Why is Accessibility So Hard? Insights From the History of Privacy

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ABSTRACT

While HCI and CSCW research has recognized the importance of accessibility, the field has primarily focused on individual capabilities and technological solutions. Inspired by the evolution of privacy research, I argue for expanding accessibility research to influence accessibility in real-world practice. Similar to privacy, accessibility is driven by a poorly defined core concept and faces comparable challenges including substantial demands placed on software development and the general lack of pushback. By drawing insights from the lessons learned from the privacy research community, this paper explores the current challenges faced by accessibility research. I propose centralized support and policymaking – two areas currently under-explored within accessibility research – hold rich potential for driving meaningful progress.

CCS CONCEPTS

• **Human-centered computing** → **Accessibility**.

KEYWORDS

accessibility; privacy; research agenda; infrastructure support; developer support; policymaking

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1 INTRODUCTION

Accessibility has been a central concern in HCI and CSCW research but has long primarily focused on innovative assistive technologies for individuals and accessibility issues of specific technologies [62]. Recently, the community has tried to diversify the research focus. A growing number of studies focus on disabled[1] people's lived experiences (e.g., [43]), and critically reflect on assumptions made about disability, accessibility, and assistive technology design (e.g., [18, 63, 89]). The accessibility research community also seeks new research avenues by fostering collaborations with other fields, e.g., security and privacy [8]. However, accessibility remains a hard problem in practice [13].

[1]While using identity-first language throughout, I am aware that people have different preferences for how to be addressed [78].

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This present paper is positioned for research communities that concern accessibility in HCI, CSCW, and accessible computing. I aim to highlight the complex realities of accessibility and identify under-explored directions by drawing inspiration from the history of privacy. My inspiration comes from two recent reflective articles on privacy and Algorithmic Fairness, Accountability, Transparency, and Ethics (FATE) by Hong [44, 45]. Hong argued that FATE should learn from the history of privacy research and practices because the two areas share high similarities and face comparable challenges such as ill-defined goals and lack of pushback on the issue [44]. I believe accessibility research can benefit from joining this discussion because it shares a high similarity with privacy as FATE. Similar to privacy, accessibility is driven by an ill-defined concept. Both fields have traditionally emphasized computational and technological approaches but require insights and methods from law, policy, ethics, user experience design, systems design, and more in practice. Additionally, privacy and accessibility face similar challenges throughout the software development lifecycle, including analysis, design, coding, deployment, and maintenance. More importantly, both fields struggle with getting people to care.

Next, starting with a brief introduction to human-centered privacy and accessibility research, I discuss how similar the two fields are. Based on the lessons learned in the privacy research community, I argue that accessibility research should diversify its focus and consider centralized support and policymaking as two important directions. Taken together, this paper aims to make the following contributions: 1) I demonstrate the parallels between privacy and accessibility, emphasizing the broader social context that influence accessibility in practice; 2) I suggest a broader scope in accessibility research, particularly by exploring the potential of centralized support and policymaking; 3) I emphasize the importance of communication and collaboration within HCI sub-fields. By forming joint forces, we may advance research and promote the development of more responsible technologies together.

2 BACKGROUND AND RELATED WORK

This section provides a brief overview of human-centered privacy and accessibility research in terms of their history and goals. Due to the space limit, this review is not intended to be exhaustive. A more comprehensive examination could be referred to review articles conducted in the two fields [16, 52, 62].

2.1 Overview of Human-Centered Privacy Research

Privacy, as a long-standing human value, has gained renewed attention in the age of information and communication technologies (ICTs) [3, 16]. The widespread adoption of computing technologies has intensified the focus on the control and management of personal information. [16]. In response, the security and privacy

research community has made efforts to identify security and privacy risks within ICTs and develop privacy-enhancing/preserving techniques such as cryptography, encryption, access control, and formal methods [91].

Despite these efforts, researchers found that the adoption of privacy-friendly techniques is not only dependent on technical factors but also on usability. People may not adopt security and privacy techniques if they are not easy to understand and seamlessly integrated into their daily routines [5]. Therefore, greater attention has been paid to user behavior and decision-making about privacy. Pioneering this user-centric approach, Saltzer and Schroeder advocated for computer security mechanisms to be "psychologically acceptable" as early as 1975 [77]. Following these traditions, human-centered privacy and security have now become an active area covering theory development [67, 70], human-centered system building [61], user understanding [29], policymaking [40, 54, 96] and critical analysis [64, 72].

