

# Accessible Design beyond Assistive Technologies: Future Directions for HCI Research

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## ABSTRACT

In this paper, I argue that accessibility is an important social justice issue within the HCI community. I explain why accessibility should be considered beyond the design of systems targeted toward people with disabilities. I use the social and postmodern models of disability and examples to illuminate future directions for HCI. Specifically, I focus on expanding the perspectives of people with disabilities in design to nudge the way we think about people with disabilities and to explore more inclusive design activities.

## Keywords

Accessibility; Disability; Design; Social Justice.

## 1. INTRODUCTION

Disability [2] is a life experience marked by complex phenomena including impairments of the body, views of society, and their interaction. It differs across cultures, geography, and time, and can be defined according to judgments based on imposed norms of what constitutes a body and mind. It can be visible or invisible to others, and visibility and the label of disability itself can change depending on factors such as the situation or governing institution.

HCI research has considered the access needs of people with disabilities, hereafter referred as accessibility. However, it has largely focused on building technologies that meet an access or information need or on involving people with disabilities in the design of such technologies. Some exceptions include Universal Design [12], which has been touted as a method for integrating access needs within design, but is also criticized [7] for its oversimplified approach and for not emphasizing the importance of including people with disabilities in the design process. Another example lies in Abascal and Nicolle's [1] exploration of embedding access needs into design guidelines with the goal of encouraging more socially and ethically aware HCI. They reference guidelines produced by the World Wide Web Consortium and add social factors and ethical concerns such as consent and privacy as important foci for HCI when refining their preliminary design guidelines. While this research is important to increase information and access for people with disabilities, it often does not attend to people with disabilities as actors in a broader social world, or consider what factors beyond proposing design guidelines might be instrumental in promoting more inclusive design. Indeed, specific needs of particular groups should never be undermined, but it should be done so with the consideration that people with disabilities are, or may want to be, users of technologies not specifically designed for them.

HCI researchers have already proposed Disability Studies [8] and Critical Realism [5] as useful theories that can drive the development of assistive technologies to consider factors beyond the technology itself. Yet both examples provide case studies involving the development of assistive technologies and do not

reach beyond to consider people with disabilities as users of technologies not explicitly designed for them. In the special education literature, Foley and Ferri [4] reveal how the medical model of disability and rehabilitative assumptions pervade technology designs that necessitate retrofitted accessibility, and only when accessible technologies are approved as a school or workplace accommodation. They propose moving from labeling technology for people with disabilities as "assistive" or "accessible," to inclusive design. Transitioning back to HCI, I argue that a history of underrepresentation and inadequate attention to accessibility in designs beyond those explicitly targeted toward people with disabilities forefronts accessibility as an important social justice issue in our community.

Given its position as a social justice concern, it is important to explore how to increase the agency of people with disabilities as critical HCI stakeholders and how to expand their perspective to all design. Following the lead of Mankoff *et al* [8] and Frauenberger [3], I attempt to ground my ideas for future directions in the social and Post-Modern models of disability. In summary, the Social Model of disability [9] arose in response to a pervasive Medical or Individual Model that positioned disability as a problem within an individual, and thus the individual's responsibility to adapt to the world around them. Instead, the Social Model considers the phenomenon as socially constructed. For example, barriers to access are created by society, and proponents of the model consider the responsibility of accommodating people with disabilities as belonging to everyone.

The Social Model is criticized [6] by approaches sometimes referred to as the Postmodern (used here), Phenomenological, or Cultural models of disability. As the social model of disability was developed in sociology, and predominantly by physically disabled activists, it is criticized for relying too much on social factors and for too narrowly define disability. Recent models of disability, such as the previous examples, bring in other factors such as culture, impairment, and the body as essential components of the experience of living with a disability.

Keeping these tenets in mind—taking collective responsibility for accessibility in HCI, and considering the multitude of factors that influence interactions among people with and without disabilities, I provide some examples of how the above ideas have manifested in projects I have been involved with. The examples are rudimentary and provided to provoke conversation and hopefully, inspire, research and interventions around creating more inclusive design environments and activities.

## 2. Future Directions

Here, I distill some ideas of future directions in two main areas, directions to provoke the way we think about people with disabilities, and directions for discovering the practices of people with disabilities and in translating them to inclusive design activities. I attempt to cite to previous work from which these

ideas segue but recognize the brevity excludes several important contributions. Particularly, HCI researchers have begun to carve a place for theories such as Feminist and Postcolonial HCI which serve as excellent examples for how to bring Disability Studies further in.

I acknowledge that my personal experiences largely center on blindness, but I write about accessibility in design for people with disabilities more generally. It is not an intent to map my experiences to implicate design for all types of disabilities, but to move the conversation forward thinking more broadly.

