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How Organizational Structures Produce Inaccessible Technology at a Hybrid Company

THESIS

submitted in partial satisfaction of the requirements
for the degree of

MASTER OF SCIENCE

in Informatics

by

Maya Gupta

Thesis Committee:
Assistant Professor Stacy Branham, Chair
Professor Melissa Mazmanian
Associate Professor Anne Marie Piper

2022

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ABSTRACT OF THE THESIS

How Organizational Structures Produce Inaccessible Technology at a Hybrid Company

by

Maya Gupta

Master of Science in Informatics

University of California, Irvine, 2022

Assistant Professor Stacy Branham, Chair

For people with disabilities, substantial barriers exist to accessing technologies ranging from mainstream web browsers and public websites to individual pieces of media content. Despite decades of research investigating the magnitude and causes of this problem, software often fails to meet basic accessibility benchmarks and requires expensive retrofitting. Prior research has largely fallen into three categories: (1) evaluating the quality of current accessibility guidelines, (2) assessing the compliance of technology products with accessibility guidelines and standards, and (3) surveying the individual perspectives of technology development professionals. Yet, few if any studies have sought to understand more systemic causes of inaccessible technology development in industry. This thesis presents a qualitative interview study of the organizational aspects of (in)accessible technology development from the perspective of 10 technology professionals situated in different roles at a mid-sized technology company. Through our discussions of workplace policies, individuals' familiarity with accessibility, implementation of accessibility before and after design, and challenges with this implementation, I identified

organizational factors that would undermine even the best guidelines or efforts of accessibility-minded individuals. Specifically, I found a lack of formalized accessibility roles, lack of software accessibility accountability, as well as a lack of infrastructure for integrating disabled users into the design process. My work suggests that, until we approach accessibility at an organizational level, we may continue to see retrofit accessibility solutions that leave people with disabilities behind.

Chapter 1

Introduction

Software accessibility in enterprise is becoming a large topic of concern on a national scale. Accessibility guidelines meant to guide engineers and designers in their work are becoming increasingly widely available and recognized [23, 31, 15]. These guidelines are becoming so mainstream that a federal law now mandates public companies to ensure their websites follow the WCAG (Web Content Accessibility) 2.0 guidelines [23, 45]. Furthermore, a variety of software tools and code bases aimed towards aiding in the development of accessible technologies have been made publicly available by several different sources [35, 15]. Large technology companies proclaim their commitment to accessibility and often have internal regulations that guide accessible technology development at their organization [49].

However, despite these efforts and proclamations, software remains largely inaccessible. Meaning, 12.7% of potential users [10] cannot fully access the web, applications, and other tools - if at all. For example, a 2019 report by WebAIM documented that the top 1 million websites had on average 59.6 WCAG 2.0 errors per page [54]. Android applications follow this same trend; a 2020 study found that 46% of evaluated Android applications had not labeled any of their buttons [53] - a rudimentary accessibility practice [23]. These statistics are rendered even more discouraging when one accounts for the fact that many large-scale

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compliance evaluation metrics only cover half of the WCAG 2.0 guidelines, and the evaluation tools are often prone to false-positive and -negative results [52]. Further, WCAG 2.0 itself has been the subject of scrutiny for a lack of comprehensive accessibility standards related to cognitively disabled* [41] and deaf users [36].

Researchers have begun to address this problem through several different lines of inquiry. Some researchers have targeted accessibility guidelines by assessing their quality [36, 11], clarity [11, 28, 51], use [20], availability [20, 28, 47], and comprehensiveness [36, 41, 47]. Others have sought to document the low software compliance rates with these guidelines as a call to action for researchers and policy makers [53, 54]. Software engineering researchers have analyzed available automated software tools and created new ones to support accessible development at the code level [15, 26, 44]. Research has also found that technology professionals are often unprepared by their formal education to develop accessibly [35, 53], so early accessibility exposure [3, 29] and accessibility advocacy training [3, 29] have been recommended as possible remedies. Despite all of these efforts to create tools and education programs, a vast majority of inaccessible software still exists. It begs the question, why is this still going on?

Studies investigating this question of why inaccessible technology is consistently developed resurface every few years. Researchers including Snider et. al. [49], Trewin et. al. [49, 51], Putnam et. al. [37], and Lazar et. al. [28] have conducted survey studies over the last 20 years to gain an understanding from the individual developers of such inaccessible technologies. They have found that issues understanding available guidelines [37, 49, 51], budgeting constraints [28, 37], and a lack of management buy-in [37, 49] are

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main contributing factors to developers not having the means to create accessible

products. Due to the nature of survey methodologies, they have not been able to provide

context for these findings. Notably, all of these studies attend to the perspective of

individuals. Yet, as documented by the many studies above, Snider et. al.'s 2020 [49]

revisiting of the concern, and the continued lack of accessibility compliance, there have

been no reports of large progress being made in accessible technology development.

This study answers a recurrent question with a novel framing: what are the organizational

causes of inaccessible technology development? To address this question, I conducted a

qualitative interview study with 10 employees in various technology-focused roles at one

mid-sized (i.e. 100 to 999 employees [16]) technology non-profit corporation - hereby

referred to as "the corporation." Participants each held one of the following titles: user

experience (UX) designer, UX manager, engineer, product manager, content strategist, and

accessibility specialist (see Table 1). I asked participants about workplace policies, their

familiarity with accessibility, accessibility implementation before and after design, and

challenges with this implementation.

I found that a lack of shared understanding of accessibility, accessibility directives,

software accessibility accountability, as well as infrastructure for integrating disabled

people into the design process contributed to challenges with implementing accessibility.

Broadly, I found that approaching this research topic from an organizational perspective

allowed us to more wholly understand the systemic, rather than just individual,

explanations of inaccessible technology development. I present a discussion that describes

methods in which organizations can tackle these systemic challenges and how accessibility

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research may build upon organizational studies to further explore accessibility in

technology development.

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Chapter 2

Related Works

2.1 Accessibility Guidelines, Requirements, and Compliance

Some researchers have sought to understand the issue of inaccessible technology development through the analysis of current accessibility guidelines. Accessibility guidelines for the web have become increasingly important as more people depend on the web for everyday life. The Web Content Accessibility Guidelines (WCAG) by the World Wide Web Consortium (W3C) [23] is perhaps the most recognizable set of published guidelines. WCAG 2.0 – the latest iteration - is a set of recommendations for developers to help make their websites more accessible and currently stands as the de facto method of ensuring a website's compliance to the American Disabilities Act, Section 508, and EN 301 549 [45]. Beyond WCAG, other tools exist for guiding developers in creating accessible products, such as the Easy Read principles [23], Mobile Web Best Practices (MWBP) [31], or Authoring Tool Accessibility Guidelines [22].

Guidelines are important, as they inform developers and federal standards; however, they are not a perfect solution. Studies have shown that WCAG has a mismatch between the user reported severity and the WCAG priority level [12], does not cover all issues that disabled people may experience when using the web [36, 41], fails to properly address certain

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disabled populations entirely [41], and lacks enough guidelines for mobile formats [1, 4]. A

mismatch between user-reported severity and the WCAG priority levels, in particular, is a

problem as priority levels can determine what is worked on first and what is required, and

researchers have found that the priority levels noted by guidelines often do not match the

perspective of disabled users [12]. Multiple user evaluation studies have found that WCAG

does not cover even half of the issues disabled users identified [12, 41]. Calvo et al. [11]

conducted evaluations with accessibility experts and found that 6% of issues identified by

experts as potential problems were not covered by the WCAG 2.0 AA standards. As

developers have begun to shift to a mobile-first design philosophy, the need for good

mobile guidelines has also grown. To address this, researchers like Ballantyne et al. [4]

have sought to improve accessibility guidelines by expanding them to mobile platforms by

providing a set of guidelines for mobile applications. Organizations have also since pushed

for this shift towards guidelines for mobile platforms, as seen by the publication of the

MWBP [31] by the W3C [23].

