

# Senses Working Overtime: Improving Software Quality Through Accessibility and Inclusive Design

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## Abstract

Accessibility makes it possible for those with various disabilities to access information and services. Inclusive Design focuses on making choices so that software and services are usable by as many people as possible. They are distinct but complementary facets of software development and delivery, and they are difficult to add to software after the fact. Making software Accessible using Inclusive Design principles at the start, or as early as possible, makes it easier to develop software that can be used by more people, and allows the development team to deliver better quality, better user experience, and happier users all the way around. In this talk, I will demonstrate principles and processes that you can use to help make Accessibility and Inclusive Design a natural part of your development and testing activities.

## Biography

Michael has worked on a broad array of technologies and industries including virtual machine software, capacitance touch devices, video game development and distributed database and web applications. He currently works with Socialtext in Palo Alto, CA. He writes a software testing blog called TESTHEAD (<http://mkltesthead.com/>).

Michael is also a founding member of the "Americas" Chapter of "Weekend Testing". You can follow their progress and tweets at @WTAmericas or email at [WTAmericas@gmail.com](mailto:WTAmericas@gmail.com). Michael served as a member of the Board of Directors for the Association for Software Testing from 2011-2015. He was their Treasurer and then their President. Currently, he helps teach their Black Box Software Testing classes. Michael is also the current producer and a regular commentator for The Testing Show, a podcast produced for QualiTest (available in Apple Podcasts).

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# 1 Introduction

Accessibility and Inclusive Design are related in that they both strive to increase access to systems, but they are achieved in different ways. We want products to be designed so that they allow as many people as possible to access information. We want to do all we can to make sure that people with disabilities are able to have as similar an experience as their normative counterparts. Both Accessibility and Inclusive Design aim to meet these goals but the ways in which those goals are accomplished differ.

Accessibility can be defined as “The design of products, devices, services, or environments for people with disabilities. Accessibility allows for design compatibility with a person’s assistive technology”.<sup>i</sup> Inclusive Design can be defined as “The design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible... without the need for special adaptation or specialized design”<sup>ii</sup>

This paper considers ways to include Accessibility and Inclusive Design as part of the standard design, development and quality process.

## 2 Why Do We Need to Think about Accessibility and Inclusive Design?

Nearly everyone experiences a primary or secondary disability of some sort during their lifetime: sight, auditory, motor, or cognitive, for example.<sup>iii</sup>

According to the U.S. Census, nearly 1 in 5 people have some form of disability<sup>iv</sup>. The World Report on Disability states that more than a billion people in the world today experience disability.<sup>v</sup> Many people not considered disabled have some sort of disability – even if it is simply wearing glasses. Design taken for granted one day may be insufficient the next, so it makes social and economic sense to plan for a better user experience by incorporating these design philosophies.

## 3 Situational Disabilities

When a user has a persistent issue (low vision, low hearing, limited mobility, cognitive disability) we consider that a primary disability. There are additional challenges that people without disabilities can face, and these are referred to as “situational” disabilities. Examples of situational disabilities include:

- Background noise (hearing)
- Distracted tasking (cognitive)
- Small text/non-scaled web page (vision)
- Foreign language (literacy)

Picture yourself in a country where you can’t read the language or even the writing. This is a way to imagine the frustration people with disabilities might feel using a system not designed for Accessibility. Recognition is the first step towards solving the problem.

IKEA’s assembly instructions is a good example of Inclusive Design<sup>vi</sup>. By presenting the instructions as pictographs and images they overcome literacy issues. Additionally, in most cases, only one set of instructions is needed, rather than repeating the same series of instructions multiple times in several languages.

## 4 Ten Principles of Web/Mobile Accessibility

Jeremy Sydik's book "Design Accessible Web Sites"<sup>vii</sup> focuses on "Ten Principles of Web Accessibility". At the time, mobile was a very small market compared to what it is today, but many of the principles that Sydik presented are just as applicable in the mobile space. Those ten principles are:

1. Avoid making assumptions about the physical, mental, and sensory abilities of your users whenever possible.
2. Your users' technologies are capable of sending and receiving text. That's about all you'll ever be able to assume.
3. Users' time and technology belong to them, not to us. You should never take control of either without a really good reason.
4. Provide good text alternatives for any non-text content.
5. Use widely available technologies to reach your audience.
6. Use clear language to communicate your message.
7. Make your sites usable, searchable, and navigable.
8. Design your content for semantic meaning and maintain separation between content and presentation.
9. Progressively enhance your basic content by adding extra features. Allow it to degrade gracefully for users who can't or don't wish to use them.
10. As you encounter new web technologies, apply these same principles when making them accessible.