First, I ground design within the auspices of the Social and Postmodern models of disability, arguably the first future direction as it needs further intellectual contextualization and iteration. I position design as a process and practices requiring access to participate, sometimes resulting in artifacts which are often laden with goals that they too will be accessed. I further consider it an opportunity for ideologies and practices to take part in the collective responsibility to create accessible processes, practices, and things.

## 2.1 Probing Perspectives on Disability and Accessibility

I begin with an example drawing on ongoing classroom research of undergraduates studying design thinking with my colleague, Kristin Shinohara. Students were asked to design an indoor way-finding app and to consider either blind and vision impaired users, or deaf or hard of hearing users along with sighted and/or hearing users in their target populations. Student groups were paired with a blind, vision impaired, deaf, or hard of hearing participant five times throughout the course for user interviews, brainstorming, low and high-fidelity prototyping, and final user tests.

Our preliminary findings from two instances of the course demonstrated that as expected, students had little experience with people with disabilities or design, were challenged by the constraints of designing for their participant along with other potential users, and were deeply impacted by the experience. One compelling quote from a student demonstrated the impact of humanizing disability through involvement with people with disabilities. *“I empathize with [participant] in her frustrations of her current technology and the complications it entails, and her hindrance in navigation due to her sight disability. I used this as a goal or motivation when conceptualizing and brainstorming ideas...”* Our findings also hint that students could conceptualize their users as part of a greater society and made relevant considerations in their design decisions.

The above example begins to demonstrate that designers can be prompted to consider accessibility as a collective responsibility. Where this project departs from other accessible design initiatives is that it not only humanizes disability and accessibility in design, but challenges students to consider people with disabilities as a part of a greater target population. Opportunities to broaden this work could explore how to guide students and designers through biases in design and how to motivate consideration of broad perspectives from many target populations.

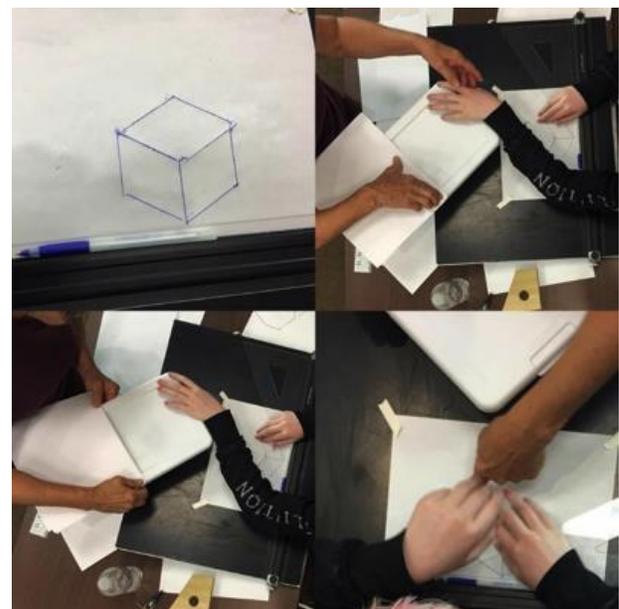
Some previous work has pushed the boundaries of factors considered in the design of assistive technologies such as Shinohara and Wobbrock’s [10] call for social accessibility to accompany often over-emphasized functional accessibility, sometimes resulting in designs viewed as unattractive by participants with sensory disabilities. Shinohara and Wobbrock’s [11] diary study probes further to demonstrate technology’s

impact on nondisabled peoples’ perspectives of disabled passersby. This literature meshes with the above example to prompt work questioning what collective responsibility means in the fields of accessibility and HCI, and what factors beyond the design of technology itself and its impact on users should be considered. As people with disabilities operate in complex social worlds, so do people, including designers and researchers, without disabilities. Probes into their perspectives can further inform the impact of design decisions on people with disabilities.

Other avenues could follow the example, challenging designers to consider multiple target populations during hackathons or team building activities. As the students reflected on their experiences, similar reflective exercises could be used to deconstruct biases and to brainstorm accessible designs. Finally, attention should be given to investigating stakes. Potential risks include the balance of promoting accessibility as a de facto necessity and insuring the perspectives and needs of people with disabilities are not forgotten. As we build on a history of assistive technologies meant to normalize and assimilate people with disabilities, as [4] suggests, we must prioritize how to legitimate and celebrate the disabled experience in technology designs.