Though imperfect, researchers agree that properly applied guidelines generally increase

web accessibility [7, 12]. Yet, studies show that there is a recurrent problem of low

compliance rates with these guidelines on the web [53, 54]. For example, a 2019 report by

WebAIM documented that the top 1 million websites had on average 59.6 WCAG 2.0 errors

per page [54]. The Digital Rights Commission conducted one of the first surveys on

multiple websites in 2004 in which they surveyed 1000 websites and found that less than

20% complied with the WCAG Level A, less than 1% for Level AA, and no sites for Level

AAA [28]. Similarly, Kane et al. conducted a survey on top university websites and found

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only 2 of 100 websites did not have any accessibility issues [25]. More recent survey studies have provided similar findings among government websites and top business websites [12, 21, 27].

Studies have investigated why there is such low compliance with accessibility guidelines on the web. Researchers have suggested possible explanations to be that there is a difficulty in validating compliance [12], a need for many methods of evaluations [41], and that guidelines' language is perceived to be too technical to understand [12]. Sloan et al. argued that a more holistic approach that considers context of use and user needs is necessary for improving usability guidelines [47].

While these studies sought to understand the difficulty in achieving accessibility through the lens of guidelines and compliance, I am looking at (in)accessibility through the organizational factors that help or hinder employees in creating an accessible product.

2.2 Accessibility Education

Over the past two decades, researchers have investigated how to develop computing curriculum tailored to educate about and encourage advocacy of accessibility for future technology professionals [18, 31, 33, 34, 39, 46]. Researchers have found that including accessibility in lessons about the design process can lead students to integrate accessibility practices into their future work [33, 34, 46]. Universal and inclusive design principles have been suggested as ways to introduce students to accessible design [18, 31, 39]. Other studies have proposed possible accessible computing pedagogies. Suggestions included: teaching accessible design early in computing education [37, 38], collaborative learning

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with disabled people [29, 42], focusing on automated accessibility tools [42, 43], and encouraging empathy for disabled users [31]. Some researchers have extended this to develop specific curriculum to be used by teachers [38, 42].

However, despite the abundance of research suggesting the importance of accessibility education in influencing accessibility-minded technology professionals, a 2018 WebAIM report of web accessibility practitioners found that only 5.5% noted receiving accessibility curriculum from their formal education [53]. Massive Open Online Courses (MOOCs) have been cited as a possible alternative to gaining accessibility knowledge in a formal education setting [18]. Nonetheless, MOOC accessibility courses follow a similar pattern; these courses only have a 10% retention rate [18], and former students have claimed that the coursework was challenging [37] and difficult to integrate into their current work [39]. Also, it is unclear how professionals include accessibility once on the job regardless of their exposure to accessibility curriculum [39]. Further, it is unclear how organizations can reinforce, add to, or undermine this education.

2.3 Accessibility from Technology Professionals' Perspectives

Despite the plethora of accessibility guidelines [23, 22, 31] and legal mandates [23, 31, 45] surrounding accessible information and communications technology (ICTs), a large number of ICTs reportedly remain inaccessible to people with disabilities [12, 27, 21]. As such, there have been several studies aimed at examining the needs of computing professionals when integrating accessibility practices [12, 22, 23, 27, 31, 45]. These studies have sought to understand the challenges faced when developing

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accessible technical products and propose solutions for these challenges [e.g. 12, 22, 23, 27, 31, 45].

For example, Putnam et al. [39] surveyed 314 UX and HCI professionals regarding accessibility in their work and found that most professionals considered accessibility to be important or very important in their work, but they felt that decisions about accessibility were not in their control [39]. Similarly, Trewin et al. [51] surveyed 49 IBM web developers to explore the barriers that developers face when developing accessible web-based products and reported that the developers perceived that designing for accessibility was difficult, largely due to the complexity of evaluation and testing tools [51]. Further, Lazar et al. [28] surveyed 175 webmasters and reported "lack of time, [lack of] client support, inadequate software tools, and confusing accessibility guidelines" as the main challenges faced when integrating accessibility [28].

Other research has focused on the accessibility software resources and forums available to technology professionals. Swallow et al. [46] developed the Web Accessibility Information Resource (WebAIR), a tool for web developers intended to mitigate concerns about the language, organization, and volume of existing tools and guidelines being too domain specific, difficult to understand, and overwhelming in volume [46]. More recently, Snider et al. [49] analyzed accessibility related questions from information searches and direct queries on accessibility forums and found that 1) accessibility related ontology needs expanding, 2) more support and information regarding accessibility requirements and expectations is needed from some source,

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and 3) guidelines for validating and reporting accessibility compliance are desired [49].

While foundational research has broadly addressed the challenges that developers and designers face when utilizing accessibility tools and presented survey data about the attitudes and motivations of computing professionals when considering accessibility, it may have neglected to provide the context of these findings and present a more holistic understanding of the systemic and organizational factors influencing these findings. My work expands on these foundations by examining organizational factors through interviews with technology professionals in a diverse set of roles. I seek to further this work by gaining a more holistic understanding of the systemic and organizational challenges that deter professionals from integrating accessibility practices into their work.

2.4 Hybrid Organizations

Researchers have defined hybrid organizations as those which merge "seemingly incompatible" [19] institutional logics and/or organizational forms [19]. Examples of such organizations are those that serve both academic and commercial interests [9, 56] or businesses that operate in both the government and public sectors [9]. The combination of these multiple interests complicates organization-wide decision making [2, 9, 57, 40]. Organizational theorists have conceptualized hybrid organizations using three perspectives: hybrid identities, hybrid forms, and hybrid rationales [19].

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This thesis predominantly draws from the hybrid rationales perspective. The hybrid rationales perspective has been defined as one that understands hybrid organizations as a combination of multiple "patterns of cultural and political values, beliefs, and practices" [19]. These rationales have been theorized as the result of multiple - often conflicting - institutional logics that guide both individuals and organizations [17]. Institutional logics are often defined from the top-down [17] - commonly stated in an organization's mission statement or internal documentation - *or* through the repeated practice of highly visible individuals or groups within the organization [40].

The external and internal challenges and opportunities of hybridity have been well-documented through interviews with individuals and groups within organizations, case studies, and ethnographies [2, 9, 6, 19, 50, 55, 56]. Studies have shown that external challenges of hybrid organizations include confusing audiences and stakeholders due to spanning established social categories [56] and facing difficulty trying to attend to the expectations of multiple groups [57]. Further, internal challenges include members struggling to identify with and understand their role within the organization's convention-defying nature [9], members being torn between the multiple logics of the organization [2], and conflict arising due to individuals' differing understandings of organizational reality [2, 6]. Conversely, external opportunities abound within hybrid organizations; spanning multiple categories allows hybrid organizations to sometimes deviate from expectations [55], and hybrid organizations have the potential to reach a much larger audience and resource pool than single-mission organizations [50]. Likewise, internal opportunities -

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such as the potential for increased innovation [14] and creativity [24] - provide encouragement for organizations to embrace hybridity.

Despite all of this research, few, if any, studies have sought to understand hybrid organizations which seek to merge the institutional logics of revenue generation and accessibility. I would like to use the lens of hybrid organizations as a means to understand the organizational factors that influence inaccessible technology development.

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Chapter 3

Methods

3.1 Study Design and Procedure

To examine what organizational factors may affect (in)accessible technology development in industry settings, I conducted a qualitative interview study examining the accessibility practices of technology professionals in a variety of roles at one mid-size technology corporation in the United States. I asked participants to reflect on the accessibility policies at their place of work, their familiarity and understanding of accessibility, how accessibility is implemented during and after design, and what challenges they encounter when trying to design accessible systems and products.

To attend to the possibility of emergent findings - as this is the first organizational interview study of accessible technology development - I used a semi-structured protocol to guide my questioning. Questions were generated iteratively through two pilot interviews conducted with individuals, recruited through personal networks, who were working in the technology sector at the time of the interview. A 29-question instrument was developed, addressing accessibility practices at the company, team, and individual level. Interviews

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were conducted by the three researchers (including myself) over Zoom, audio recorded, anonymized, and fully transcribed by a third-party service provider.

