Binaries in Binary

Harmful Consequences and Radical Possibilities of Technology for Trans Liberation

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Chapter 1: An Introduction to Gender and Technology

As I am both a trans person passionate about dismantling the dominant gender system and a technologist curious about the power of data, my academic interests sit in what often feels like two disparate worlds. Upon discovering critical scholarship from science and technology studies, information studies, and other disciplines interrogating the sociocultural impacts of technology, I knew I wanted to pursue a thesis that links my interests and builds upon existing literature. While there is a growing community of technologists and scholars challenging the development of biased or unjust technologies, including a subset applying concepts from queer theory and transgender studies, much about the relationship between gender and technology remains unexplored.

To some, it may seem as if technology and gender are virtually unrelated. What could be more natural than flesh, more unnatural than circuits, wires, and machines? However, while the trans experience is rooted in the body, it is the body's encounters with external systems which shape its place in a particular social context. From a social constructionist perspective, the reality of a body and its gender is built by its community's ideologies. With a strong tradition of a male-female gender binary, Western cultures construct gender in such a way that necessitates the category of "trans." Scholars in the field of gender studies have robustly explored the impact of cultural ideas in shaping what "trans" means. However, it is important to acknowledge that material systems of the physical world, built by the very same cultural ideas, also relegate bodies into certain gender categories and regulate what genders are legible within the dominant system. Technological systems, as one type of material system, certainly affect trans identities and lives.

Trans identity, as I will loosely define it later in this chapter, marks anyone who fails to fully conform to the dominant gender system based on the falsehood of a biological binary of genitalia and chromosomes. Trans people, then, face more or less violence depending on their proximity to a normative gender identity and therefore have a vested interest in the potential impact of technology on the dominant gender system itself. How does technology stabilize the dominant gender system, further entrenching the marginalization of trans people, and how does it challenge said system? More specifically, how does technology help or hinder movements for collective trans liberation? To investigate, this paper draws from many overlapping fields, including transgender studies, feminist science and technology studies (STS), information science, human-computer interaction (HCI), and digital media studies.

This chapter seeks to integrate the concepts and findings from various forms of technology studies into trans studies, intending to set a clear foundation for analysis of the relationship between gender and technology. I begin with a literature review, the first section of which traces the intellectual lineage of transgender studies. While introducing key ideas from prominent scholars and interesting concepts and conflicts within the discipline, I define (trans)gender, trans liberation, and other terms for the purposes of this thesis. Afterwards, I turn to science and technology studies (STS), once again outlining the development of the field's ideas, beginning with feminist STS and then folding in scholars and concepts from what I position as subfields of STS that critically engage data, information, and more. Throughout, I debunk common myths about both major concepts—technology and gender—emphasizing their socially-constructed and interdependent nature. After explaining the methods that will support my ensuing analysis, I apply the foundational understanding of gender and technology developed in this chapter to a preview of the chapters that follow.

Literature Review

Transgender Studies

      The field of transgender studies provides an important framework for the analysis conducted in this thesis. As defined by Cáel Keegan (2020a), transgender studies is "an interdisciplinary critical project that takes up the *subjectivities* of transgender people to theorize a host of relations among gender, culture, science, knowledge production, and power" (p. 68). This intellectualization of transgender as a concept began in the early 1990s through political calls to movement-building (Feinberg, 1992; Stone, 1992). Importantly, it arose both with and against queer studies, often treated simply as a "special guest" or discrete subtopic within the more institutionally-recognized queer studies (Keegan, 2020b; Malatino, 2015). However, two decades after the first trans studies conferences, the field has begun to be recognized in the academy as its own separate, formalized discipline, largely in response to the founding of *Transgender Studies Quarterly* in 2014 by Susan Stryker and Paisely Currah as the field's first peer-reviewed journal (Stryker, 2017, p. 181; Keegan, 2020b). From here, I define key terms, introduce major scholars, and reference several important debates and topics from the field of transgender studies.

      While the concept of gender is universally familiar, it is commonly misunderstood. First of all, gender is socially-constructed, as Kessler and McKenna were among the first to investigate and name explicitly in their book *Gender: An Ethnomethodological Approach* (1978, as cited in Allen, 1980). They argued that gender is something people "do" through everyday interactions when they "attribute" gender to others based on a multitude of characteristics (Kessler & McKenna, 1978, as cited in Allen, 1980, p. 107). This gender system is maintained

through what Judith Butler (1990) famously theorizes as a performance. As Haimson and Hoffmann (2016) explain, Butler demonstrates that "there is no 'true,' original notion of male or female for people to conform to, only other performances of masculinity or femininity that people can imitate." Thus, gender is not natural or essential to the body, and neither is sex (Wajcman, 2000, p. 457). Rather, they are complex categories "constructed in contested sexual scientific discourses and other social practices" (Haraway, 1991, p. 156). For example, the common explanation for gender variance, that gender is in the brain whereas (binary) sex is in the body, obscures the role of gender in producing the social meaning behind human anatomy (Kessler & McKenna, 1978, as cited in Allen, 1980, p. 109). In reality, combinations of genitals, chromosomes, secondary sex characteristics, and reproductive processes, including but not limited to intersex conditions, aren't binary either (Stryker, 2017, p. 15).

The term transgender, then, must be understood as term which arose within the performative gender binary of Western cultures. In her book *Transgender History*, Susan Stryker (2017) defines transgender as referencing "people who move away from the gender they were assigned at birth" (p. 1). While this is already broad, Davidson describes an even more expansive idea of trans, one with a multitude of meanings. As Hoffmann (2017) relates, Davidson sees trans as inclusive of gender variance, gender nonconformity, and gender bending, with an intentional level of ambiguity (p. 8). Snorton (2017) is even more vague, describing trans as "movement with no clear origin and no point of arrival" (p. 2). Halberstam (2018), too, refuses "to situate transition in relation to a destination" (p. 4). He and others acknowledge the difficulty of defining such a fluid and ever-changing phenomena as gender, as he writes that "naming fixes bodies in time and space and in relation to favored social narratives of difference" (Halberstam, 2018, p. 8). To address the need for all-encompassing terminology, Halberstam uses the term

"trans*" to reference categories "organized around but not confined to forms of gender variance" (2018, 4). Some scholars even use trans as a verb (Halberstam, 2018, p. 20). There is, however, some pushback against using transgender as a broad umbrella covering even people who do not identify with the term, both because it limits their agency to define themselves and because in reality there is no single, unified trans community (Darwin, 2020; Valentine, 2007). However, for the purposes of this paper, it is important to be able to concisely address a breadth of gender configurations that have in common their status outside the dominant system as "other." Therefore, after taking into account the various ways in which leading scholars define trans, I will use the terms trans and transgender interchangeably to reference an expansive definition including all gender experiences that contradict the dominant binary, cisgender norm.

Perhaps the most important reason to define transgender broadly—including people based on their experiences even if they do not self-identify as transgender—is to ensure my use of the term includes gender experiences that fall outside the narrow Western notion of trans identity. As C. Riley Snorton (2017) shows in his book *Black on Both Sides*, normative gender itself in the West has historically excluded Black people. He explains how the conditions of chattel slavery stripped Black women of their womanhood, leaving them "ungendered" as mere flesh, commodities and sites for medical experimentation (Snorton, 2017, p. 56). Snorton conceptualizes "gender fungibility" as a result of "ungendered blackness," naming the way in which enslaved people embodied gender as mutable and were frequently able to employ cross-dressing as a technique of disguise during a fugitive escape to freedom (2017, p. 58). Thus, "captive flesh figures a critical genealogy for modern transness," and "the condensation of transness into the category of transgender is a racial narrative" (Snorton, 2017, p. 57, 8). Despite this inseparability of transness and Blackness, and the way in which Blackness made transness

possible, normative trans identity depends upon white standards of femininity and masculinity and is withheld from Black people. Following Snorton (2017), I resist the imposition of a cis-trans binary, acknowledging the existence of other nonnormative genders and explicitly naming that I reference them using the term transgender.