However, privacy continues to be a complex issue in real-world applications, frequently grabbing headlines due to breaches or misuse. Leveraging his two decades of experience in privacy research, Hong identified 11 key challenges in this domain (detailed in [45]):

- Privacy is a broad and fuzzy term.
- There is a wide range of privacy risks.
- Technological capabilities are rapidly growing.
- There are very strong incentives for companies to collect data about us.
- Same device, same data, different perspectives.
- The burden on end-users is too high.
- Developers have low knowledge and awareness of privacy.
- Companies get little pushback on privacy.
- It is not always clear what the right thing to do is.
- Machine learning and probabilistic behaviors make privacy hard to predict.
- Emergent behaviors make privacy hard to predict.

Many of the challenges in this list, if not all, could map to accessibility. Like privacy, accessibility struggles with concept ambiguity, diverse user needs, rapid technological change, burdens on users and developers, and minimal pushback. I unpack these similarities in Section 3 and suggest the potential for the two communities to learn from each other.

2.2 Overview of Accessibility Research

According to a basic definition by Cambridge Dictionary, accessibility is "the quality of being able to be entered or used by everyone, including people who have a disability [32]". In the context of accessible computing, this definition translates to promoting the accessibility of digital technologies for disabled people and seeking solutions that address real-world accessibility challenges. CHI 2024's subcommittee on "Accessibility and Aging" defines accessibility papers as "those that deal with technology designed for or used by people with disabilities including sensory, motor, mobility, psychosocial or cognitive, intellectual or learning disabilities, or people who identify as neurodivergent [24]."

The field of accessible computing emerged alongside the rise of disability activism in the U.S. Following the passage of Section 508 in 1986, Richard Ladner and Gregg Vanderheiden organized a dedicated panel at CHI'88 to discuss the development of accessibility guidelines and their implications for HCI [55]. Shortly after the Americans with Disabilities Act (ADA) was enacted, the Communications of the ACM published a special issue dedicated to disability and computing, emphasizing the importance of designing for disability [37]. These growing efforts culminated in the founding of The ACM Conference on Accessible Computing (ASSETS) in 1994.

While recent years witnessed the diversification of focus, accessibility research has traditionally focused on assistive technologies and individual abilities [62]. As shown in a recent systematic review of accessibility research from 1994 to 2019, the field typically focused on specific accessibility needs of disability sub-groups, such as communication needs of d/Deaf and hard-of-hearing people [62]. Inspired by similar user-centric and value-driven considerations within the privacy field, I argue for a more expansive approach to accessibility research.

3 HOW ARE PRIVACY AND ACCESSIBILITY SIMILAR?

I believe that accessibility research can gain valuable insights from the history of privacy because of the similarities shared by the two fields. Both are driven by a complex goal, facing diverse user needs and challenges in software development. Crucially, both fields have long faced a lack of pushback on the issue. Drawing on Hong's reflection on the challenges faced by privacy [45], I explore the shared challenges that privacy and accessibility encounter next.

3.1 Driven by a Complex Goal

Both privacy and accessibility are driven by an ill-defined core concept, making the goal complicated. Privacy is a broad term without universally accepted definitions [30, 45], which is often operationalized in different ways in regulations and real-world practice [35, 36]. As Hong put it,

> "Privacy has been described as 'the right to be let alone [92],' control and feedback over one's data [17], data privacy (which led to the Fair Information Practices [68], which is the basis of the vast majority of legislation on privacy), anonymity (which is a popular definition among computer science researchers), presentation of self [38], boundary negotiation [10], the right to be forgotten, contextual integrity [67] (taking political, ethical, and social norms into account), and more [45]."

Even for the same device and the same data people can still have different perspectives toward privacy [7]. Moreover, research found that the understanding of privacy fluctuates over time and significantly across cultures [3, 90]. As a result, the goal of privacy is often unclear, needless to say coming up with solutions.

The goal of accessibility seems far more clear than privacy, but it is also under critical reflection. For a long time, accessibility has been treated as a technological requirement to follow, usually in the form of a checklist. For example, according to the World Wide Web Consortium (W3C), "web accessibility means that websites, tools, and technologies are designed and developed so that people with disabilities can use them" [28]. However, research has increasingly

revealed that the goal of accessibility may not be as straightforward as once thought. For instance, conflicting access needs can make complete accessibility an ideal rather than a reality [8, 43]. Additionally, people may have different understandings of accessibility. Critics such as John Lee Clark argue against viewing accessibility as a supplement to the original content, advocating instead for direct engagement [25]. These ongoing debates reveal accessibility as a complex goal as privacy.