3.2 Participant Demographics and Sampling

A total of 10 participants were recruited for this study, over and above the two pilot interviews. All participants were employed at the same mid-size technology corporation (i.e. 100 to 999 employees [16]) and held various technology-focused roles. Recruitment was conducted in partnership and collaboration with the corporation over a period of two months. My recruitment material mentioned the research questions of this study, which included the term "accessibility", and as such I received a high proportion of self-selected participants with at least some interest in accessibility. This contact distributed the recruitment materials and advertisement to colleagues whose job titles included: user experience (UX) designer and manager, engineer, product manager, content strategist, and accessibility specialist. Interested participants contacted me directly. Three participants were men and seven were women. Two participants identified visually disabled. To preserve anonymity, I have adjusted the job title wording slightly and I use gender neutral pronouns (i.e., they/them/theirs. Further, I have decoupled participant IDs from participant demographics, instead presenting participant demographics as summaries including an average, a maximum number, and a minimum number when appropriate.

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Job Title	Participant IDs	Job Description
Accessibility Specialist	P01, P07, P08	Engineers and managers on team dedicated to road mapping accessibility initiatives, conducting accessibility audits, and responding to reports of inaccessible features
UX Manager	P02, P03	Manage UX designers across all product teams
Product Manager	P04	Manages engineers and UX designers across one product
UX Designer	P05, P06	Design software layouts for usability
Content Strategist	P09	Write any written content that appears on public products and internal documents
Engineer	P10	Develops code for one product team

Table 1: Table detailing participant job spread.

	Age	# Of Years at the Corporation	# Of Years of Formal Higher Education
Low	25	2	0
High	57	11	9
Average	34	5	5

Table 02: Decoupled participant demographics. Averages have been rounded to the nearest number for clarity.

3.3 Transcription and Analysis

The interview protocol was designed to last approximately 60 minutes. Participant interviews actually lasted between 60 to 90 minutes, and 72 minutes on average. In total, I collected, transcribed, and analyzed 731 minutes of data from my 10 participants. I conducted an inductive thematic analysis across all transcripts, and I generated a code book based on the analysis of three interviews. I shared and explained the codebook to and two other researchers, and each were given two interviews to code. I continuously met with the researchers to review the coding for quality and consistency and coded an additional five transcripts. I made a final pass of the codebook to confirm that the analysis

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was appropriate. Findings are organized with axial codes and open codes appearing as headings and subheadings, respectively.

3.4 Company Background

The company through which I sought to address my research question and gathered participants is referred to as "the corporation" in this paper. The company relies heavily on volunteer-based work; however, all participants are salaried employees. Most employees are not collocated. The corporation has many customer-facing software development projects – some small, some large - that have different levels of resources.

The corporation is a midsized [16], open-source, hybrid company [19]. This company identifies itself as a hybrid organization both in public and internal documents. As described in section 2.4 above, hybrid organizations merge "seemingly incompatible" [19] institutional logics and/or organizational forms [19]. The corporation has a competing for-profit wing that values selling software and acquiring users, and it has a non-profit wing that values making its software open-source and accessible. At the corporation, these two logics are merged in the organization's mission and daily activities. The mission statement explicitly mentions both, and the participants interviewed reported having job responsibilities tied to both (e.g. developing new, commercial software that is also open-source and accessible). Employees shared, as noted in the Findings, that their responsibilities relating to either for-profit ends *or* open-source *or* accessibility conflicted in some ways (e.g. allocating time dedicated to each in a project's timeline and deciding how much time to allocate to each). An important note about the mission statement is that

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it is a living mission statement - as the employees I interviewed all mentioned it and used it as evidence to demonstrate the corporation's dedication to accessibility; they stated that 'accessibility' in the mission statement is referring, at least in part, to accessibility for disabled people.

Additionally, hybrid organizations combine multiple "patterns of cultural and political values, beliefs, and practices" [19]. These patterns are defined from the top-down [17] - commonly stated in an organization's mission statement or internal documentation - *or* through the repeated practice of highly visible individuals or groups within the organization [40]. Again, the corporation's mission statement defined its values of profit, open-source software, and accessibility. Further, as the findings will expand upon, the corporation has instituted several practices related to these multiple values. Accessibility practices include employing an accessibility team and creating a system for accessibility checks (see Section 4.0.1). For-profit practices include encouraging UX teams to develop novel technology that draws in new users and requiring software teams to adhere to strict release deadlines.

3.4 Methods Limitations

I do not describe the company reporting structure, as 1) we explain individual reporting structures when relevant in the findings, 2) participants were not able to clearly recall the company reporting structure due to their positionality and its complexity, and 3) I could not piece together a holistic view from the participants gathered. I had 10 participants

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excluding pilot interviews. I decided that this was an appropriate number to proceed with after a long two-month recruitment period. Recruitment was also affected by my primary contact at the corporation leaving the company in the middle of recruitment and recruitment happening during the COVID-19 pandemic, during which the corporation laid off a large number of its employees.

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Chapter 4

Findings

Through my analysis, I found 14 different organizational factors which may impact accessibility in practice: 1) a lack of shared understanding of accessibility, 2) the need to negotiate accessibility, 3) a lack of accountability for accessibility, and 4) a lack of infrastructure for integrating disabled users into the design process.

4.0 Formal Structures at the Corporation

4.0.1 Existing Formal Structures at the Corporation

There were several formal structures at the corporation that were meant to encourage accessible technology development, including **an accessibility team and accessibility audits**. An accessibility team of six engineers and managers - three of whom were interviewed for this study - existed to tackle several accessibility-oriented activities. These activities included: completing accessibility audits, responding to user-reported accessibility errors, and completing accessibility-focused projects. An example of one of these accessibility-focused projects came from P08:

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"So right now I'm working to support screen reader users on Mac OS. So there's this native screen reader is [sic] called Voice Over. And we previously didn't have any support for that in [removed for anonymization], and I'm adding all of the APIs and nonsense to make that functional" - P08

P01, P07, and P08 reported that each member of the accessibility team had a domain in which they were expert, so accessibility team members are assigned projects from their manager, P01, based on that domain.

Another existing structure at the corporation intended to aid in accessible technology development was the practice of **accessibility audits** - mentioned before as a responsibility of the accessibility team. P01-P10 shared that accessibility audits are the main way technical teams receive feedback on accessibility prior to software releases. Accessibility audits are requests by UX or Engineering managers, and these requests are sent to the accessibility team. Depending on the scale of the project, the accessibility team will either conduct a review of the software and present findings, or an external accessibility team is contacted for review (P01, P04, P07, P08); Smaller projects are handled internally, whereas larger projects "require" (P01) an external team. The accessibility audit process includes an accessibility specialist reviewing the software for accessibility "errors" (P04, P07) and presenting ways that the software teams can remedy them (P01, P02, P04, P07, P08).

"I've requested an accessibility audit twice before. Both times, I gave [the accessibility team] access to the deliverable and within a couple days we had a meeting scheduled to discuss what accessibility errors they found and how we could fix them." - P04

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Managers are encouraged to submit requests for accessibility audits before software releases, although this is not always done in practice (P01, P02, P04, P07, P08).

As we will see in additional findings sections below, this thesis demonstrates how these organizational structures often fail to address challenges with developing accessible technology and how organizational practices undermine these structures.

4.0.2 Missing Formal Structures at the Corporation

Conversely, there are several organizational structures that the corporation lacks relating to accessible technology development. These structures include a lack of: accessibility training upon hiring, standardized accessibility training once on-the-job, standardized accessibility requirements and guidelines for designers and engineers, accessibility directives (i.e. Objectives and Key Results), accessibility coordination across teams, and infrastructure for including disabled users during the design process. Further findings demonstrate how these missing organizational structures hinder accessible technology development at the corporation.

4.1 Lack of Shared Understanding of Accessibility

4.1.1 Training

Accessibility training was not cohesive amongst participants. Fewer than half of the participants, 4 participants, relayed that they came into their current job with previously

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attained accessibility training. Participants P07 and P08 gained this training through their undergraduate and graduate degrees, and participant P01 and P02 gained this training through previous job experience. Participants P03, P04, P05, P06, P09, and P10 came to work at the corporation with no accessibility training. Consequently, participants had various degrees of familiarity on the subject at the time of hire. Additionally, participants shared that they gained an understanding – or an additional understanding - of accessibility at the corporation through several different means due to a lack of provided standard accessibility training, thus compounding the disparity of accessibility understanding.