One major contribution of trans studies is an emphasis on the embodied experiences from which gender and gender categories arise. Snorton's (2017) account of Black bodies viewed as flesh through the lense of gender fungibility is but one example of the trans focus on embodiment. This could be seen as a challenge to Butler's (1990) notion of gender as performance by acknowledging the material nature of gender (Keegan, 2020b, p. 70). Indeed, the late 90s saw some pushback against poststructuralist theories of gender, with some trans people "seek[ing] very pointedly to be nonperformative... quite simply, to be" (Halberstam, 2018, p. 121). Yes, gender is not natural or essential to the body, but can—or should—it be understood as something separate from bodies entirely? Butler has responded to this arguably misrepresentative criticism through later works such as *Bodies That Matter* by clarifying that gender performativity is anything but separate from bodies; rather, performativity is the reiterative practice through which regulatory norms materialize sex, gender, and bodies (1993, p. 2). Recent trans scholarship has proven comfortable analyzing performativity alongside, rather than in opposition to, the realness and realities of bodies (Halberstam, 2018, p. 121). Trans studies deals with this apparent contradiction in such a way that exemplifies its reliance on, and acceptance of, paradoxical truths (Keegan, 2020b).

For example, is it inherently radical to be trans? There is a dominant popular narrative that simply existing publicly as trans is radical due to the contradiction between trans identity and the dominant gender system's narrative that gender matches binary sex assigned at birth.

Stryker (2017) disagrees, however, explaining that to align cisgender with normativity and transgender with radical transgression perpetuates a cis-trans binary that masks the way in which "the politics of normativity and transgression cut across both cis and trans categories" (p. 13). I would argue that the best answer trans studies has to offer is actually both yes and no; one's identity can be radical relative to the strictest of gender norms while conforming to other norms that have arisen for transness. In the effort to resist a cis-trans binary, it seems counterproductive to impose a radical-not radical binary when both points can be true at once.

As I investigate the impact of technology on movements for transgender liberation, it is important to understand what I mean by liberation. The most well-known use of the idea of liberation in queer spaces was the Gay Liberation Front (GLF), which began in 1969 and "modeled itself on radical Third World liberation" (Stryker, 2017, p. 110). While the GLF was not always a trans-friendly space, trans people took collective liberation into their own spaces, most notably the Street Transvestite Action Revolutionaries (Stryker, 2017, p. 110). This group's goals of securing food, housing, and education for young queer youth embody the idea that trans liberation requires unity against all oppressions, especially capitalism. While these activist groups embodied the spirit of trans liberation, the *Trans Liberation Newsletter* and Leslie Feinberg's (1992) pamphlet on the subject attempted to put it into writing. Feinberg does so broadly through references to working-class revolution, whereas the *Newsletter* makes specific demands to ease the lives of transgender people, from free gender-affirming medical treatment to decriminalization of cross-dressing (Feinberg, 1992; Stryker, 2017).

With these historical examples, it becomes clear that liberation is neither a trans- nor identity-specific term, but rather applies most frequently to anti-capitalist, anti-imperialist movements seeking freedom, dignity, and self-determination for oppressed peoples. For trans

people, liberation is inseparable from class struggle, decolonization, prison abolition, and other liberation movements, and it cannot be achieved without "tireless struggle against all structures of domination" (O'Brien, 2021; Guitzel, 2021). I apply the general idea of liberation to the oppression of trans people. As Michelle O'Brien (2021) writes, "gender expression is central to human fulfillment, to our creativity and our dignity, to express beauty, and to experience pleasure." Transgender liberation would provide freedom for gender expression—or even freedom from gender expression—but also requires a collective movement, beyond the experiences of individuals, in favor of liberation for all (Griffiths, 2021).

Another point of debate within transgender studies is whether or not to read and name transness in history. Stryker, a foundational trans scholar and historian, wrote *Trans History* to chronicle the long history of gender nonconformity and crossdressing that exists in the West (2017). She acknowledges that terminology, both for individual identities and for diagnostic labels in the medical community, has changed greatly over time and is still changing today; nonetheless, her work collects and displays perceived examples of transgender people from the past (Stryker, 2017, p. 1, 53). While she focuses primarily on the United States, many cultures outside the West have traditions of gender systems and identities beyond a binary, although they may not have survived colonization. These histories are often presented in an effort to counter transphobic narratives today. In a struggle for liberation, understanding collective history can be a powerful tool and motivator, but is it possible that labeling historical phenomena as transgender could actually interfere with liberation?

Everhart (2021) writes about the 2011 discovery of a 5000-year-old male skeleton buried according to female customs and subsequent naming of that skeleton as transgender. She articulates that the desire to present this discovery as evidence that trans people have always

existed "fails to legitimate contemporary transgender identity" or "improve the material conditions of trans life" (Everhart, 2021, p. 1, 3). In other words, it will not help achieve trans liberation. Instead, such "reaching backward" imposes a modern and Western understanding of gender upon the past (Everhart, 2021, p. 1, 4). Indeed, Snorton (2017) was careful to write that he does not view cross-dressing narratives of fugitive slaves as "recoverable trans figures" (p. 59). I articulate this conflict not to say that Stryker and other trans historians are mistaken, or to deny the importance of their work, but simply to acknowledge that when I apply space- and time-specific language to multiple spaces and times, I do so only to succinctly reference a large heterogeneous group of people and their genders. The fluidity of gender over time and its resistance to fixed categories provide important context for the upcoming analysis of how gender itself is shaped by technology.

Science and Technology Studies

In the second section of this literature review, I address the interdisciplinary field of science and technology studies (STS), which explores "the transformative power of science and technology" to shape contemporary societies through various institutions, practices, and "entanglements with the worlds people inhabit, their lives, and their values" (Felt et al, 2017, p. 1). As a discipline, STS first coalesced in academia in a 1977 handbook outlining the then-unnamed field's roots in the increasing concern paid to social impacts of science and technology after the post-World War II boom in their development (Spiegel-Roesing & de Solla Price, 1977). The field has changed greatly since the handbook's publishing, and it is now the first edition of four. The following three, sponsored by the Society for the Social Study of Science, are known as *The Handbook(s) of Science and Technology Studies* and were published

in 1995, 2008, and 2017 (Jasanoff, Marle, Peterson, & Pinch, 1995; Hackett, Amsterdamska, Lynch, & Wajcman, 2008; Felt, Fouché, Miller, & Smith-Doerr, 2017). Especially relevant to this thesis is the subfield of feminist STS. After defining technology for the purposes of my analyses, I will introduce some of the key scholars and ideas of STS and feminist STS.

Technology as a concept is commonly understood, yet it is difficult to define in a rigorous academic context (Carroll, 2017, p. 1). On a practical level, most people would agree that a radio is a technology whereas a tree is not. The challenge comes in crafting a definition that is specific enough so as to exclude things that are not technologies, but general enough to avoid leaving out things that are. A few key questions dominate the scholarly debate over what should count as technology. First, does technology require the involvement of an intelligent species? Insulin, a naturally-occurring hormone, serves its purpose without human intervention, but it is also taken intentionally by people with diabetes to lower blood sugar (Carroll, 2017, p. 8). Second, can abstract concepts be considered technologies? Knowledge and ideas can be seen as technologies that produce machines as their physical outputs (Carroll, 2017, p. 11). Further, to the general public, context can affect whether or not something is seen as a technology. For example, an electric iron is hardly a technology in the hands of a housewife, but as soon as a man steps in to fix one, it's technological (Bray, 2007, p. 42). Carroll (2017) proposes the broad definition that to be technology, something must have a purpose, a function, and a benefit (p. 6). Rather than enforcing a very narrow view of technology, I intend to allow the term to remain broad within the context of the aforementioned scholarly debate. However, my use of the term technology will primarily reference tangible instances of technology, following a definition from STS arguing that technology is the "design, construction, and use of material devices and infrastructures" (Felt et al., 2017, p. 19).