These principles are helpful when it comes to designing applications and they are also helpful when it comes to framing how they should be tested. When Socialtext started considering Accessibility issues and focusing on better compliance, these principles were implemented as part of testing first and then became part of the general design and development process.

An example can be seen in an enhancement that was made to the Content menu option in Socialtext. Since there are a lot of possible places to have content, it was determined that a submenu would be an easy way to group content and allow users to quickly discover what they wanted to work with, as well as create new pages. With a mouse, this is easy. Click the Content item on the Navigation bar and then select something from the Workspaces, Watchlist, or Recently Viewed submenu listings. Additionally, click on the "plus" button and you can create a new page. With a keyboard, the user could get lost within the submenus and have no indication as to where they were or how to get out of that submenu. By using the Accessibility principles, Socialtext was able to better articulate how to access the submenu options, how to move to the other submenus, and how to escape the submenu.

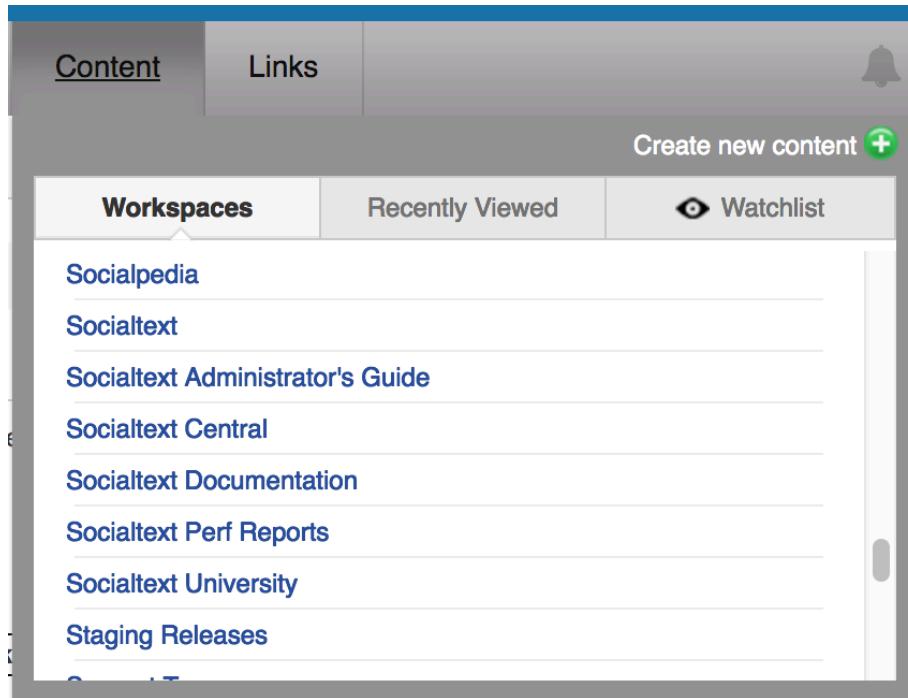


Figure 1: Socialtext application. The submenus within the Content menu listing.

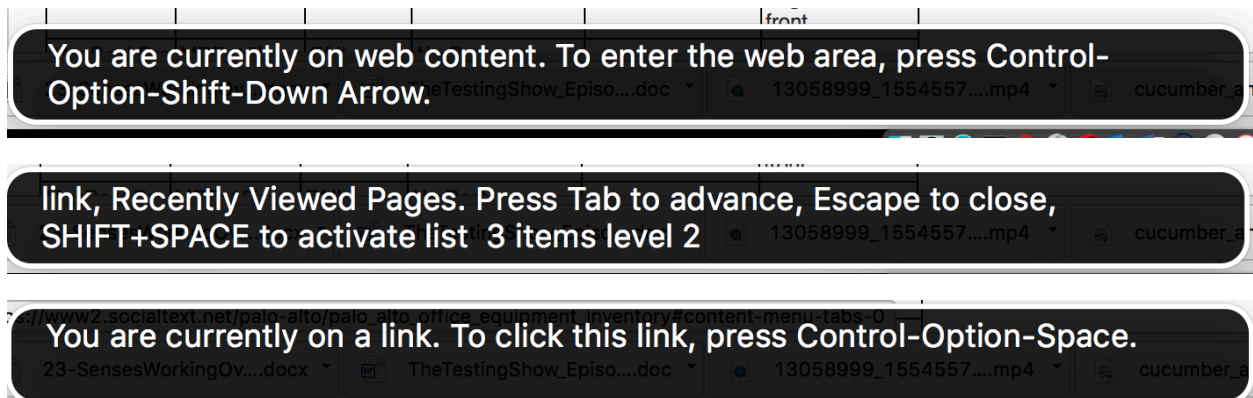


Figure 2: Literal text provided by VoiceOver screen reader to describe the navigation process inside the Content submenu.