Employees expressed having different exposure to formal training at the time of orientation. All participants indicated that they received no formal training from the corporation about accessibility upon hiring. Only 3 participants (P05, P07, and P08) shared that they received any type of formal accessibility training through courses and training sessions purchased by their managers. For context, the corporation allots a budget to team leads for the purpose of purchasing professional development materials and seminars for their teams. Some managers, according to P05 and P07, use these funds to provide training on accessibility for their employees. This training can be purchased through several corporation-approved vendors and is not vetted through in-house processes. As such, training can be highly variable in its perceived quality or utility, if provided at all.

“My manager purchased an accessibility training session a few years ago. (The manager) set some time aside for me to watch a recording of that training session. I could kind of get the gist of it, but it wasn't something I was actually a part of” – P05

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P01 and P08 explicitly expressed their desire to include material about accessibility during

the onboarding process. On numerous occasions, P08 reported that, when conversing with

management, they offered to initiate this process and provide the necessary materials to do

so themselves but did not receive an encouraging response.

> "I really want to start an accessibility training session for new hires… I've even pitched this (to management)
> a couple time. Like 'I'll make this for you!'…(Management) hasn't approved it. So at this point, we have people
> coming in without even hearing from the accessibility team." – P08

Further, participants indicated uneven on-the-job exposure to accessibility knowledge.

Another method through which participants gained an understanding of accessibility

practices is by the solicitation of accessibility audits. An accessibility audit is a service that

can be purchased wherein a team of accessibility professionals writes reports about

accessibility issues and opportunities on a project (P01, P06). Participants (P01, P05, P06,

P07, P08) reported that managers have the authority to request accessibility audits – either

by contacting the internal accessibility team for the review of smaller projects or by

purchasing the services of an external vendor to examine larger systems. While these

audits were used more so to obtain reports about specific accessibility issues in fully

developed systems and how to address them, participants P05 and P06 expressed that

observing these audits and reading the resulting reports informally taught them about

accessibility; they were able to become versed on accessibility issues previously unknown

to them and how to address them. Participants P05 and P06 shared that they then took this

knowledge and applied it to future projects.

> "We had an accessibility audit done on our project last Spring. The person conducting it was really
> good about verbally walking us through their thought process – what is inaccessible, why, how it can
> be changed… I learned a lot from that. I use some of the strategies he taught us still. – P06

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impairments) to reflect a social model of disability, wherein disability is understood to be caused by
discriminatory policies, attitudes, and infrastructures.

Participants mentioned several other informal ways through which they had to take initiative to gain an understanding of accessibility. Participants P01, P02, P05, P09 recalled instances in which they utilized professional development funds to attend accessibility and UX conferences. Participants P02 and P09 cited these events as inspiring incidents for their interest in accessibility, as this was their first exposure to presentations explaining its necessity and providing material on how to further learn about it.

> "I was able to go to a UX conference where there was this panel about accessibility. It was inspiring. It made me motivated to go home and learn more" – P02

Participants P04 and P09 gained an understanding of accessibility through a previous personal interest in the topic or through their own personal experiences with disability and inaccessibility – whether because they themselves were disabled or they had a personal relationship with a disabled person.

Many participants' accessibility training resulted from a combination of several of the means described above. Participants discussed a range of training experiences related to accessibility which informed their variable understanding of accessibility.

4.1.2 Standards and Checklists

Interviews also revealed a lack of clear and consistent accessibility standards and checklists available to participants. All participants noted that standards and checklists are frequently used at their company. However, participants across job descriptions described a lack of accessibility guidelines provided by the organization (P01, P02, P04-P10). This,

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along with the sentiment from all participants of preferring the use of checklists when reviewing their code and/or designs for usability and accessibility features, led to many seeking out guidelines from other sources. The engineers described using built-in tools provided by their coding environment to review for potential accessibility issues. The accessibility issues that arose from these checks were generally limited since the environments could only identify limited types of errors. When confronted with these errors, the engineers raised those concerns that could not be addressed by simple code changes to UX designers. Participants (P02, P03, P06, P10) indicated that doing so has previously led to tensions between the designers and engineers (see section Negotiating with Peers).

> "Android studio pointed out an accessibility error that could not be dealt with without a change to the design. I could not code within the design and fix this error… I brought this up to the UX Designer on our team, but they weren't willing to change the design. They were miffed, said they didn't have time to change it, and told me to focus on my job." – P10

The UX designers cited the WCAG guidelines as being their central reference for checking the accessibility of a system. This is not a requirement from the corporation, and as such is done is many different fashions. As a result, some designers followed the accessibility protocols included in the WCAG guidelines very closely and some not at all.

> "I have found some parts of WCAG that are applicable to my job and are easy to implement, so I will do those… things like font size and color contrast" – P02

Owing to the lack of company-supplied guidelines, participants P02 and P08 had to take I upon themselves to develop checklists of their own to address usability and accessibility

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concerns. This was the least institutionalized of the methods described to check for accessibility. Both participants could not clearly recall how they developed these checklists, as they were developed over several years using several formal (e.g. WCAG, company guidelines) and informal (e.g. personal research or recurrent flags from users) sources. These checklists were used by the individuals alone and not shared with others in the organization.

> "I actually made my own (accessibility) checklist that I follow. It's included in a checklist that I made for any piece of content I put out. It really acts as a reminder... It's just for myself" – P08

Across both checklists, the same two accessibility considerations were included: using a font size of over 9pt and ensuring "adequate" (P08) and "distinct" (P02) color contrast; no ratios were included to specify the ratio of color contrast. Notably, these two accessibility considerations were the only ones recalled by participants not on the accessibility team (P02-P06, P09, P10).

4.1.3 Equation of Accessibility with Usability

Another facet of this lack of shared understanding of accessibility is the equation of accessibility and usability by several participants (P03, P04, P05, P09). Participants on the accessibility team invoked the commonly used HCI phrase "what is accessible is usable" (P01, P07, P08) to explain how they have often presented accessibility to UX designers and managers, as usability is something they perceived as being more supported on an organizational level. However, participants outside of these roles often demonstrated a misunderstanding of this statement. These participants misconstrued this aphorism to

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instead be "what is usable is accessible." (P04, P05) This misunderstanding was often

demonstrated when asked about how participants account for accessibility in their daily

work:

"Usability leads to accessibility" – P04

This minor discrepancy has major implications for how accessibility is thought of and

implemented in design, as those not in accessibility-focused roles often conflated their UX

design tactics with accessibility design tactics. This conflation obscures the specific and

necessary design decisions that produce accessible software products. P05 demonstrates

this viewpoint when describing how accessibility plays a role in their job:

"We try to make things accessible. It's kind a part of my job in UX. I'm making software usable, which is
making it more accessible" – P05

The equation of accessibility with usability by those not on the accessibility team, in

contrast with the similar but divergent association of accessibility and usability by those

who are on the accessibility team, is another example of the lack of cohesion between the

understandings of employees on accessibility.

4.1.4 Varied Views of Success at Accessibility

This lack of cohesive understanding of accessibility culminated in participants'

perspectives on how successful the corporation is at achieving the goal of creating

accessible products. Depending on job role and knowledge of accessibility, participants had

conflicting views of the corporation's actual success at accessibility. P02, P03, P05, and P06

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– all of whom are not employed by the accessibility team - described the corporation as highly successful at creating accessible products, often invoking language from company literature to do so:

> "I think we are doing a good job at making our tech accessible. We try to. It's in our company handbook. Our mission states (redacted for anonymization)" – P06

Conversely, participants on the accessibility team expressed a dissatisfaction with the corporation's accessibility practices and shared a view that the corporation was not adequately meeting accessibility benchmarks. They perceived this to be a result of 1) more experience with and knowledge of good accessibility practices and 2) the viewpoint of being "the last line of defense" (P01) for accessibility.

> "We're kind of the last line of defense when it comes to shipping things out accessibly. We are the boots on the ground and get an idea of just how inaccessible some of the stuff we put out is… I would not say that we are doing a good enough job right now at producing accessible content" – P01

Participants' varied views on the corporation's success at accessibility further exemplifies the lack of cohesive understanding of accessibility demonstrated at the corporation.

4.2 Negotiating Accessibility as Opposed to Mandating Accessibility

The need to negotiate accessibility – at all levels of the corporation – was perceived by all participants to be a major limiting factor of the ability to produce accessible products consistently and quickly. I use the term 'negotiation' to describe the process of back-and-

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forth discussion between individuals aimed at completing a task or planning for achieving a certain goal.