3.2 The Wide Scope of User Needs

Both privacy and accessibility face complex user needs encompassing a broad spectrum. As noted in Section 3.1, the definition of privacy is broad and covers diverse user needs including data control, impression management, interpersonal relationship management, etc. Solove proposed a taxonomy of privacy to illustrate the wide landscape of privacy risks [83]; these risks range from concerns over data collection, processing, dissemination, etc. Moreover, privacy is highly contextual and personal, varying by person and situation [29, 88]. Experts on online safety often have competing perspectives for which threats and advice people should prioritize [93]. Effective security and privacy support often requires a holistic assessment of the situation that people face [88].

Similar to privacy, accessibility needs are broad, concerning visual, hearing, motor, mobility, speech, cognitive, intellectual, learning, and socio-psychological disabilities. Accessibility needs are also highly contextual [84] and fluid [89]. For example, d/Deaf people have diverse language backgrounds, which would pose challenges for designing language technologies for this population [86]. Blind and low-vision people may have varied preferences regarding the level of detail and object attributes included in image descriptions [84]. Access needs may even conflict with each other in ability-mixed settings [8, 43]. For instance, in video conferencing, while visual information could be important for one, it could cause distractions to others or affect their privacy [8, 43]. In certain scenarios, people might prefer a slightly less accessible experience for the sake of joy and challenge, such as in games or dances [4, 33].

Due to the high requirement for personalization, customization settings are often used in commercial products to meet personal needs for both privacy and accessibility. However, managing the settings can be cumbersome for users, requiring significant effort and knowledge to navigate [33]. While researchers have been exploring more intuitive solutions, challenges remain because of the dynamic and ever-changing nature of user needs [26, 94, 95]. Currently, the burden still falls on users, who typically spend significant time managing their privacy and access needs through complex settings configurations [33], navigating different systems [76], and dealing with software updates [79–81].

The ever-changing landscape of technologies further complicates privacy and accessibility. Emerging technologies, such as augmented/virtual/mixed reality, the Internet of Things, smart speakers, and AI-based technologies, all keep introducing new user needs and behaviors that are hard to predict. Unfortunately, while there is an increasing call to consider privacy and accessibility in all stages of design [42, 97], they are still often taken as an afterthought or add-on feature [13].

3.3 Lack of Developer Support

Another challenge facing both privacy and accessibility originates from the developer side. While both are crucial requirements in software development, developers often have low knowledge and awareness of them [71]. For instance, developers may not realize the extent of data their applications are collecting because they often rely on third-party APIs [15, 58, 60]. As a result, supporting developers has become a significant area of research in privacy in recent years [2, 58].

Accessibility, much like privacy, depends significantly on third-party APIs and development frameworks, which can sometimes lead to conflicts [47]. Other challenges include the scarcity of effective accessibility tools and resources, as well as the difficulties in accounting for retroactive changes in project timelines [71].

Moreover, accessibility is frequently overlooked in computing education [14]. Patel et al. found that formal education inadequately prepares developers to handle accessibility challenges in software development [71]. Students often lack motivation to learn accessibility skills because these skills are typically not required in subsequent work or classes [27]. Accessibility skills are also hard to transfer to other fields, making it hard to motivate people to acquire relevant skills.

3.4 Lack of Pushback

Last but not least, both privacy and accessibility face significant challenges in getting "organizations and developers to care" [27]. There appears to be minimal resistance or pushback on privacy, especially before the enforcement of regulations such as the General Data Protection Regulation (GDPR). Additionally, because privacy issues are difficult to quantify, they often do not influence consumer purchasing decisions, leading companies to lack motivation to enhance product privacy. Similarly, while accessibility is mandated by regulations such as the ADA in the U.S. [34], companies tend to limit their accessibility support to the minimum compliance [13].