Upon viewing the world through an STS framework, it becomes clear that science and technology are themselves social constructs, "historical products of human labor, ...choices, and designs" that in turn "make and remake" people and their societies (Felt et al., 2017, p. 1). While STS shows how science and technology interact with social systems, feminist STS specifically focuses on gender systems, arguing that technology and gender share in a "mutually constitutive relationship" (Bray, 2007, p. 38). Judy Wajcman, a leading scholar in feminist STS, calls this relationship, "in which technology is both a source and a consequence of gender relations," the "*technofeminist* framework" (Wajcman, 2004, p. 7). The reflexive processes by which social orders construct technology while technology constructs social orders are known as "co-production" (Felt et al., 2017, p. 1). Scholars of feminist STS describe the co-production of technology and gender to show that each concept shapes the other. For example, Sullivan and Murray (2009) argue that bodies are "always already technologised" and technologies are "always already enfleshed" (p. 3). While gender and bodies are by no means synonymous, bodies are typically gendered, and technology that molds gender frequently does so by regulating bodies. Through their impact on the body, gender and technology are interdependent and inseparable, and one must be studied with a critical understanding of the other.

Despite the intellectual history of the critical study of science and technology, there are several pervasive myths about technology that persist today, namely the ideas that it is objective, apolitical, and measuring natural phenomena. On the contrary, just as notable feminist scholar Donna Haraway argues that all knowledge is situated in a given context or locality, all technology is built and used within a specific social context and according to inevitably subjective decisions (Haraway, 1988, as cited in Felt et al., 2017, p. 35). Science itself is ideological, produced socially according to various motives and agendas (Felt et al., 2017, p. 33).

Thus, at each stage of the creation of scientific knowledge or technologies, subjective and political notions become inevitably attached to any product. The best technological example of this point is data. Data seems, at first thought, to be objective, simply a scientific measurement of reality encoded into technology. On the contrary, however, data is "at once an interpretation and in need of interpretation" (Cifor et al., 2019). First, recording data requires that subjective design decisions be made about what to measure and how, and second, researchers investigating data must interpret it, inevitably doing so from their own personal perspective (boyd & Crawford, 2012, pp. 667-668). So, like knowledge, data is situated. Indeed, data about human subjects derives from human bodies which are gendered, raced, classed, and otherwise identified (Cifor et al., 2019). Just as gender doesn't measure any natural state of being, technological measurements are not natural either. For example, the correlation coefficient measuring the relationship between two variables is calculated according to a human-made formula that accommodated its author's personal and social interests (Felt et al., 2017, p. 34). Finally, although technology is not neutral and objective, it also cannot be essentialized as always good, i.e., a sign of progress, or always bad, i.e., a tool of the patriarchy (Bray, 2007, p. 39). Thus, one cannot simply be for or against technology (Halberstam, 1991, p. 441).

In time, the critical ideas developed through STS in academia spread elsewhere, both to technologists themselves and to social scientists studying emerging technologies as the pace of technological development increased and the world entered the age of big data. Other subfields have branched off, with the scholarship that I highlight here coming from, among other places, information science, media studies, digital and data studies, and human-computer interaction, which focuses on technology design and user experience. From data scientists to programmers, ethicists to philosophers, and historians to theorists, many have collaborated on the

interdisciplinary work investigating the entanglements of technology with power and privilege, discrimination and bias, and the state and corporations. This broad network of scholars and fields can be considered a modern instantiation of and improvement upon the intellectual foundation of feminist STS, keeping pace as the field changes quickly. After describing the types of organizations fostering this work, I will introduce some of its key scholars and researchers.

Much of this scholarship comes from academia, in graduate programs like information schools, or "iSchools," and through various interdisciplinary research centers at big universities, like the AI Now Institute at New York University. Other research on the social impacts of technology takes place in well-funded large tech companies, like Google or Microsoft, though it's worth noting that corporate interests often conflict with research findings. Most notably—but certainly not as any exception to the rule—Google has recently come under fire for censoring an internal research project from its Ethical AI team that criticized the large language models used in search engines, even firing the team leaders (Simonite, 2021b). Alternatively, there are nonprofits like Data for Black Lives, the Algorithmic Justice League, the Mozilla Foundation, and more. It's worth noting, of course, that the institutional interests of universities and nonprofits shape their research goals and funding too, even if less blatantly than in corporations. Even so, the types of organizations surveyed here do address the harm of technology through various angles such as education, policy changes, new tech development, and resistance.

Algorithms of Oppression: How Search Engines Reinforce Racism, by Safiya Noble (2018), helped to start a wave of popular discussion of biased technologies, especially those employing artificial intelligence (AI) and automation. Noble, a digital media scholar coming from a library and information sciences background, directs the Center for Critical Internet Inquiry at UCLA and teaches Gender and African American studies (*Safiya Noble*, 2022). She

describes how a mundane Google search for the query "black girls" led her to pornographic search results (Noble, 2018, p. 3). Digging deeper, Noble found other racism and sexism embedded in algorithms, including one that classified Black people in images as apes (Noble, 2018, p. 6). Her work has exemplified one key idea of modern STS, which is that technology can be biased or produce biased outcomes without any ill intent of the technology's designers and developers.

Without reductively condemning technology as inherently bad, it is important to acknowledge that oppression is often hard-coded into technological systems (Costanza-Chock, 2018). A common example of this phenomenon is when an algorithm, or set of rules, learned by a computer produces biased outcomes. If biased data was used to train the computer, then the computer will naturally encode those biases, and the algorithm's results will be biased; as computer scientists say, "garbage in, garbage out" (Costanza-Chock, 2018). But, discriminatory technology comes from an array of systemic sources, not simply a biased computer scientist or bad algorithm (Hoffmann, 2019, p. 904). Sometimes, the consequences of technology extend beyond those that were intended by the designers (boyd & Crawford, 2012, p. 662). In other cases, "humans and technology co-conspire to not just passively reproduce but actively uphold and reproduce discriminatory social structures" (Hoffmann, 2019, p. 904). With or without bad intentions, technology can be oppressive. Ethical questions arise especially in relation to public data collection, since people may not realize their data is being recorded and analyzed (boyd & Crawford, 2012, p. 673). This purportedly anonymous and neutral data collection can produce negative outcomes, since data and technologies make bodies, especially those which are marginalized, available for surveillance and tracking (Cifor et al., 2019).

Another valuable lesson that comes from modern scholarship on AI is the idea that there is a limit to what technology can do. In her 2019 book *Artificial Unintelligence: How Computers Misunderstand the World*, Meredith Broussard warns against the misguided notion that problems are best solved by technology, calling it technochauvinism. Broussard, a data journalist, professor, and research director of the NYU Alliance for Public Interest Technology, uses examples of real-world AI technologies like the self-driving car to illustrate the consequences of technochauvinism (*Meredith Broussard*, 2022). Technochauvinism would argue that bigger data is better, but as boyd and Crawford (2012) show, even big datasets have limits (p. 668). Further, increased access to technology does not automatically lead to equity (Bourque & Warren, 1987, p. 175). As Broussard writes, "our collective enthusiasm for applying computer technology to every aspect of life has resulted in a tremendous amount of poorly designed technology" (2019).