4.2.1 Negotiating Directives

Participants often cited a lack of top-down directives from upper-level management as creating a need to fervently advocate for accessibility, often in tension with management's "higher priority" (P07) goals - thus resulting in the negotiation of accessibility directives. Participants (P01-P09) relayed that the corporation emphasized the obligation of teams to center objectives and key results (OKRs) when outlining team goals and work processes. OKRs are a strategic planning tool that is supposed to align goals and activities across units of the company (P01, P02). Participants (P01, P02, P07, P08) lamented that none of the OKRs specifically addressed accessibility. A participant outside of the accessibility team described how this omittance hindered their ability to advocate for a focus on accessibility in their projects and resulted in them having to negotiate for time to do so:

> "It's hard to persuade my supervisor to let me spend time on such and such accessible feature when I don't have an OKR to refer to… I tried to once, and my supervisor didn't see how it would help us with our team goals" – P02

P02 then further expanded on this by describing a process in which they negotiated for time to dedicate for accessibility on a project:

> "I told my supervisor that adding text descriptions for the images on our site would take three hours... He said that we couldn't do that... Then I asked for one hour, and he said 'yes'" - P02

Participants within the accessibility team recalled attempts they had made to take existing OKRs, tailor them for accessibility, and present them to management for dissemination;

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however, management was not receptive (P07, P08). These actions were taken to have management-driven incentives to present to those on all teams in order to implore them to develop accessible products. Additionally, having these adapted OKRs created objectives that made sense for the accessibility team's activities, thus allowing for benchmarks against which the accessibility team's activities could be measured and assessed; the OKRs driven by management often focused on aspects of development (e.g. "lines of code" (P03) or "design sessions" (P04)) that did not suit the work being done by the accessibility team. P08 describes this need for adapted accessibility objectives:

> "We tried to make OKRs for ourselves by adapting the given ones. Like, one example of an OKR is 'work towards growth' through blah blah blah. We adapted 'growth' to mean a growth in users with disabilities of our products. This helped us direct our work and helped us show to management that we made progress in this way… they accepted these new unofficial OKRs" – P07

This negotiation was between management and the accessibility team: the management created general OKRs; the accessibility team realized that these OKRs were not suitable to them; the team developed alternative, unofficial OKRs; and management accepted these unofficial OKRs. The authoritative absence of accessibility in OKRs from management necessitated negotiation between the already-detailed directives and the actual needs and goals of the accessibility team and others concerned with implementing accessibility in their projects.

4.2.2 Negotiating With Management

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Participants recalled several instances during which they negotiated with management to rally more support for accessibility initiatives. One prominent example of this was the negotiation for accessibility focused OKRs, as there were none provided by management at the time of interviewing. Participants (P01, P02, P04, P07, P08) shared that they perceived the adaptation of existing OKRs to relate to accessibility for their own use did not completely fulfill their needs. These participants stated that 1) the lack of management buy-in did not provide them with the authority to direct other teams to follow these accessibility objectives and 2) the unofficial status of the accessibility OKRs did not allow for the proper assessment of their accessibility work. As such, several participants (P08) shared experiences of campaigning to management to provide them with accessibility related OKRs.

"We have company-wide monthly meetings where we can post anonymous questions and comments. Every month I have asked about getting OKRs focused on accessibility." – P08

These negotiations included: supplying ideas for accessibility OKRs during organization-wide meetings (P01, P07, P08), contributing to discussions in the company-wide Slack channel about OKRs (P02, P07, P09), and sending emails to upper-level management detailing the need for these OKRs (P01, P08). These negotiations took place over multiple exchanges and included much back-and-forth and compromise (P01, P02, P07, P08, P09).

Another example of negotiating accessibility with management came from the participants on the accessibility team. These participants relayed their experiences advocating for accessibility requirements for products made by the corporation. In response, they were

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told that they could develop these accessibility standards, but they must distribute them as "suggestions" as opposed to "requirements." Thus, they shared that they did not have the authority to enforce these accessibility standards. P07 explains that:

> "We made a list of accessibility guidelines for designers and engineers since there aren't currently any. We pitched this to management, but they shut us down. They said if we want to share these accessibility checklists with other teams, we have to call them 'suggestions', not requirements. We really wanted to get these out, so we said 'ok, if we do that can you send them out for us so people take them a bit more seriously?'. And they did." – P07

In both examples described above, the tension between the objectives of management and the advocacy for accessibility by participants resulted in negotiating accessibility initiatives with management. Additionally, participants left these situations feeling that they were not provided with a clear explanation of how these accessibility initiatives did not align with the priorities of management.

4.2.3 Negotiating With Peers

Negotiating with peers was another way in which participants described negotiating accessibility in the corporation. Participants P02, P03, P05, P07, P08 shared that they often found themselves in the position of advocating for allocating time and/or funds on projects with other team leads, designers, and engineers. These negotiations would take place on a more frequent basis (e.g. at weekly team meetings as opposed to monthly organization-wide meetings) and focus on smaller scoped concerns compared to the negotiations with management. Examples of accessibility concerns that participants mentioned as being ones for which they had to "bargain" (P03) with their peers included the: purchase of

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accessibility audits (P02, P05), addition of accessibility features to web-based products and services (P02, P03, P07, P08), request for UX testing by disabled users (P05, P07), and implementation of an assessment system to check for the accessibility of products pre-deployment (P02, P05, P07, P08).

> "Last month I had to make the argument to my manager that we needed to make time to do an accessibility audit because we were publishing a large bit of software. I had to really argue my case... My manager said that she would request [an audit], but that it would only be for one portion of the software because we didn't have time. I said 'ok' since it was at least something" – P05

P05 above described an instance of negotiating with their manager to complete an accessibility audit. In this example, they had to engage in several back-and-forth conversations to compromise on an accessibility measure that would suit both of their interests (i.e. accessibility confirmation for P05 and timeline adherence for the manager).

Additionally, all participants on the accessibility team shared experiences in which they were forced to argue with other teams about the necessity of their accessibility recommendations (e.g., regarding a piece of software or a design) – accessibility recommendations that they are specifically employed to provide. Sometimes, the failure of this negotiation would result in the accessibility team taking on extra labor outside of their purview by performing design and coding tasks for the design and engineering teams. One participant from the accessibility team recounts:

> "I was going back and forth and back and forth talking with the (redacted) team to get some accessibility issues fixed before shipping the software. They said that they could dedicate one person to the task for maybe one hour. That just would not be enough, so I ended up fixing the issues for them. That was not my job, but I really wanted to get this done." – P07

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These negotiations occurred because of tensions between accessibility concerns and various other responsibilities held by the participants' peers. Participants recounted examples wherein their accessibility advocacy was in tension with the team's or a peer's budget (P02, P03, P05, P08), timeline (P02, P05, P07, P08), and/or ability to do so with the staff on hand (P05). Negotiations with peers were frequently used examples when participants elaborated on how negotiating accessibility was an integral part of their work life.

4.2.4 Social Stigma

Social stigma was a major concern shared by participants when detailing experiences of negotiating accessibility, as negotiations often occurred in public physical (e.g. workspaces) or online (e.g. video conferences, Slack channels) spaces. "Stigma" was a term used by multiple participants (P02, P05, P08, P10) - as well as variations of it (e.g. fear of "rocking the boat" (P10) or appearing "pushy" (P02, P08)).