## 2.2 Translating Everyday Practices to Inclusive Design Practices

I begin this section with another example drawn from spending a week with blind high school students at an engineering workshop. It was hosted by the National Federation of the Blind<sup>1</sup>, which has implemented several programs to engage blind youth with stem fields. As a long standing blind member of the organization, I served as a mentor for blind high school students in summer, 2015. They learned how to draw raised-line schematics (Figure 1), to repurpose recyclables to build low-tech water filtration systems, and to use shop tools to build boats. Student groups



**Figure 1. Photos of students drawing a 3D box with assistance from an instructor. Photos taken by Natalie Shaheen and used with permission.**

<sup>1</sup> <https://nfb.org/>

worked vigorously to win competitions of the best designs and put their creations to the test by filtering water and racing their boats.

Throughout the week, I primarily assisted in the water filtration system class, teaching students to safely use hand tools and spawning brainstorming on creatively repurposing plastic bottles. However, during my breaks, I repeatedly wondered to the drawing table. I came with experience with shop tools but had not endeavored to draw a schematic. I quickly learned how the teacher had adapted common measuring tools (Figure 2) and found which commonplace pens create tactile lines with extra pressure. Though the week was valuable for my own skill building and personal growth, I reflected on how the practices of an enclave of blind engineers can be applicable beyond the mission of the event which was to empower and raise participation of blind people in stem fields.

Most compelling to me was how well the blind engineers had developed systems to do their work that the few sighted people also found beneficial. Additionally, their accessible design strategies were easily applicable to designing and developing systems that were not explicitly targeted toward blind users, but were accessible for them. While I have personal experiences problem solving to gain access, the impact of our creativity did not reveal itself to me until I was in a group of blind people teaching strategies while learning others.

Again, we can use the Social Model of disability and ideas from the postmodern approach, specifically the multiplicity of factors that influence the development of inside knowledge about the experience of having a disability to deconstruct this example and to inform future work. Most research I have taken part in both as a researcher and as a participant has investigated people with disabilities on their own, either answering a survey, answering interview questions posed by a researcher, or usability testing. However, combining blind engineers created a ripe learning environment where students and instructors mentored one another, sharing strategies and personal experiences, here called expert knowledge, some of which were beneficial to engineering, others,



**Figure 2. Photo of measuring tools used which have been adapted with tactile markings to be accessible to blind users. Photo taken by Natalie Shaheen and used with permission.**

for everyday life. When people with disabilities are studied alone,

taken-for-granted practices may not be revealed. Conversely, a group setting may allow unique practices to become commonplace, may amplify expert knowledge and invisible work, and may encourage people with similar access barriers to share said expert knowledge. Arguably, some expert knowledge, referred to as invisible work, is incurred in response to inaccessible environments, both functionally and socially. For example, Branham *et al's* [3] paper that surfaced some of the invisible work undertaken by blind employees in mixed-ability workplaces, revealed practices that often go unnoticed and increase stress and distance people with disabilities from colleagues. Denoting invisible work is powerful in recognizing the extra effort by people with disabilities, and more work should be dedicated to documenting, eliminating, and educating colleagues about it. However, it does not tell the whole story. Additionally viewing unique perspective and practices by people with disability as expert knowledge can position it as an object of study for informing the design process, not simply for problematizing disability as a site for design intervention. Ethnographic methodologies could capture practices in progress, and provide additional perspective on how social and bureaucratic structures interplay with mixed-ability design teams and inclusive design practices.

Additional opportunities lie in helping HCI researchers to understand the value of expert knowledge acquired by people with disabilities and how to apply such knowledge to designs other than those explicitly targeted toward people with disabilities. With that comes the risk detailed above, the challenge of disseminating expert knowledge and inclusive practices such that they will not become devalued but instead legitimate and celebrate the experience of disability in design beyond accessibility.

Revisiting the power of collective creativity, I want to emphasize opportunities to explore its impact. While design and workshops and Participatory Design strategies often leverage group activities, how often are all members actually participating, and how often are the most underrepresented stakeholders still a minority of the design teams? Iterative design workshops that invite people with similar access needs but that also invite diverse perspectives could combine expert knowledge with collaboration to discover inclusive design activities. It is clear that people find solutions when necessary, so why not provide information and tools and allow people with disabilities to discover how to design for themselves? Not only does this combine with efforts to raise participation of people with disabilities as designers, but can also lead to identifying practices that promote more inclusive design.

### **3. Conclusion**

In this paper, I have argued that accessibility, and people with disabilities should be a social justice concern of the HCI community. I further argue that accessibility should be expanded beyond the design of systems targeted toward people with disabilities. I overviewed the Social and Postmodern views of disability and provide an initial framing of design from the lens of those models. Contextualized through examples, I specifically marked future directions to probe the way we think about people with disabilities in design and to translate practices of people with disabilities to inform more inclusive design environments and activities. It is my hope that this paper can spark discussion and lead to concretizing some of these future directions into actionable projects.

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