Just as there are limits to what technology *can* do, there are also limits to what it *should* do. A landmark project exposing both racism and sexism in artificial intelligence technologies is the Gender Shades paper produced by Joy Buolamwini and Timnit Gebru through the MIT Media Lab (Buolamwini & Gebru, 2018; *Gender Shades*, n.d.). Buolamwini, a Black woman, founded the Algorithmic Justice League after realizing that facial recognition technology only recognized her while she was wearing a white mask (Algorithmic Justice League, 2022a). Along with Gebru, co-founder of Black in AI and one of the Google employees fired after protesting the censorship of its Ethical AI team, Buolamwini found that machine learning algorithms attempting to classify the gender of a subject perform notably worse on darker-skinned or female faces, with the worst error rates on faces that are both dark-skinned and female (2018, pg. 8). Unsurprisingly, the datasets of faces upon which the gender classifiers are trained contain disproportionately lighter-skinned people (Buolamwini & Gebru, 2018, p. 1). Remedying this

issue has negative consequences, however, as improving facial recognition systems would mean further exposing Black and brown communities to the already-unjust ways that such technology is used for surveillance and criminalization (Hoffmann, 2019, p. 906).

Additionally, facial recognition is used for gender classification, which equates gender with sex and thus may frequently misclassify trans people. Morgan Scheuerman and collaborators (2019) have found that non-binary identities are outright excluded in gender classification and that algorithmic performance on trans faces was poor compared to cis faces. This work raises many questions about the social implications of encoding assumptions about gender based on someone's appearance, or what Kessler and McKenna (1978, as cited in Allen, 1980) called "gender attributions," into data. Overall, these researchers studying the biases of computer vision have demonstrated for the entire tech industry that longstanding and emerging technologies alike must be interrogated for their potential discriminatory consequences.

Methods

To build my argument in this thesis, I make use of several methods from critical social sciences. Feminist STS in particular has an interesting relationship to methods; philosopher Sandra Harding (1987) asks in the introduction to her collection *Feminism and Methodology* if there is even such a thing as a feminist method. She chooses to elucidate several methodological features commonly differentiating research as "feminist," including using women's wants and needs to formulate research questions and analyzing their perspectives and experiences as data (Harding, 1987, pp. 6-8). In my research, I intentionally ground my work in the wants, needs, perspectives, and experiences of transgender people. In this way, I take an explicitly trans, or

transfeminist, approach to feminist methods (Stryker & Bettcher, 2016; Koyama, 2003). Crenshaw's (1989) intersectionality is the most common theory necessitating the attention I will pay to the overlapping, interlocking systems of oppression and privilege based on social identities, extending beyond transness and womanhood to matters of race, class, and other factors. However, my work is also informed by expansions upon and challenges to intersectionality, including the idea of gender as multiplicitous in its interactions with other identities and the theorization of transgender and race together, rather than separately (Keyes, May, & Carrell, 2021; Gill-Peterson, 2014).

John Law's (2017) chapter in the fourth STS handbook offers some STS and feminist STS methods. As STS "may be understood as the study of method in practice," the discipline engages the ways that science and technology apply methods in various contexts, and the ensuing effects of doing so (Law, 2017, p. 31). These applications of methods can be considered "technoscience," or a "set of social and material practices" (Law, 2017, p. 31). To best study technoscience and its impacts, "STS almost always works through *case studies*" (Law, 2017, p. 32). Therefore, I present many examples of the ways in which technologies and technological practices produce social realities of gender. In this way, gender and technology will each be the subject of discourse analysis as my primary method, inspired by the sociology of knowledge approach outlined by Keller (2005). Specifically, I investigate how technology as a discourse has both historically and in the present produced "social consequences and power/knowledge effects," in part through its relationship to gender as a discourse (Keller, 2005, p. 233). Likewise, my analysis examines the way that gender as a discourse has changed over time and produced material instantiations of gender systems within technological systems through its impact on design and development. I attend to the work both discourses do in classifying people and

bodies, producing "collective identities" and "distinctions between us and them" (Keller, 2005, p. 236). Further, I challenge the stories narrated by dominant discourses of technology and gender.

In light of Haraway's notion of both knowledge and methods as situated, I choose to state my positionality as a researcher in an attempt to avoid "reproduc[ing] social agendas" (Law, 2017, p. 35). Instead of ignoring my social location and the impact it has on my work, I acknowledge the subjectivity from which I write in order to aim for a "strong objectivity," placing myself "in the same critical plane as the overt subject matter" to contextualize my results (Harding, 1987, p. 9). I am a white, culturally Jewish, American, queer and transmasculine person. I grew up upper-middle class in southern Maine, and at the time of writing I am 23 years old, attending college in Boston.

Looking Ahead

By robustly defining gender and technology, exploring their co-production, and outlining the potential of technology to uphold oppressive systems like gender, this paper has set the foundations for an analysis of the particular impact technology has on transgender lives and identities. I aim to contribute to the existing literature in trans studies and STS by working at their intersection, a crucial site for change given that trans people are uniquely vulnerable to the violences of technological systems. In the following chapters, I examine the impacts of technology on the dominant gender system, on movements for trans liberation, and consequently, on trans lives.

First, chapter two chronicles the neoliberal co-opting and incorporation of radical trans movements. Like many other activist efforts, trans rights movements have been co-opted by the neoliberal state which has watered down their goals, emphasizing inclusion and recognition (Spade, 2011). Through a focus on legislation and rights, and gender self-determination, naming, and language, trans movements become beholden to the framework of inclusion and recognition that Spade (2011) so deftly identifies. The primary aim of chapter two is to explain this phenomenon in part by demonstrating the role of technology in trans incorporation, using Anna Lauren Hoffmann's translation of Spade's work on administrative systems to the technological sphere as a conceptual framework. I identify several relevant aspects of the relationship between gender and technology, beginning with the inclusion, construction, and measurement of trans identities by gender categorization schemes. Then, I address the ways that technologies recognize—or fail to recognize—trans people as fitting within the newly-established trans categories, arguing that they do so by encoding transness as an individual phenomenon, an exception to the rule, read through people's bodies. Ultimately, the way that technological systems conceptualize gender facilitates the incorporation of transgender into the realm of normative identities.

The technology-supported adaptation of the category transgender to fit within the dominant gender system has harmful consequences, which I aim to describe in chapter three, for trans people and trans liberation movements. Hoffmann's extension of Spade's analysis is again a central framework in this chapter, this time involving the parallel between administrative and data violences. I cover violences of inclusion and recognition, including datafication, surveillance, misgendering, outing, and counting. Throughout, technologies perpetuate the normative, legible trans identity incorporated by the state. This reinforces a white, binary trans

narrative, causes further violence to trans people who cannot or do not seek state recognition of their gender, and limits the potential of trans liberation by fracturing the trans community. I note that frequently, neoliberal transgender movements are misguided in their efforts to improve or change technologies. They frame technology as the solution to its own harms and follow discourses of fairness and ethics; all the while, trans people continue to experience harm and subjection through technology.

Finally, in my fourth chapter I pivot to a more hopeful analysis, imagining liberatory ways to develop technologies. I investigate the radical possibilities of technology to destabilize, rather than enforce, the dominant gender system, helping rather than hindering trans liberation movements. To do so, I explore existing technologies from the past and present that blur the fixed, sexed genders enforced upon bodies, offer safety, resources, and community to trans people, and enable organizing by spreading radical ideas. Using these as inspiration, I offer recommendations for the design of future technologies, advocating for community participation and intentional insertion of liberatory values. Then, I turn to the conditions under which technology is built and used, both in profit-driven corporations and in small technology cooperatives. I argue that technology can be liberatory for trans people if it is detached from capitalist funding and the state's agenda of control.