## 5 Practice Empathy: Be “HUMBLE”

It’s one thing to advocate about Accessibility or Inclusive Design. It’s another to put yourself squarely into the situations you are trying to design for. In “Black Box Accessibility Testing: A Heuristic Approach”, Albert Gareev and Michael Larsen describe heuristics to help us think like our users<sup>viii</sup>. One of those heuristics is summed up as “be HUMBLE”.

**Humanize:** Be empathetic, understand the emotional components.

**Unlearn:** Step away from your default [device-specific] habits. Switch into different habit modes.

**Model:** use personas that help you see, hear and feel the issues. Consider behaviors, pace, mental state and system state.

**Build:** knowledge, testing heuristics, core testing skills, testing infrastructure, credibility.

**Learn:** what are the barriers? How do users Perceive, Understand and Operate?

**Experiment:** Put yourself into literal situations. Collaborate with designers and programmers, provide feedback.

Looking back at the feature enhancement I described for the Socialtext Content menu, it was important to consider how a user without a mouse or ability to see the screen would interpret the workflow. By stepping away from using the mouse and turning on a screen reader, the person testing could feel the frustration with trying to access a document within those menus, as well as the difficulty of knowing where they were in that menu. What are the prompts a user receives if they enter the submenu? How do they advance through the listings? How do they escape to the upper level of the menu? How can they move to another submenu? Does the application give them prompts to help them remember where they are and what to do?

## 6 Accessibility and Inclusive Design in Action

There are many ways that software developers and designers can use the principles for Accessibility and Inclusive Design effectively and help make better design and quality decisions. Additionally there are numerous tools that are available to help gather information and experiment with solutions

A high-level audit can be made with the “Web Accessibility eValuation Tool” or WAVE<sup>x</sup>. This is a website where you can enter a URL. WAVE will then go through and highlight the elements that pass, as well as call out warnings and errors on the page as defined by the Web Content Accessibility Guidelines (WCAG)<sup>x</sup>.

There are a variety of Developer Tools available as plug-ins for various browsers. These allow developers and testers to see if a change will be compliant with WCAG guidelines and experiment with the parameters of values such as color contrast. There are specific tool for looking at color contrast, semantic meaning, and overall WCAG compliance.

For those who wish to test pages for non-sighted users, Apple has VoiceOver built into the Operating System, and “NonVisual Desktop Access” (NVDA) is a freely available screen reader for Windows platforms. By turning on a screen reader, you can listen back to the page output as the screen reader is interpreting it.

Examine how your pages will appear to a color-blind user. Realize that there are variations of color-blindness. Color contrast is important. Having an effective and appropriate contrast between colors can help make sure that text and images are not lost in the background.

The “Hemingway” app analyzes the readability of text. This can be helpful for developing content to help people with dyslexia, as well as encouraging greater readability of text in general.

Look at a good example. The World Wide Web Consortium (W3C) has a “Before and After”<sup>xi</sup> demonstration that shows pages prior to being complaint with WCAG and makes a side by side comparison with pages that are compliant. The source code can be viewed and compared, and a variety of Accessibility and Inclusive Design issues and fixes can be reviewed.

# Accessible News Page Report Before and After Demonstration

Improving a Web site using Web Content Accessibility Guidelines (WCAG) 2.0



Overview Home News Tickets Survey Template

Inaccessible: News Page Report  
Accessible: News Page Report

### Perceivable

Expand all rows Collapse all rows

Conformance of News Page to WCAG 2.0 - Perceivable

#	Title	Description	Result
1.1	<a href="#">Text Alternatives</a>	Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.	✓
1.2	<a href="#">Time-based Media</a>	Provide alternatives for time-based media.	✓
1.3	<a href="#">Adaptable</a>	Create content that can be presented in different ways (for example simpler layout) without losing information or structure.	✓
1.4	<a href="#">Distinguishable</a>	Make it easier for users to see and hear content including separating foreground from background.	✓

Expand all rows Collapse all rows

### Operable

Expand all rows Collapse all rows

Conformance of News Page to WCAG 2.0 - Operable

#	Title	Description	Result
2.1	<a href="#">Keyboard Accessible</a>	Make all functionality available from a keyboard.	✓

Figure 3: W3C Before/After Simulator with Report

Some additional areas that can help any page are:

