind or cognitively impaired people, 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's 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 can't 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 for someone who might have a cognitive impairment.

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, (and let's not forget Flash), and complex layouts became commonplace. Assistive technologies struggled to parse the content in a meaningful way. One response to this was ARIA (Accessible Rich Internet Applications.) Developers tagged rich content with accessible information that helped assistive technologies better describe 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 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, check the article "The History of Digital Accessibility and Why it Matters" from the Paciello Group.[6]

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[6]

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, Sonification, Voice Recognition, Search Engine Optimization, and UX stem from accessibility initiatives.

Enhance Your Brand:
Diversity and inclusion efforts so 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 and reporting, 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] When making your product accessible, it will not only benefit customers who rely on assistive technologies, but your product will be more usable in a wide array of use cases and disability-personas as well. You will enjoy increased consumption of your content and increased usage of your services.

Minimize Legal Risk:
You or your customer 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 pages that are highly structured, organized, and annotated, resulting in the highest possible organic search rankings. Conversely, digital products that are not accessible will get penalized, resulting in suboptimal organic search engine rankings.

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[7] https://www.w3.org/WAI/business-case/

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

Types of disability

There are four different types of disability 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 tactical graphic, such as a braille display or embossed graphics.

Motor impairments primarily deal with the various levels of reduced ability to use hands and fingers, as keyboard and mouse access are the primary interfaces to digital products and services. Note, that while it is easy to think of motor disabilities as permanent handicaps, 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. And who doesn't know somebody with arthritis or Parkinson's disease?

Cognitive impairments, such as ADD, ADHD, dementia, dyslexia, and others call for solutions that make content less confusing, overwhelming, and more easily digested. Rarely can one automatically 'transform' content intended for a general or professional audience into something cognitively accessible. In this case one needs to manually create new, audience-specific content. For example, tweaking the layout (fonts that are easier to read for people with dyslexia, avoid animations for people with autism and epilepsy) are common remedies here.

Given that the web relies heavily on text and images, hearing loss, or deafness, is often one of the "least-disabling" disabilities for a person trying to consume content on the web or in an app. It is also one of the easiest impairments to remedy as the primary challenge here is consuming video content that is not close-captioned.

Solutions

In this paper, we will focus on how to build inclusive solutions for people with visual and physical 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 solution is simple: Images need to be tagged with a description. This solution will never be a complete alternative to a photo or illustration (AKA. "an image says more than a thousand words"), but a few choice words can greatly improve the experience for someone who can't see.

Dynamic content, such as live charts and graphs, are far more challenging. A financial chart displaying complex data-relationships designed to be understood at a glance means nothing if you can't see it. The optimal solution would be some kind of Artificial Intelligence capable of not only reading the chart title, legend, etc., but also explaining the significance of the data, like a person trained in statistics. 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 read back 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 musical tones to express changes in a dataset), which Highcharts also supports, may be used alone or in conjunction with screen reader technologies.

Another alternative would be a braille tablet that could render the visual outlines of the chart in a tactile format, an accessibility feature that charts created with Highcharts supports. .

For low-vision users and those 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 WCAG[9] 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 sequential musical tones 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 the Georgia Tech's
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, a core-developer and Head of Accessibility for Higcharts 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 be deliberate about it, and make it part of your standard development process.

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[9] https://www.w3.org/TR/WCAG21/

In this area, software companies in the USA have arguably made the most progress when it comes to putting accessibility into action. While no specific standard has been written into law regarding web accessibility outside of the public sector (in the US, Section 508 mandates that all federal services must be accessible, and any states have followed suit as well), many companies have turned to the Web Content Accessibility Guidelines (WCAG) from the World Wide Web Consortium 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 it can be easily processed by all users in one way or another, including using a screen reader to read the site or those needing closed-captions to understand video content.

Operable, meaning that navigation and UI components are accessible to all users, including those using a keyboard instead of a mouse.

Understandable, meaning that users need to not only perceive a site, but understand the content according to their ability.

Robust, meaning that the content can be used by assistive technologies on a number of devices, platforms, and browsers.

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'll catch issues that the automated tests won't.

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 doesn't 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'd like to add 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 check out 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, is the company behind Highcharts, is 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 design when it comes to charts. With Highcharts, we have spent the last 5 years pushing the limits of web standards and modern browsers by building solutions for different disability personas. We've 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.

Learn more at highcharts.com

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