Chapter 2: Incorporating Transness

A major obstacle facing movements for transgender liberation, and indeed all liberatory movements in the contemporary United States, is the phenomenon wherein the neoliberal state co-opts and incorporates radical action. By shifting movement goals towards achieving state recognition and being included into government systems and legislation, "we are encouraged to fight for inclusion in systems that the most important movements of our times are trying to dismantle" (Spade, 2011, pp. 18-19). This is made clear as many nonprofits, politicians, and much of the well-meaning public celebrate the criminalization of transphobia through hate crime legislation and the repeal of a ban on trans people serving in the military, among other examples. I will break down the incorporation of transness by focusing on rights and legal equality, inclusion through gender categorization, and various modes of gender recognition. For the purposes of this paper, I use inclusion to reference the modification of systems to contain trans identities, and I apply the term recognition to describe the process of assigning trans people to the newly-included identities within those systems. Throughout, I identify the crucial role of technologies in facilitating the mainstreaming of trans activism. My analysis draws on work from Dean Spade, a trans activist and lawyer, on administrative systems. Because my focus is on technology, I lean heavily on Anna Lauren Hoffmann, a scholar and professor of information studies, and her application of Spade's analysis to data and technological systems. With the work of these scholars as a foundation, I demonstrate that technology plays a significant role in the incorporation of trans movements into neoliberal systems.

Incorporating Movements

In his book *Normal Life: Administrative Violence, Critical Trans Politics, and the Limits of the Law*, Spade (2011) brands the present day as "an age of cooptation and incorporation," explaining that radical resistance movements frequently wind up diverted towards a neoliberal agenda (p. xv). Using gay and lesbian activism as an example, he shows that as movement goals shift towards legal reform, seeking recognition by and inclusion within state systems, the most vulnerable communities are left behind and political coalitions across identities deteriorate (Spade, 2011). For instance, achieving marriage equality was portrayed as the pinnacle of gay and lesbian rights in the United States, but the right to same-sex marriage doesn't address the disproportionate poverty and violence faced by queer and trans people, nor does it resolve any universal problems related to the institution of marriage, such as the denial of health insurance or hospital visitation rights to unmarried partners, queer and straight alike (Spade, 2011, p. 13). Stryker (2017) explains that "a neoliberal model of minority tolerance and inclusion" replaced "the more radical concept of alliance, resistance, and rebellion" against oppression, adding that nomenclature shifted alongside this political change "toward an 'LGBT+' community, rather than a 'queer' one" (pp. 170-171). While trans people are included in the acronym LGBT, and many consider themselves queer, trans liberation is largely separated from the already-incorporated, mainstream gay and lesbian movement, despite the fact that the origins of gay liberation included trans people and causes. So, the co-opting of trans activism in the United States is a relatively recent and currently ongoing phenomena, as trans identity has become increasingly politically relevant.

Before getting into the ways in which some strains of trans activism seek rights, inclusion, and recognition in part through or encouraged by technology, I must emphasize that a

key belief underlying any neoliberalizing movement is the idea that the ultimate solution to oppression, in this case transphobia and other suffering faced by gender nonconforming people, comes from the capitalist state and market. Spade (2011) argues to the contrary, writing that "state programs and law enforcement are not the arbiters of justice, protection, and safety but are instead sponsors and sites of violence" (p. 2). He focuses on the administrative systems that run state programs, showing that they create "norms that distribute vulnerability and security," exercising power to manage the population and "distribute wealth and life chances" (Spade, 2011, pp. 4-5). Hoffmann (2020) applies Spade's concepts "to a broader terrain of both public and private data technologies," since technological systems can have similarly violent consequences (p. 3). Simply seeking inclusion within and recognition by these systems fails to attend to the structural violence they cause to trans and otherwise-marginalized people, and may even lead to further violence. After all, "the struggle for liberation is not a struggle for diversity and inclusion—it is a struggle for decolonization, reparations, and self-determination" (Hassein, 2017, as cited in Hoffmann, 2020, p. 12). I reserve extensive discussion of the consequences of the incorporation of trans identity and resistance for the next chapter, focusing here on the processes of incorporation itself.

Key to the co-opting of any movement, this neoliberal framing of the capitalist state as the solution to, rather than a cause of, transphobic oppression prompts a political movement strategy centered around achieving legal equality through antidiscrimination and hate crime legislation. Essentially, the goal is to achieve rights under the law for trans people. However, using "discrimination…as a method of identifying and addressing oppression" serves to conceptualize systemic harms as simply "individual prejudice and isolated bad acts" (Spade, 2011, p. 14; Spade and Rohlfs, 2016). Consequently, it becomes "impossible to properly describe

or remedy the harms of these systems," and said harms go unaddressed (Spade and Rohlfs, 2016). Attempts to secure rights by outlawing discrimination thus have a limited capacity to reduce transphobic violence. Oppression resulting from data and technological systems provides an example; as Hoffmann (2019) describes, "efforts to isolate 'bad data,' 'bad algorithms,' or localized biases of designers and engineers are limited in their ability to address broad social and systemic problems" (p. 910). Legal reform, then, is only minimally effective in addressing the harms, presented throughout this paper, that technologies cause trans people and communities.

In fact, legal reform that achieves symbolic acknowledgement of trans rights can exacerbate harm against trans communities. For example, laws that establish certain acts of transphobic violence as hate crimes "focus on mobilizing resources for criminal punishment systems' response to such violence" (Spade, 2011, p. 14). This lends legitimacy to systems of policing and imprisonment, both notable for perpetuating injustices against trans people, especially those who are already vulnerable due to other factors including but certainly not limited to being poor, Black, brown, indigenous, and/or undocumented. Likewise, legally mandating acceptance of trans people into institutions like the military provides those institutions with credibility. As a result, the actual systems causing harm are presented "as good and fair systems that need only include the missing population," rather than as violent systems with white supremacist, colonial roots that should be abolished (Spade and Rohlfs, 2016). Ultimately, the rights won by an incorporated movement only serve "deserving" subjects, those who are portrayed as "'normal,' 'hardworking,' 'law-abiding citizens'" (Spade and Rohlfs, 2016). In movements for trans rights, the construction of a "deserving" trans person produces a normative mode of transness legible to the state that I will address further in the next chapter. While resistance movements against discriminatory technology parallel trans liberation movements in

that both are susceptible to being co-opted by neoliberal goals that fail to achieve systemic change, I will demonstrate that technology also plays a direct role in the mainstreaming of trans activism through two elements necessary for distributing rights, namely the inclusion of trans identities in administrative and technological systems and the recognition of trans individuals by those systems.

Including Trans Identities

Choosing Categories

Now that the paradigm of movements seeking rights and inclusion has been established, I turn to the effects of updating gender categorization schemes in attempts to accommodate trans identities in bureaucratic systems. As covered in the literature review, a foundational principle of feminist STS is the idea that gender and technology are co-produced. So, the gender categories offered in a technological system are simultaneously shaped by and shaping societal gender norms. Frequently, technology stabilizes the dominant gender system by categorizing people for the purposes of data collection. Johnson (2015) explains that "conditions in the world" could be represented in multiple "ordering[s] of data," but only one can be chosen for a given data system (p. 161). For example, many systems represent the reality of gender as binary sex, using "M" for male or "F" for female, but others use a select list of gender identities. Since gender is not naturally-existing, technological representations of gender actually help to create the very categories that data claims to measure (Spade, 2011, p.141). While no "translation" of reality into data can truly capture all gender variance, systems may fail in different and multiple ways, by excluding certain identities entirely, grouping together identities like nonbinary and

binary-identified trans people and obscuring their differences, and/or separating related identities like gender and race (Johnson, 2015, p. 161).

The process of choosing gender categories is powerful because it requires labeling and classifying people's genders, or as Halberstam (2018) says, "naming [that] fixes bodies in time and space and in relation to favored social narratives of difference" (p. 8). The desire to distinguish among various modes of embodiment has roots in European colonialism, when gender differences became important for governance and control, "racial otherness," and division of labor (Halberstam, 2018, pp. 5-7). This white supremacist impulse towards classification persists today and therefore the gender categories in a technological system, whether they are offered on a survey like the U.S. Census or encoded in a database like Facebook's user records, are "regulatory" and "committed to norms," especially for people from non-Western cultures (Halberstam, 2018, p. 12). By constructing gender itself, the gender categories in technological systems serve to impose gender norms upon people, restricting possibilities for all and especially marginalizing those who are left out. Indeed, by "enact[ing] categories of personhood, construed as a priori material realities," gender categorization schemes "can either diminish or enhance the life chances of the people interpellated by those categories" (Singer, 60). Therefore, even attempts to satisfy neoliberal pressure by incorporating trans identities impose power and contribute to the construction of gender itself, often leaving certain trans people invisible while ensuring others fit a normative, legible instantiation of transness.