4 WHAT MAY WORK FOR ACCESSIBILITY BASED ON THE LESSONS LEARNED IN PRIVACY?

The challenges faced by privacy have led to a rich set of research directions, e.g., privacy theories [67, 70], emerging technologies' privacy concerns [1, 6, 31, 56, 73], personal privacy assistants to assist users in making privacy decisions [61], privacy nutrition labels to inform users of data use [50], etc. Similarly, accessibility research has been thinking about the goal of accessibility [43, 89], improving accessibility of emerging technologies [62], etc.

However, while all these efforts are valuable, translating research into practice is always hard. If we look at the history of privacy, while a great portion of the work may improve awareness of privacy, the vast majority of cases did not have much success in pushing privacy in practice [44]. On the company side, the interests of different stakeholders are still misaligned, e.g., companies, advertisers, and consumers; on the user side, even if people improve their awareness regarding the privacy of the products, there are usually no alternatives [44].

These lessons from privacy indicate that industry self-regulation and merely improving awareness are insufficient for addressing

complex, value-driven issues such as privacy and accessibility. Just as with privacy, individuals have limited choices for assistive technologies and often have to tolerate the inaccessibility of mainstream technologies [76]. There is also a lack of developer support and enforcement mechanisms.

Among the widespread efforts, it has been proven that centralized support such as smartphone app stores and external regulations such as GDPR have been among the most effective strategies for enforcing privacy in practice [44]. As Hong put it,

> "...the most substantive lever for improving privacy has been comprehensive legislation and regulation such as GDPR and California Online Privacy Protection Act (CalOPPA)... Nowadays, companies and developers have to care about privacy, due to the potential for massive fines... The next most effective lever for privacy has been smartphone app stores. The centralized nature of app stores and their dominant position for distributing apps made it possible for Apple and Google to dictate certain standards for privacy. [44]"

Drawing lessons from privacy, I argue that centralized support and policymaking should be valued to effectively promote accessibility in practice.

4.1 Centralized Support

Centralized support would be important to ensure accessibility support to be consistently enforced. Currently, inaccessibility is still a problem for many software [76]. Even when technology companies have accessibility support in their products, it is often inconsistent — for example, many websites try to meet ADA and the Web Content Accessibility Guidelines (WCAG) requirements by integrating an accessibility menu but screen reader users may consider these in-built widgets redundant or restrictive [51]. People often have to spend significant time navigating different systems to develop workarounds and individual solutions [76]. Enforcing standards in centralized platforms such as the app stores of Apple and Google may help with this issue by enforcing consistency.

Although developers should take responsibility, simply blaming the developer side for accessibility is unhelpful because the burden on developers is also high [13], especially considering they need to consider many other issues. Sometimes, different requirements may even conflict with each other such as accessibility and aesthetics [87] (although aesthetics is often based on an ableist norm [46]). Therefore, providing consistent support to companies and developers will be important. For example, understanding how developers build privacy-friendly applications and considering strategies to support them is a topic gaining attention in privacy research [41, 58–60]. However, while some research focused on developers' perspectives [19, 57, 87], developer support has still received relatively little attention in accessibility research. Future work should consider supporting developers in practicing accessibility, along with other values such as usability and privacy, at different development stages (i.e., analysis, design, coding, testing, deployment, and maintenance) [82].

Notably, one challenge in centralizing support may lie in the vast spectrum of contextual access needs as mentioned in Section 3.2. Some major technology companies have already been integrating assistive technologies and features into their systems or devices, such as screen readers, magnifiers, stabilizers, hearing aid support, and lived transcription [11, 39, 66]. These efforts help provide consistent and centralized support in terms of accessibility. However, moving forward, we are still facing many problems — with such a wide range of complex access needs, how can we build upon these existing efforts to ensure consistency in accessibility support? What support or services should (not) be made centralized in terms of accessibility? Addressing these problems could be a valuable step towards creating a more accessible digital environment.

4.2 Policymaking

Policymaking is another direction that deserves attention to enforce consistency in accessibility. External regulations have always been strong enforcing mechanisms for value-based issues such as privacy. Privacy regulations such as GDPR have been among the most active areas in privacy research in recent years (e.g., [40, 54, 96]).

In the U.S., regulations like Section 508 and the ADA have long been the driving force behind accessibility standards. Established in the 1990s, WCAG has been an active area for ongoing research. Research has been exploring the root causes of inaccessibility and noncompliance with centralized guidance [74, 75]. Additionally, researchers delved into specific technical needs and developed best practices for emerging technologies. For example, Raja Kushalnagar and his colleagues have been developing standards for captioning and teleconference [12, 53].