> "There's stigma in being someone who always fights for something... I get afraid of making a reputation for myself as someone who is always arguing [for] and bringing up accessibility" - P07

I use the term here to describe "a strong lack of respect for a person or a group of people or a bad opinion of them because they have done something society does not approve of" [59], understanding "society" as "others in the organization". Participants (P02, P04, P05, P07, P08, P10) expressed a fear of stigma from too frequently requesting for attention to be paid to accessibility-related topics.. This concern was most often expressed by those on the accessibility team. All but one participant from the accessibility team were wary of

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speaking about accessibility-related issues at organization-wide meetings because they, as

P08 put it, did not want to be regarded as "that [person] who is always bringing up

accessibility." P08 went more into detail:

> "Yes our company-wide meetings have an anonymous forum for posting questions, but we're a small company and there are only a couple accessibility specialists. People can quickly figure out it is me advocating for accessibility during these meetings all the time. I don't want to create a reputation for myself as that person who is always bringing up accessibility." – P08

Although there were some safeguards in place to encourage employees to raise

accessibility concerns (e.g. anonymous forums or chat features during organizational

events and meetings), participants from the accessibility team expressed a hesitance in

regards to the efficacy of these safeguards. As the accessibility team at the corporation was

fairly small (i.e. under 10 people), participants from the team still felt exposed when posing

their concerns – even seemingly anonymously. P07, echoing statements from P08, shared

about how they felt like their anonymous comments in chat functions during meetings

could still be tied to their identity:

> "I am hesitant to post in the chat. I am the only (redacted identifying demographic information) on the accessibility team. So, it's pretty obvious when I'm sending messages about how we need to pay more attention certain types of accessibility issues." – P07

As a result of this concern for social stigma when publicly negotiating for accessibility,

participants shared sentiments about having to check in with themselves about how and

when to raise these concerns. Again, participants were fearful of appearing too assertive

(P02, P05, P08) or becoming known negatively for frequently steering the conversation

towards accessibility (P01, P05, P07, P08, P10). Several participants (P02, P07, P08, P10)

stated that they often have had to weigh the consequences of introducing accessibility

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concerns against the possible benefits, or they have had to be "strategic" (P02) and

consider which accessibility issue was urgent or timely enough to raise – as they did not

want to raise too many concerns.

> "I try not to make a fuss too often. So, sometimes I have to decide if an accessibility feature is worth fighting for. I don't want to be a problem employee. I try to be strategic about which accessibility things I am bringing up to others and which I need to let go" – P10

Social stigma was often a topic of concern for participants when they spoke about

negotiating accessibility at all levels.

4.3 Infrastructures the Elide Accessibility

4.3.1 Aggressive Timelines Do Not Allow Accessible Development

Aggressive timelines were frequently cited by participants as an organizational factor that

elides accessibility. Participants explained that project timelines are created by product

managers in response to directives from upper management (P01-P10). Timelines are then

shared with subordinates in order to direct work, prioritize tasks, and budget time (P01-

P10). Participants reported that accessibility is not "baked into" (P02) timelines and that

"aggressive timelines" (P01, P04) were perceived to not allow for the introduction of

accessibility (P01, P02, P03, P05-P10)

Participants relayed that these aggressive timelines were exacerbated by the lack of

requirements for accessibility checks to be done before deployment, so any accessibility

checks requested were often not accounted for in the planned timelines for projects.

According to participants (P01, P02, P03, P07, P08), accessibility audits are the only design

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and code checks done specifically for accessibility prior to releases. These accessibility audits must be requested by design teams and are then completed by the in-house accessibility team or outside vendors. Members of the accessibility team (P01, P07, P08) claimed that this happens infrequently and often with very little time given.

> "We'll get an (accessibility) audit request maybe once every couple months… that's one in total from the many design teams and projects there are… and even when we get them it'll be like one week before release"
> - P01

Managers, designers, and engineers shared that accessibility audits, the primary method of receiving accessibility feedback prior to software deployment, were not "baked into" (P02) project timelines and were requested ad hoc. Managers (P02 and P04) claimed that they requested accessibility audits only when they believed they had "wiggle room" (P02) in their timelines. Relatedly, these managers are both participants who expressed somewhat of an interest in accessibility because of personal experiences with disability.

These aggressive timelines also led to accessibility errors "slipping through the cracks" (P03). Participants shared that even when they were able to receive completed accessibility audits before technologies were released, often they did not "have enough time" (P02, P05) to implement the adaptations suggested in the accessibility audit to make the technology more accessible before deployment (P02, P03, P05, P10). P09 recounted an incident in which:

> "We got the (accessibility) audit info back in time by the skin of our teeth, but it was already two days before the project was scheduled to be finished… we just did not have time to implement all of the feature changes suggested. We were only able to do a couple of the suggestions… like changing font colors. The accessibility team isn't at fault, it was just timing." – P05

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Further, aggressive timelines were perceived to not allow enough time to iterate on accessibility issues. Participants on the accessibility team stated that, even in the rare cases where accessibility audits were completed with enough time to implement the suggested changes, it was unlikely that the accessibility team would be able to look at the software again to review the changes for accuracy (P01, P07, P08).

Participants, like P05 above, stated that the aggressive timelines and late-received accessibility audits led to them having to "pick and choose" (P05) which suggestions they could implement from the audits and which suggestions would have to be left for a later, updated release (P02, P05, P07, P09) or, in some cases, disregarded altogether (P02, P06).

> "(Once) I was given a suggestion to edit our design to have fewer links at the top of the page… maybe find a way to categorize them or something to make it easier for screen readers. We didn't have enough time to change this… we still haven't changed it. No user has reported a bug yet, so we haven't had to… It honestly slipped my mind until now" - P06

Interestingly, participants – like P06 above – often described accessibility issues as "bugs" (P02, P03, P06, P10), implying a responsive rather than proactive stance on inaccessibility.

4.3.2 No Accountability for Inaccessible Deliverables

Participants in all roles reported a lack of accountability for inaccessible deliverables. This accountability failure was said to be a result of the lack of accessibility-focused directives, as explained above.

The accessibility team shared restrictions that limit their ability hold teams accountable for accessible deliverables. Members of the accessibility team repeatedly expressed that, when conducting accessibility audits, they are not allowed to "enforce" (P01, P07) accessibility-

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minded changes; they are only allowed to "suggest" (P01, P07, P08) them. The team

asserted that this language was provided to them by management to reflect that they do

not have the authority to hold other teams accountable for inaccessible software and

cannot make them implement accessible changes. P01 recounts a scenario where this lack

of enforcement power led to the deployment of inaccessible software:

"Last month there was a release that had a bunch of accessibility issues that I flagged. I sent my suggestion to the design team, but nothing was changed… We have to 'suggest' it, we can't truly enforce anything for other teams." - P01

Managers and team leads remarked that they are not held accountable for inaccessible

deliverables, so they "cannot" (P02, P03, P09) hold their subordinates accountable. The

lack of institutionalized and standardized accountability adherence has resulted in 1) the

inability to reference company directives when attempting to enforce accessibility (P02,

P09) and 2) a feeling that it is "unfair" or (P02) or "not equal" (P03) to hold their engineers

and designers to standards that they themselves are not held to. P09 explains:

"It would be unfair of me to say "you need to make this accessible" when no one is forcing me to do the same. It feels like I can't hold (the engineers) accountable." – P09

Additionally, managers (P02 and P03) felt they did not have to hold their subordinates

accountable for implementing accessibility. This results in them frequently not checking

for or enforcing accessible design. This was also frequently mentioned in conjunction with

aggressive timelines as a reasoning for accessibility being forgone when short timelines

require some design aspects to be postponed or disregarded; other design aspects are seen

as "essential" (P02) because they are required by the corporation before deployment. P03

shared an example:

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"The project was set to be published shortly, and we knew we had to change certain things – errors that would disrupt the core functionality of the software. We had to complete those changes before we published… Accessibility is something that isn't required by us before we send out the software, so we pushed that aside in favor of fixing the functionality errors." – P03

Two managers (P02, P03) stated that they oftentimes must assume that accessibility is being done since they do not review their deliverables for accessibility and are not held accountable if deliverables are inaccessible.

"I just have to assume the software is accessible. I'm not expected to make sure its accessible, so I just have to hope that my engineers are" – P02

4.3.3 Self-Accountability or Deprioritization

Both teams and individuals reported using priority lists – both formal and informal – when conducting design cycles. Participants referenced formal priority lists when discussing design timelines (P01-10). These priority lists dictate which design and engineering concerns are addressed first. All participants outside of the accessibility team shared that accessibility consistently lays at the bottom of these priority lists, if on them at all (P02-P06, P09, P10). Consequently, accessibility is often completed "far right", meaning late in development, (P02, P06, P09, P10) in the design cycle, if done.