Despite the many gender identities roughly consolidated under the term trans, only those incorporated into administrative and technological systems wind up acknowledged by the state and other institutions holding power. Singer (2015) describes the "transgender matrix" as "a phenomenon of rapidly proliferating embodiments and identities that exceed familiar sex and

gender categorization, thus producing categorical excesses" (p. 62). While the transgender matrix

exemplifies the resistance of bodies against "universal data-gathering practices" that are

"designed to produce and define them," only a finite number of identities can be included in the

gender categorization scheme for any data system, unless it offers gender as a fill-in-the-blank

field (Singer, 2015). In contrast to the multitude of gender-variant identity terms, male and

female seem like stable categories, even though they are also socially constructed (Singer, 2015,

p. 64). Unsurprisingly, when systems attempt to frame a trans identity or identities as similarly

stable, Western gender identities and those that serve whiter trans communities are more

commonly included, as they are more familiar to the state and belong to a class of trans people

already adjacent to power. For example, nonbinary is frequently listed as a third gender category,

collapsing the nuances of culturally-specific identities like two-spirit or boi into a term that is

often seen as white by default.

So, updating gender categories to include some trans people still reproduces a "dominant

US transgender imaginary that disqualifies racial minorities and economically marginalized

gender-nonconforming individuals" from a data system's intended usage (Singer, 2015, p. 68).

Since data serves "organizations' needs to make knowledge of its subjects legible," the people

excluded from or hidden within a dataset by virtue of its gender categories cannot be considered

by the "data-driven processes of decision" to come from that data (Johnson, 2015, pp. 160-162).

As I will discuss further in the next chapter, neoliberal incorporation of transness through

expansion of gender categories in technological systems constructs a normative trans identity

that the state endorses, to the detriment of trans people that aren't recognized as fitting into

normative transness. Davidson takes this consequence a step further and argues that "different

constructions of the category transgender, who it includes and excludes, are not simply

negotiations of a collective identity but . . . negotiations about the boundaries of a social movement and that movement's efforts toward social change" (2007, p. 61, as cited in Singer, 2015, p. 59). Not only are gender categorization schemes a consequence of the incorporation of trans liberation movements, but they also further the co-opting of those movements by shifting their boundaries to only include respectable trans people and causes.

Even when technology accommodates trans identities, it regulates them, shaping which ways of being trans are legitimate and thus affording only certain trans people the privilege of institutional gender recognition. As a social media platform, Facebook "demands authenticity yet proscribes certain people from authentic self-presentation" (Haimson & Hoffmann, 2016). The platform is premised on the idea that users represent their true selves, and in fact used to have a "real name" policy that attempted to validate a user's identity by forcing them to register under their legal name. In doing so, Facebook conflated authenticity with visibility through state recognition, revealing authenticity itself to be "an artificial category—a performance" that merely appears natural (Haimson & Hoffman, 2016). Even with this policy gone, Facebook still maintains the dominant gender system below the surface, using a binary mindset in its business and binary data for gender in its software (Hoffmann, 2017, p. 10). The evolution of Facebook's rules for user gender identity provides an example of how some incorporation of trans identities is merely symbolic. At its inception, the platform didn't require each profile to report a gender, but as it increasingly incorporated advertising, gender became a valuable category and was included as male, female, or unspecified (Bivens & Haimson, 2016). In 2014, "56 gender options beyond the binary" were added in response to advocacy efforts, but due to the "demand for a binary gender categorization by the advertising industry," genders were and likely still are "reverted back to a binary system [in the database] based on the pronoun that is selected"

(Bivens & Haimson, 2016). To allow trans identities in public-facing settings while corralling all gender variance into a third category behind the scenes hides the violence of misgendering committed by Facebook's data.

Unfortunately, technologies designed to be gender-affirming still produce gender norms that construct a right and a wrong way to be trans based on acceptable gender categories. In a medical context, gender-affirming surgeries are only offered to people that meet certain requirements. The early academic gender dysphoria clinics needed criteria for surgery eligibility, but couldn't find a test for whether or not someone was "genuinely" trans, so they settled for measuring if someone was "trans enough" by evaluating "their performance in the gender of choice" (Stone, 1992, p. 10). This process forced individuals who desired surgery into compliance with a normative trans identity based on the experience of middle-class, white trans people. In order to access surgery, people had to emulate a binary trans identity characterized by the narrative of being born in the wrong body, and heterosexuality, among other things. To some extent, modern providers of gender-affirming surgeries still evaluate patients to determine that they are trans enough, although most seek a somewhat normative trans narrative primarily to ensure procedures are covered by patients' insurance. Clearly, technologies besides just data reinforce dominant gender categories. By pressuring trans people to properly perform their gender identity according to social norms for gender expression and behavior, technologies like gender-affirming surgeries that recognize and address trans identities still subtly construct gender categories, privileging certain trans experiences over others.

Issues Measuring Transness

Due to the powerful consequences of creating a gender categorization scheme, from the normalization of certain genders to the exclusion of others in such a way that has significant effects on people's life chances, there has been much debate over how to best measure gender, and transness specifically. I will focus on gender categorization in demographic survey research as an example to illustrate the various motivations, methods, and obstacles involved. The current standard in transgender data in the United States is the U.S. Transgender Survey (USTS), formerly known as the National Transgender Discrimination Survey (NTDS), conducted by a nonprofit called the National Center for Transgender Equality in 2011 and 2016, with another survey planned for 2022 (2022 U.S. Trans Survey, n.d.). As Labuski and Keo-Meier (2015) explain, the 2011 NTDS "stabilized the term *transgender* in order to produce their data," though the survey included many forms of transness (p. 18). The survey's designers admittedly had to compromise expansive representation and found it challenging to develop "liberating versus limiting" boxes (Hoffmann 2017, 10). Despite its imperfections, the data from the USTS/NTDS does crucially provide "evidence of the statistical prevalence of a population that some would prefer remain invisible" (Labuski & Keo-Meier, 2015, p. 15).

Several problems with data quality and accuracy arise when researchers attempt to count the number of trans people in their target population. First, quantitative analysis becomes more complicated as the number of gender categories increases, since statistical tests with more than two groups are harder to interpret and can require a larger sample size. Further, though the pool of gender identities from Singer's (2015) "transgender matrix" is qualitatively rich, it lacks any order or system (p. 65). This is in part due to the unstable nature of gender itself, especially as it is defined in gender studies, which makes production of measurements and data difficult (Labuski & Keo-Meier, 2015, p. 18). While there may be an "inevitable uncontainability of

categorical excess" in trans-specific data collection, researchers still attempt to "capture the experience of being trans for the widest variety of readers in ways that benefit transgender people" through gender categorization schemes (Singer, 2015, p. 65; Labuski & Keo-Meier, 2015, p. 14). Because there is no universal standard for which trans identities to include, and how, studies and surveys utilizing different definitions of transness cannot be compared with each other. For example, Singer compares two needs-assessment studies and demonstrates that while one only counted people as trans if they reported "a discordance between their birth-sex assignment and current gender identity," the other study allowed selection of multiple gender identities and ultimately included over a third of its participants, assigned male at birth, whose primary gender role was male but who also identified as drag queens, cross-dressers, or transgender (2015, p. 67). In another case, inclusion criteria for one study "ranged from surgery to pronoun use," where for the other it required someone to be considering surgery in order to be counted as transitioning (Labuski & Keo-Meier, 2015, p. 19). The "lack of concordance" between definitions of trans identity and resulting gender categorization schemes limits the ability for studies of trans people to "generate widely useful data" that can be compared (Labuski & Keo-Meier, 2015, p. 19).

