Thesis Project Portfolio

Software Frontend Design: Utilizing HCD for Home Power Usage Web Apps

(Technical Report)

Expertise and Policy Influence of W3C's Web Content Accessibility Guidelines (WCAG)

(STS Research Paper)

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Sociotechnical Synthesis

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My technical report and STS report both focus on improving human-centered web design. Human-centered design (HCD) aims to strengthen systems by placing real individuals at the center of the development process. For my technical project, I applied HCD to create more efficient and usable solar web applications for an internship, while my STS project explored how effectively web policy protects and supports the inclusion of people with disabilities in web design. Applying the HCD principles I learned in school at my internship, I was able to transform project requirements into user-centered designs focused on the typical user. However, this process did not explicitly account for accessibility. That's why I felt my STS topic was a perfect complement to my technical work.

The solar web app I worked on enables users of all experience levels to calculate stats on their home appliance power usage that is intuitive and easy for novices to use, as well as powerful and complex enough for advanced users. To ensure the most user-friendly design, I utilized different Human Centered Design techniques and patterns to create a design that resulted in the most consumer satisfaction and quickest completion times. Using Figma, I created tens of different wireframes so I could compare designs on a broad, component level and get a feel for organization. Then I narrowed my choices to two or three designs programmed using SvelteKit. I took my measure for comparison by conducting beta testing with a handful of testers. They gave verbal or written accounts of each design and were timed on completion of a basic task. The results showed that a design that made more use of modals and collapsible divisions was more

favorably received, as it was easier to view and use. Users also had an easier time using designs that didn't require dragging over single button presses.

My STS research covered how the WCAG is highly influential because of the varied expertise spanning technical innovation, policy integration, and accessibility advocates, but the interactional expertise of disabled individuals is neglected. The literature review I conducted emphasizes the existing approval of the WCAG but highlights issues and delays in introducing the standard to legislation. Despite this, research suggests that this hasn't stopped the WCAG from playing a major role in accessibility cases in court, continuing to prove its influence. I chose to expand on previous work by examining the different forms of expertise that contributed to the guideline's established influence and its continued development. To do this, I analyzed publications and documents by advocacy groups, accessibility experts, policy-makers, and the W3C itself and its subgroups. In addition, I examined the demographics of W3C experts, the processes of contribution, the articles produced, and the division of labor from the W3C website. I discovered that a wide range of experts all played a role in cementing WCAG as the international standard, but those with disabilities are far more overlooked and unincorporated. I concluded that the WCAG has a strong foundation and history as the first and most integrated set of web accessibility standards, which, at times, is sufficient evidence for adoption. Despite existing at the forefront of guidelines, however, the design process is still not supported enough by direct research with the people it was written to serve.

By working on both of these projects, I have been able to develop my ability to test and collaborate with real users while also considering the needs of those I don't immediately think of or fully understand their worldview. I made design decisions based on specific feedback in my technical work, but my STS research pushed me to think more critically about the people I don't

always get to work with who are often overlooked. This dual perspective helped me move beyond surface-level usability improvements and toward more inclusive design decisions. When I first learned about web accessibility and the WCAG, I wondered why they weren't emphasized more or taught alongside web design. Exploring them together has taught me how intertwined accessibility and design are.