Learning from the history of privacy, a policymaking perspective would be crucial for governing and ensuring the accessibility of emerging technologies. The existing WCAG offers a valuable foundation, but its reach may have limitations. As technology continues its rapid evolution, collaboration across research disciplines is essential to explore how best to develop effective policies that guarantee the safety and accessibility of these advancements for all. What would accessibility policies look like in the context of generative AI, augmented realities, virtual realities, and mixed realities? Considering that many fields such as privacy and FATE are exploring guidelines and policies for these emerging technologies, and many of them might be conflicting with each other (e.g., privacy and accessibility [48]), working together to create a unified approach would be highly beneficial.

5 DISCUSSION

5.1 Accessibility as a Multi-level Infrastructure

This paper contributes to ongoing conversations about accessibility by highlighting its complex realities and identifying under-explored areas in the field. Building on insights from the history of privacy, I propose that addressing centralized support and policymaking could be crucial steps to enhancing accessibility in practice. Similar to privacy, accessibility is not only specific to certain technologies or individuals; it requires support beyond the individual or application level, including support and governance at higher levels.

Building on the arguments developed in this paper, I advocate for a broader scope of accessibility research, urging a shift toward treating accessibility as an infrastructure. Currently, accessibility research typically focuses on assistive technologies for specific needs, such as captioning [49, 65], and sign language technologies for

d/Deaf and hard of hearing people [21, 22, 85]. Through this paper, I argue that research should pay more attention to the challenges in practice.

Just as privacy protections have evolved to encompass a spectrum of solutions and safeguards, accessibility must adopt a multifaceted approach to ensure standards. This involves not only technological advancements but also robust infrastructure support, such as policy regulation to enforce standards and ensure compliance across industries and independent developers. Without infrastructure support, intended accessibility efforts can even inadvertently lead to inaccessibility. For example, due to a lack of standards, disabled people now often need to navigate the use of a complex suite of software [76, 79]. Drawing insights from the development of privacy, accessibility can seek strategies to enhance it as an infrastructure and ensure holistic support. For instance, customer support [98] and community support [88] can all be great sources of accessibility support besides developer support and regulatory frameworks.

5.2 Fostering Cross-field Understanding and Joint Forces

The commonalities between privacy and accessibility suggest the potential for fostering cross-field communication and understanding in HCI. While interdisciplinary communication has been increasingly frequent in recent years, most of the communication is established on shared interests on a specific topic, e.g., accessibility and disability studies [63], accessibility and inclusive security & privacy [8]. This paper implies shared concerns and challenges among different HCI sub-fields, even if their goals appear to be different. Additionally, cross-field understanding would be necessary because pursuing a goal in practice often requires people to negotiate among a wide set of values, such as privacy, security, accessibility, usability, and aesthetics [9, 20, 87].

Though this paper is positioned for the accessibility research community, I believe privacy can gain valuable insights from accessibility efforts — for example, including the most affected people in education and research initiatives [23, 43]. Considering Hong's comment on the similarity between privacy and FATE [44], the three communities may benefit from forming a joint force to promote more responsible technologies. Beyond the focus on centralized support and policymaking in this paper, accessibility, privacy, and FATE can learn from each other in tackling other shared challenges, such as how to serve diverse needs of a broad user base.

6 CONCLUDING THOUGHTS AND LIMITATIONS

This paper argues for the need for centralized support and external regulations to promote accessibility in practice. Drawing parallels with privacy, which shares a high-level conceptual nature and close relevance to software development, the paper advocates for mutual learning between privacy and accessibility to advance the development of responsible technologies. The argument emphasizes the need for accessibility research to extend beyond individual disabilities and assistive technologies for personal use, recognizing accessibility as a structural issue that demands collective efforts.

I acknowledge that this paper relies heavily on Hong's comments on privacy research. I have drawn on relevant literature to provide a more comprehensive perspective on both privacy and accessibility. I intend to spark discussions on accessibility rather than offer concrete suggestions for accessibility research and practice. Additionally, I am aware that this paper is situated in the context of North America and Western Europe, as most of the sources I draw from are in the academic traditions of these places. I am aware that researchers and policymakers in many other countries are also considering promoting accessibility in practice. For example, China recently passed a new law on accessibility in 2023 [69]. Future discussions should be done in more diverse contexts.

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