"My team has a list of things that need to be completed. This list is ranked in terms of priority. High impact design concerns, like 'does this do what it's supposed to do', are top priority… accessibility is fairly low on the priority list." – P06

Notably, this is different to the operations of one team. P04, the manager of this team, described their team's design process as consisting of several short design sprints, with each sprint including time devoted to addressing accessibility concerns. This design process is one that P04 spearheaded due to their personal relationship to disability.

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Participants mentioned informal priority lists as a method for structuring their individual assignments (P01-P10). These priority lists are often not written down and are not shared with others. Three participants (P02, P03, P09) noted that accessibility is ranked as low-priority on their informal lists, whereas three participants did not consistently consider it at all (P05, P06, P10).

> "I have a mental checklist of things I have to consider when writing code. I check the accessibility errors last, if I have time" – P02

Participants on the accessibility team shared that they have informal priority lists, but all items on the list pertain to accessibility concerns (P01, P07, P08).

Due to the lack of top-down accessibility directives, an accessibility orientation that prioritizes accessibility on the development side was often tied to individuals deciding that accessibility mattered. In two cases, this orientation was inspired by having personal connections to people with disabilities in their lives. For example, P04, a participant who implemented an accessibility-minded design process for their team shared:

> "I have a wife who is in a wheelchair. I really care about making sure my product is accessible… So, as manager, I have made sure that I include accessibility at every step, not just at the end." – P04

P04's perspective also documents how it is possible to implement accessibility in the design process at this organization ,but it must be prioritized and advocated for in order to do so.

4.4 Lack of Infrastructure for Recruiting PWD in Design

4.4.1 User Testing Excludes Disabled People

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Employees shared that user testing before software releases excludes disabled people. Participants (P02-P06, P09, P10) emphasized that this is the only way they get user feedback before releases. Before each large release, UX designers request usability tests through corporation-approved vendors. All UX designers and managers interviewed (P02, P03, P05, P06) explained that when requesting these tests, they do not have much control over which users they are getting feedback from.

"I can't say that I have a sense of the demographics of the users from (the usability studies). I just ask for x amount of users from the vendors." -P05

P02 and P06 claimed that the vendors are supposed to ensure a "diverse" (P06) user pool, but they did not have access to specific information about what "diverse" means in this context. No UX designer reported ever having requested specifically for disabled users to be contacted for testing, and none could say that they are sure that disabled users have ever been recruited through the vendors. The UX designers shared that they have never received explicit encouragement to ask for feedback from disabled users during these usability tests nor have they ever been given the option to by the vendors.

"I haven't ever been told to test for accessibility or get blind users or anything through the UX testing." -P02

"Sometimes (the vendors) will ask if I need certain demographic benchmarks met – like only female users or users aged 20-30… I've never been asked about users with disabilities" – P05

As such, the UX designers interviewed were unsure if disabled users have ever been consulted to discuss usability and/or accessibility prior to software releases.

4.4.2 Accessibility Testing Done Post-Hoc

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A great amount of accessibility testing at the corporation is done post-hoc. Members of the accessibility team explained that "most" (P01) accessibility issues are caught after software has been released to the public. Accessibility issues are reported by users – many of whom disclose that they themselves use are screen reader users and/or disabled (P07)– mostly through discussion forums hosted by the corporation. There are forums that focus specifically on "bugs" (P01, P07, P08). As such, accessibility issues are treated as bugs to be resolved by the accessibility team. Accessibility team members stated that they get at least one report per week on these forums. One of the main responsibilities of the accessibility team is addressing the bug reports on the forums. P07 explains:

"We have these online forums... where users can report accessibility bugs. I'd say about 25% of my time is focused on fixing these." – P07

P01 shared that they also look to social media sites, such as Reddit and Twitter to gather information about accessibility issues pertaining to websites and technologies released by the corporation. They estimated spending about one to two hours per week doing this. P01 expressed that they do general searches of words related to the corporation and its websites and products, and they note any accessibility issues about which users have posted. P01 stated that they sometimes respond to users' posts to gather more details.

"I'll usually run a search for (corporation name) or (product name) plus 'accessibility'... there's some great information on there. If people are having trouble with something, you can bet that they're going to twitter to talk about it." – P01

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This method of receiving information about errors post-hoc is quite common at the corporation, as they operate as an open-source company. However, this is notable in that this is the only method in which accessibility errors are reported other than accessibility audits, which are often neglected by design and engineering teams (see 4.3.1), compared to other usability errors that may be caught prior to software publishing through purchased UX testing.

4.4.3 Unpaid Labor of Disabled Users

Members of the accessibility team explained that disabled user-participants who provide accessibility and usability feedback post-hoc, through forums and social media, are not paid for their labor. This coincides with general practices of the corporation, as they are largely open source based. However, this is in stark contrast to participants recruited through usability testing purchased through outside vendors who are paid for their time and feedback. As described above, participants were skeptical that paid usability testing included people with disabilities (P02, P03, P05, P06). P08 shared:

> "Yeah, accessibility bugs on the forums are all found through volunteer work... we really owe a lot to them...
> (forum users) help find a lot of issues that made it through" – P08

Sometimes, this unpaid work by disabled user-participants is labor intensive. P01 and P07 stated that disabled users that report bugs will often work with the accessibility team over a period of time to help resolve issues. P01 recounted a scenario where:

> "This wonderful woman on twitter posted about an issue with (corporation-owned browser). I was going back-and-forth with her for weeks as I tried to resolve the issue... She's blind and uses a screen reader, and she tested out several iterations of code that I sent to her until we got the bug fixed." – P01

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Chapter 5

Discussion, Conclusion, and Limitations

While researchers have sought to reveal the magnitude of inaccessible technology development as well as diagnose the cause, the vast majority have looked toward accessibility checklists, guidelines, tools, and the professionals who use them [e.g., 4, 7, 12, 21, 23, 27]. None have addressed this topic from an organizational perspective. Consequently, researchers have a limited understanding of institutional practices that may bolster or inhibit accessible technology development. This thesis highlights organizational and institutional barriers in place that influence effectively implementing the tools and practices suggested by this prior research.

In this discussion, I synthesize my findings and put them in conversation with other work to illustrate that 1) accessibility checklists, guidelines, and tools are highly valued by individuals but are not effective if an organization does not implement them consistently and require compliance, 2) individual employee and user efforts to promote accessibility struggle to overcome institutional structures that limit it, and 3) the lens of hybridity in organizations may aid in understanding the institutional tensions of accessible technology development at some technology companies - like the hybrid company I observed here.

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5.1 The Need for Consistent Guidelines and Required Compliance

Researchers have spent decades analyzing how to assist technology professionals in creating accessible software. One of the major lines of inquiry has been how to make accessibility guidelines, checklists, and tools for software development [4, 7, 12, 21, 23, 27]. However, I found that there are many organizational challenges to implementing and institutionalizing these guidelines.

While there are many published and recognizable sets of guidelines and checklists for accessibility – like the WCAG guidelines [23] – that are used both as a guide and a federal standard for accessibility [45], half of the participants did not know about them. Those who knew about publicly available guidelines, reported gaining this information through previous formal education or training their manager had purchased for their team. However, participants described these trainings as highly variable and provided only when a manager chose to purchase it with general professional development funds.

 Trewin et. al.'s [51] survey of UX designers revealed a general sentiment among participants of wanting accessibility checklists and guidelines to follow. All of the participants in this thesis stated this as well, further explaining by saying that it would 1) streamline their design process and 2) assure them that they are designing accessible features correctly. Two of my participants (P02, P08) shared their desire for checklists and guidelines was so strong that they had to take it upon themselves to do work beyond their job description and manager expectations to develop their own accessibility checklists, as

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they were never given any standard checklists from the corporation. They based these checklists on publicly available guidelines, like WCAG. These personal checklists were not shared with others at the corporation since the participants did know how to do so, thus resulting in an inefficient system where several people repeated the same work and had to rely on non-standardized checklists.

Research [37, 49] has shown that technology professionals often consider WCAG to be very helpful, but its helpfulness is limited due to it being perceived as "confusing" [49] and "overwhelming in volume" [37]. This opinion was reflected and expanded on by my participants (P02, P05, and P09) stating that they would "pick and choose" (P05) which parts of the WCAG were helpful and perceived to be relevant to their work - usually limited to font size and color standards - as this was what they could understand the importance of and how to implement.