- Ensure that images are described with alt tags and that the picture is described meaningfully. Additionally, use alt tags so that repetitive images are not all called out by using the WAI alt decision tree.
- Provide a skip link at the top of the document that will allow users to get to the main content of a page and bypass the navigation menu if desired.
- Use the “lang” attribute in tags to help programs translate or render other languages.
- Make buttons that are scalable and not tied to literal images.
- Use images that have a universal meaning (a smiley face can be rendered once, no translation required).
- Use the div tag sparingly, especially in areas where keyboard focus is important.
- Make content available in a variety of formats. If you have uploaded a video, have an option for closed captioning available. Additionally, include a full transcript of the video’s content.
- If using date fields, allow for multiple ways to enter the date (text field and date picker).
- Allow Pinch-to-Zoom to let the user determine the amount of zoom and focus needed to view the page.
- Make touch areas large enough to interact with without requiring rescaling.
- Encourage the use of proportional fonts.
- Write simply and use space to aid reading.
- Review the contrast recommendations in the WCAG guidelines and encourage high contrast designs.
- Web pages may end up in other media, such as PDF files to be printed. Make sure elements that appear on the screen appear on a printed page, too.
- Remember that simple interfaces are usable interfaces. Do not make navigation or discovery more difficult than necessary.<sup>xii</sup>

One additional consideration is that tools can help us identify issues, but they do not make judgment calls. Automated tools can look for markup tags and provide assert statements with comparisons to ensure that we are using those tags. However, automated tools cannot judge whether the text provided is useful or appropriate. This is an opportunity for testing to evaluate in a mindful way.

## **7 Conclusion**

The design decisions made early in the life cycle of products have the potential to make them excellent solutions to issues they face, or genuine nightmares to use. The farther along a product gets in its development, the more difficult it is to make modifications to its design. Inclusive Design early in the product development can overcome many of those hurdles, and make a more usable product by everyone. Additionally, using Inclusive Design as a guide early on will make those last mile modifications for technologies that assist those with the most profound disabilities much easier to implement.

Think of the applications that you would want to use, and think of yourself in the future, with the possibility that a significant disability (or disabilities) may be part of your everyday experience. The keys to success for Accessibility and Inclusive Design are: remember that not everyone is the same as you; practice empathy; plan to include these design factors into the process from the beginning; and think about the future – you may end up benefiting from your own design.

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## References

- <sup>i</sup> Wikipedia. "Accessibility". <https://en.wikipedia.org/wiki/Accessibility> (accessed July 8, 2017)
- <sup>ii</sup> British Standards Institute. 2005. "What is Inclusive Design?". <http://www.inclusivedesigntoolkit.com/betterdesign2/whatis/whatis.html#p30> (accessed July 8, 2017)
- <sup>iii</sup> Disabled World. "Defining Disability Diversity in Society". <https://www.disabled-world.com/disability/diversity.php> (accessed July 8, 2017).
- <sup>iv</sup> Census Bureau Reports. Nearly 1 in 5 People Have a Disability in the U.S. <https://www.census.gov/newsroom/releases/archives/miscellaneous/cb12-134.html> (accessed July 8, 2017)
- <sup>v</sup> World Health Organization. World Report on Disability. [http://www.who.int/disabilities/world\\_report/2011/en/](http://www.who.int/disabilities/world_report/2011/en/) (accessed July 8, 2017)
- <sup>vi</sup> North Carolina State University. The Principles of Universal Design. [https://www.ncsu.edu/ncsu/design/cud/about\\_ud/udprinciplestext.htm](https://www.ncsu.edu/ncsu/design/cud/about_ud/udprinciplestext.htm) (accessed July 8, 2017)
- <sup>vii</sup> . Sydik, Jeremy J. 2007. "Design Accessible Web Sites: Thirty-Six Keys to Creating Content for All Audiences". Pragmatic Publishing
- <sup>viii</sup> Gareev, Albert and Larsen, Michael. 2015. "Black Box Accessibility Testing: A Heuristic Approach", <http://www.associationforsoftwaretesting.org/wp-content/uploads/Black-Box-Accessibility-Testing-A-Heuristic-Approach-.pdf> (accessed July 8, 2017)
- <sup>ix</sup> WAVE. Web Accessibility Evaluation Tool. <http://wave.webaim.org/> (accessed July 8, 2017)
- <sup>x</sup> W3C. Web Accessibility Initiative. Web Content Accessibility Guidelines (WCAG) Overview. <https://www.w3.org/WAI/intro/wcag> (accessed July 8, 2017)
- <sup>xi</sup> W3C. Web Accessibility Initiative. Before and After Demonstration. <https://www.w3.org/WAI/demos/bad/> (accessed July 8, 2017)
- <sup>xii</sup> Pickering, Heydon. 2016. Inclusive Design Patterns: Coding Accessibility into Web Design". Smashing Magazine GmbH