In her manifesto "The Ethical Case for Undercounting Trans Individuals," Megan Rohrer (2015) presents other issues with the collection of trans data. Some people choose not to come out as trans when participating in surveys, and this challenges the accuracy of data purportedly measuring trans populations. These "low/nondisclosing individuals," who have transitioned and can now pass as their gender identity, either choose to keep their trans status to themselves or no longer identify as trans at all (Rohrer, 2015, p. 177). If these individuals are part of a researcher's target population, their data will always undercount the broadly-defined trans community

(Rohrer, 2015, p. 176). Including—or not including—nondisclosing people could skew statistics, too. Data including them could decrease discrimination rates and obscure the violence faced by those who live openly as trans, while data excluding them could increase violence statistics and lead other trans people to delay or forgo transition (Rohrer, 2015, p. 177). This leads to a dilemma; the trans community is not represented in full without accounting for nondisclosing individuals, but including them privileges the researcher's definition of who is trans over the individual's right to self-identify (Rohrer, 2015, p. 177). Perhaps most concerningly, Rohrer's work with homeless individuals shows that already-vulnerable populations are often made more vulnerable by disclosing their trans identity. She explains that the surveys most successful at capturing gender identity took a lot of participants' time, risked violating their privacy in public, and were used to gatekeep access to other resources (Rohrer, 2015, p. 176). Ultimately, "providing unnecessary medical information to strangers can leave trans individuals feeling pathologized, overexposed, and abnormal," so Rohrer recommends supporting and advocating for the trans community without attempting to count it (2015, p. 176).

Despite this compelling argument, some would counter that it is precisely because of the trans community's vulnerability that better estimates of the true number of trans people should be calculated in order to bolster advocacy for trans people's needs. In general, arguments for better trans data suggest that a more accurate count will be larger and therefore demands by trans activists for services and policies benefiting trans people will carry more weight. It's certainly true that here, more accurate implies larger, since the current obstacles to accuracy are the narrow definitions of trans identity, when it is even included, in data collection. Doan (2016) acknowledges "the perils of forcing queer subjects into tick boxes" but describes the "need for transgender-accessible bathrooms" as "urgent" and "requir[ing] a more inclusive count" (p. 89).

She claims that not improving methods of counting trans people "simply reifies outdated medical models that severely underestimate the size of this community" (Doan, 2016, p. 105). So, as much as updating gender categorization schemes can stabilize a normative notion of trans identity, not updating gender categories at all to include other gender variance further entrenches the erasure of trans identity outside medical transition entirely. With a more accurate count, institutions will supposedly be better able to "provide appropriate services to a highly vulnerable community," combatting discrimination and violence (Doan, 2016, p. 92). One such example is found in an opinion piece by several PhD students who exist outside the gender binary calling upon the National Science Foundation to include nonbinary gender categories in its data collection on funding recipients (DeHority et al., 2021). They write that an improved list of gender categories will allow for the quantification of disparities in career opportunities, funding, and workplace harassment, even going so far as to add that "the lack of information on transgender and gender diverse scientists is both a symptom and cause of exclusion from science at large" (DeHority et al., 2021).

Strategies for Measuring Transness

Gender categorization schemes in demographic survey research have thus far proven to be a useful illustration of the positive and negative consequences that incorporating trans identities has for trans people and trans activism. Here I briefly explore multiple proposed ways of measuring transness. The "two-step" method of calculating transness by comparing birth sex and current gender identity is popular, but its reliance on the artificial separation of sex and gender tends to erase "gender-nonconforming racial minorities who occupy the bottom rungs of the socioeconomic ladder" (Singer, 2015, pp. 66-68). Outside of health research that requires

specific understanding of a person's anatomy, it may be better to just ask participants whether or not they self-identify as trans (DeHority et al., 2021). However, this does potentially obscure the many types of gender variance, lumping together "a wide variety of multidimensional individuals… many of whom have little in common aside from their gender-diverse bodies and practices" (Labuski & Keo-Meier, 2015, p. 14). Moreover, by excluding anyone who says they are not trans from research, a cis-trans binary is reinforced, when in reality some people identify with neither and should be included in a study intending to investigate any experience outside being cisgender. Other suggested gender categorization schemes range from the simple five-category list of man, woman, nonbinary, prefer not to say, and prefer to self-describe via write-in to an open-ended write-in replaced by many categories if unfeasible (Keyes et al. 2021, p. 3; DeHority et al., 2021). For quick calculations based on existing data, Doan (2016) recommends inflating current numbers via her own estimates applying potentially more accurate numbers found through smaller samples to the entire United States population.

There are also multiple recommendations that involve more radical shifts away from the dominant gender system. One approach hinges upon participatory design, or soliciting and applying input from members of the target community. In the case of survey design, especially on a community level, this could mean including more niche gender categories that resonate with the participants. In a study by the YES Center, input from gay youth of color resulted in vernacular gender categories like "femme queen" which allowed participants to be "explicitly *included* on their own terms" (Singer, 2015, pp. 69-70). Likewise, the Trans-health Information Project distributed safer sex supplies in Philadelphia based on "categories that it temporarily and provisionally breaks, reframing bodies in nonbinary code akin to a street poetry that riffs on and with standardized public health practices" (Singer, 2015, p. 71). The "tactical, local, and shifting

outreach approach" taken by organizers instead of "umbrella-like inclusion" produced gender categories like Flygirls, Divas, and BoiScouts that were actually relevant to the community (Singer, 2015, pp. 70-71). These examples of contextually-specific gender categorization schemes illustrate the multiplicity of context outlined by Keyes et al. (2021), who argue that "researchers should treat gender as fundamentally multiplicitous: as a concept with many meanings and relations to individuals and communities" (p. 2). In order to determine the proper meaning of gender for a given survey, they recommend considering many elements including how researchers and participants define gender, the role of gender in analysis, and who is excluded from the categories ultimately chosen (Keyes et al., 2021, 14). Labuski and Keo-Meier concur, suggesting that "research design should begin with questions that specify what is to be learned from a specific transgender population" (2015, p. 19).

In understanding the multiple concepts associated with gender, it becomes apparent that gender is often measured as a proxy for other, more specific traits, like gender identity, social gender role, hormone levels, and bodily anatomy (Keyes et al., 2021, p. 5). Narrowing in on "more methodologically explicit delineations of whether and how sex/gender functions as an independent variable" leads to the realization that many of the experiences with gender targeted in data collection do not neatly separate trans and cis populations (Labuski & Keo-Meier, 2015, p. 27). For example, many cis men undergo hormone replacement therapy to boost low testosterone levels, and many cis women cannot menstruate, just for different reasons than trans women. Including nontrans people when relevant and "de-essentializing transgender need not compromise our efforts to document and measure its lived experience" (Labuski & Keo-Meier, 2015, p. 26). Instead, shifting focus to a category that better represents the population of interest resists "fixed understandings of trans," and still allows for narrowing in on a certain trans

population if desired (Labuski & Keo-Meier, 2015, p. 14). Ultimately, this avoids constructing

trans and nontrans "as mutually exclusive categories" where "nontransgender status…[is]

naturalized" by gender norms (Labuski & Keo-Meier, 2015, p. 17, 25). Otherwise, in Valentine's

words, trans people "bear the full weight of binary gender," and in Stryker's, transgender will

"contain all [the] gender trouble" and radicality (Valentine, 2012, as cited in Labuski &

Keo-Meier, 2021, p. 23-24; Stryker, 2004, as cited in Labuski & Keo-Meier, 2021, p. 25;

Labuski & Keo-Meier, 2021, p. 23-25). Of all the survey methods discussed, those which include

contextual nuance are least likely to results in gender categorization schemes that regulate trans

identity, expose trans people to increased vulnerability, and produce inaccurate results.