Despite WCAG guidelines presently being a federal requirement for public sector software development, there is no such requirement for the private and non-profit sectors [45]. Perhaps unsurprisingly, the non-profit corporation I studied did not enforce the use of WCAG guidelines in any way. The accessibility team shared that they could not "enforce" (P01, P07) only "suggest" (P01, P07, P08) accessibility-minded changes. Managers reflected that they are not required to hold subordinates accountable for inaccessible deliverables, so they sometimes do not. Finally, participants in all roles reported that they are not held accountable for inaccessible deliverables. Participants also perceived this to be a reason that accessibility is one of the first aspects of software to be disregarded when having to adhere to aggressive deadlines, as they shared there are no repercussions if the

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software is inaccessible. This reflects and sheds light on the extensive research documenting low compliance rates to accessibility standards by websites [7, 12, 23, 27, 54].

5.2 The Need for Accessibility Education Beyond the Individual

Research has also addressed improving accessibility education and training targeted towards individuals as a means to promote the development of accessible software [3, 26, 29, 46]. Education and training programs have been researched and created to better inform technology professionals about accessibility and how to advocate for accessible technology development in the workplace [3, 26, 29, 46]. However, I found that individual employee and user efforts to promote accessibility struggle to overcome institutional structures that limit it.

Participants from the accessibility team shared a myriad of examples of their attempts to enact change in the corporation's accessibility practices and the resulting pushback that they received from management and other employees. For example, some team members tried to advocate for accessibility training upon employee hiring, standardized accessibility requirements, and accessibility-focused OKRs. The intent behind this advocacy was to encourage more accessibility-minded design and compliance with accessibility standards. However, they perceived management to be unreceptive to their suggestions. So, their individual efforts were denied by management. Those on and off the accessibility team

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also relayed experiences of advocating for accessibility, receiving dismissal from peers for this advocacy, and fearing the stigma associated with being an accessibility advocate.

Participants reported that the organization lacked a way to user-test their software for accessibility issues prior to release. Organizational barriers described by the participants denied the opportunity for disabled users to give feedback prior to software releases - as participants stated that UX user testing did not explicitly call for or monitor the number of disabled users. As a result, the organization's open-source configuration relies on the unpaid volunteer work of users to report accessibility issues after software releases.

These findings suggest that training interventions that target individual computing professionals may not be effective unless whole teams and upper management also receive training. Individual efforts by employees, from asking for accessibility-focused OKRs to advocating for accessibility with peers, were described to be met with pushback and resulting in a fear of stigma associated with being an accessibility advocate. Individual efforts by disabled users to report accessibility issues were limited from the outset as they were a result of organizational structures not requiring accessibility issues to be addressed prior to software deployment or allowing for UX user-testing to catch them. This suggests that accessibility education should be extended to address organizational processes and target the management that make decisions about these organizational processes.

5.3 Hybrid Organizations as a Lens for Understanding

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As mentioned in the Methods section, the company I studied is a hybrid organization that serves an open-source mission as well as a revenue-driven one. Hybrid organizations mix core organizational elements that would not conventionally go together [19]. They must juggle multiple institutional logics, as they attempt to serve multiple missions. Organizational studies researchers have well-documented the definitions and the unique organizational aspects and challenges of hybrid organizations [2, 6, 14, 24, 56, 57]. Few, if any, studies have focused on accessibility being one of the missions of hybrid organizations. I found several tensions in my interviews concerning accessibility, revenue generation, and other business functions that may be explained by the notion of hybrid organizations.

My findings demonstrate many examples of perceived tensions between accessibility and business activities. Participants often invoked phrases such as "core functionality" (P03) as distinct from accessibility, such as when P03 described the how they neglected accessibility when reacting to a short project deadline:

> "The project was set to be published shortly, and we knew we had to change certain things – errors that would disrupt the core functionality of the software. We had to complete those changes before we published… Accessibility is something that isn't required by us before we send out the software, so we pushed that aside in favor of fixing the functionality errors." – P03

Anecdotes like this suggest the perception that accessibility is in tension with other business goals, such as short timelines and other functional requirements. This sentiment was shared with 6 other participants when describing how they address short timelines. Participants also distinguished between "essential" (P02) functionality and accessibility when discussing prioritization of work and addressing errors; four participants described

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accessibility as being deprioritized in the design process as opposed to other functionality because they are held accountable for "core functionality", not accessibility.

Research on hybrid organizations can help us better understand the tensions I found and suggest possible methods for reconciling these tensions. Organizational studies define these tensions as "multiple institutional logics" [19]. Institutional logics are usually implicit and characterize what constitutes appropriate behavior and how to succeed [19, 40]. Research states that institutional tensions are a common factor in hybrid organizations due to their multi-mission nature [2, 6, 14, 24, 56, 57]. Organizational studies have found that there are multiple ways to approach resolving these tensions. Organizations can use the following methods: 1) decoupling, 2) compromise, or 3) selective recoupling [14]. 'Decoupling' is when an organization symbolically adopts policies from one of their missions while not implementing it at an organizational level [14]. This allows organizations to conform to demands from stakeholders or other environmental factors while only implementing one organizational logic that is more aligned with organizational goals. I believe that my findings suggest this to be the case currently at the corporation I studied - with accessibility being a somewhat symbolic mission and revenue generation being the more organizationally aligned one. 'Selective recoupling' has been posed by researchers as an alternative to decoupling. Selective recoupling is when an organization couples "intact elements prescribed by each logic", as opposed to a 'compromise' where the elements are only partially intact [14]. Pache et. al. published literature on how some organizations do this in practice [33].

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Complicating the idea of these tensions is the notion supported in accessibility research that accessibility is profitable and in line with the assumptions built into the studied corporation. Accessibility research argues that designing accessible systems is profitable, as disabled users are a large consumer base that may be left out by inaccessible products [58] and retrofitting accessibility requires extensive time and resources. This understanding may help us reframe my participants' perceptions. For example, when participants described having to neglect accessibility in favor of completing "core functionality" before deadlines, they are misconstruing these two things as competing tensions when they are in fact aligned. This reframing, as Lazar et. al. [28, 58] have suggested in their research, could help advocate for systemic changes wherein technology companies are encouraged to consider accessibility as a core business function.

5.3 Conclusions and Future Work

I conducted a qualitative interview study with 10 technology professionals at one mid-sized technology company in order to understand the organizational causes of inaccessible technology development. I found that a lack of shared understanding of accessibility, accessibility directives, software accessibility accountability, as well as infrastructure for integrating disabled people into the design process contributed to challenges with implementing accessibility. This work suggests that future research may focus on understanding accessible technology development using an organizational lens. This interview study examined the systemic causes of inaccessible technology development at

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one mid-sized hybrid organization. Future work might explore this topic at other types of organizations. Smaller start-up companies may have different organizational structures than larger companies and may not have the same resources. Ethnographic observational studies could uncover more results or add context to the findings presented here. Future work examining how to implement standardized checklists and guidelines within an organization or how to develop accessibility training programs for teams and management could offer additional insights on the opportunities and challenges associated with them.

5.4 Limitations

While this study uncovered organizational causes of inaccessible technology development at one hybrid company, there were several limitations that highlight the need for future research. First, these findings represented the perspectives of technology professionals at one hybrid company located in the United States. Therefore, I cannot speak to all hybrid companies. Future work may seek to understand the questions asked by this study at smaller and larger hybrid organizations or organizations not situated in the United States. Further, I did not access the software this company produced to assess it for its (in)accessibility, nor did I directly observe business processes, so the findings rely on the perceptions of the 10 employees interviewed. I also recognize that another limitation of this study is that I did not analyze the organizational hierarchies and relationships at this company (i.e. who reports to whom) or collect primary documents (e.g., guidelines or timelines).

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Additionally, I had a limited number of participants. This was due to several reasons. Recruitment was held during the first peak of the Covid-19 pandemic, and the company I studied went through significant organizational transition during this time; a number of employees were laid off or left the company. My participant population was also skewed toward participants who had some interest in speaking about accessibility, as the recruitment materials specifically mentioned that accessibility would be a core topic of discussion.

Moving forward, I hope that research expands on the topics discussed in this thesis by exploring other types of hybrid organizations, gaining the perspectives of more technology professionals, and participating in direct observations of processes.

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