Recognizing Trans People

Having discussed at length the inclusion of trans identities into technological systems via

updated gender categorization schemes, I turn to the second factor required for distribution of

rights, namely the recognition of trans people themselves—once trans identity is included—by

the aforementioned technological systems. Just as inclusion has consequences for the

construction of trans identities and life chances of trans people, so too does recognition. As

Halberstam (2018) writes, "With recognition comes acceptance, with acceptance comes power,

[and] with power comes regulation" (p. 18). He argues that the twenty-first century has seen

transgender bodies become "new frontiers for state recognition" and social tolerance, an

observation I extend to technological recognition as well (Halberstam, 2018, p. 49). Yet, "these

new modes of acceptance extended only to forms of transgender embodiment that could be easily

identified with new markets for capital," and therefore transness is regulated, divided into legible

and illegible forms (Halberstam, 2018, p. 50). As I will show in the next chapter, trans people become vulnerable to harm both in cases where they are recognized as trans by a technological system and in cases where they are not. First, however, I will explain three modes of recognition applied to trans people and identities by neoliberal and technological systems, analyzing recognition on an individual level, as an exception to the norm, and through physical bodies.

Individualizing Gender

Through neoliberal discourses of gender self-determination and transition, gender is predominantly framed as an individual issue rather than as a social identity. Zimman (2019) defines gender self-determination as the notion that "each individual is the ultimate authority on their own gender identity" (p. 148). This framing of gender stems from the broader neoliberal construction of the individual as an autonomous, solitary actor exercising free will (Zimman, 2019). Gender self-determination is invoked especially heavily in trans activism when challenging the association between sex, bodies, and gender identity. To replace an essentialist conflation of sex and gender, "self-identification takes center stage," "maintain[ing] individual agency" and legitimizing transness, for if the self is the authority over gender then no entity can deny any individual of their trans identity (Zimman, 2019, p. 150). Indeed, Zimman argues that "contemporary understandings of trans identity" are made possible by the "separation between the internal self/mind and the external self/body" (2019, p. 153). Gleeson (2021) describes a similar theory of transition, rather than simply trans identity, as an individual phenomenon in which gender recognition occurs for a trans person as they modify their external body to be perceived by others in alignment with their internal identity. This puts the onus for gender recognition on the individual wherein trans people must "overcom[e] an array of hurdles on a

personal level," essentially completing a checklist of tasks that must be met in order to be recognized socially and validated in their identities (Gleeson, 2021, p. 71). The recognition of trans people occurs increasingly through a framework of individual gender self-determination as trans movements are incorporated into neoliberal systems.

Of course, there is a different, communal theory of transition, one which "frames identities as arising out of formative relationships and processes within those bonds" (Gleeson, 2021, p. 72). Less neoliberal and more critical, this viewpoint sees identity as produced through interactions, which makes it inherently not individualistic (Zimman, 2019, p. 167). Rather, trans people find "the specific support, mentoring, and reciprocal recognition that identity formation requires" from each other and therefore develop subcultures with unique language, lifestyles, and shared knowledge (Gleeson, 2021, p. 78). Interestingly, communication technologies are often the facilitators of these "trans circles" through which gender recognition occurs reciprocally, on a communal level (Gleeson, 2021, p. 77). Hopefully it is clear from my arguments thus far that I apply the lens of feminist STS to see trans identity as social and communal, rejecting the neoliberal individualization of transness while analyzing its consequences. Perhaps the best example of this is my decision to use trans as an umbrella term, for even as there is no single trans experience, I find it important to discuss the experiences shared across multiple types of gender nonconformity. While this does result in referencing some individuals who might not themselves identity as trans, I echo Zimman's point that many people who I reference as cisgender don't identify as such either, so the tension between self-identification and social identity formation is not unique to transness (2019, p. 158).

The primary issue with an individualized framework of transness following a model of a neoliberal self is that agency itself, the means by which trans people can exercise their gender

self-identification and choose to come out or transition, is distributed unequally (Zimman, 2019, p. 149). As Zimman relates, race, class, and other identities become salient in investigating which trans people find themselves with the greatest access to gender affirmation and recognition (2019, p. 167). The more someone conforms to gender norms, the more likely their gender is to be recognized by others. For example, trans men with more masculine bodies and deeper voices are able to speak and act more "femininely" without losing access to gender recognition as men (Zimman, 2019, p. 166). Further, upper-class trans people have much greater access to expensive "body-changing technologies," from surgeries and medical interventions to clothing and other means of gender presentation; as a result, their free will to to transition in a normative and recognizable way is less constrained (Zimman, 2019, p. 167). Even access to trans circles for a communally-navigated transition is unevenly distributed, as some people live in areas without a visible trans community or cannot access one out of concern for their own safety.

While acknowledging the communal nature of transness may be more radical than individualizing it, neither theory alone will produce "revolutionary change" (Gleeson, 2021, p. 83). Zimman writes that gender self-determination is liberatory in the face of transphobic violence, but this only holds true to a certain extent and potentially interferes with community- and movement-building (2019, p. 172). At the same time, he does argue that the stories of individual trans people do not themselves constitute "a politics of trans liberation that sees beyond neoliberal subjectivity" (Zimman, 2019, p. 172). Although neoliberalizing trans movements today do often acknowledge the social nature of identities and transition, they nonetheless spread rhetoric around self-determination. Consequently, because identity is recognized primarily on the individual level, so too is transphobia. This masks structural transphobia within the very same administrative and technological systems that perpetuate an

individual framework of trans identity and legitimate "some identifications while denying that legitimacy to others" (Zimman, 2019, p. 172). The design of apps for tracking medical transition provides one clear instance of a technology that frames trans identity and transition as an individual process, thus constraining recognition to a respectable mode of transness. While these apps are made for trans people as the intended consumer—likely even by trans designers—they still place emphasis on transness as a solo journey, a checklist of steps and milestones, a means of achieving normative identity through body modification. Now that I have clarified the framing of gender identity as individualized, I will address two ways that this framework enables technologies to recognize trans people.

Exception to the Rule

Trans people are frequently recognized by technologies as an exception to the rule, as an error or aberration. Through an individualized lense of gender identity, trans communities are fragmented into disparate, seemingly-rare trans individuals. As a result, there is no strong impetus to radically rethink gendered technologies, and instead, trans individuals are recognized through workarounds that leave discriminatory design intact. As discussed prior, gender categorization schemes frequently position trans people's genders as abnormal. Even if people are allowed to change from M to F or vice versa, binary gender classification positions any input value besides male or female as an error. This essentially mirrors a system of male, female, and "other," which quite clearly contributes to "the delegitimisation of those who do not fit dominant paradigms of being" (Keyes et al., 2021, p. 11). Involving more categories doesn't necessarily help; some lists of genders contain both "transgender woman" and "woman" as separate categories, framing cisgender identity as the normal, default way to be a woman. In research,

there is often an imperative to restrict gender identities to a relatively short and simple list, as the "volatile categorical instability [of transness] threatens institutional systems with the problem of incoherence" (Singer, 2015, p. 64). If significant conclusions are to be drawn from data about people, each person must be distilled into categories and measurements, the simpler the better, as it is difficult to find clear patterns and trends for categories containing very few people. In public health research, this "often results in classifying transgender data as outliers that cannot be properly coded, managed, and analyzed" (Singer, 2015, p. 64). The mere idea of trans identities as outliers shows that technological gender categorization schemes frequently recognize trans people as individual exceptions to the rule of legible genders.

Mar Hicks (2015), historian of technology, writes that "the technological systems we live with, and within, are artifacts from the past…constructed by particular historical contexts" and therefore "can discipline us into acting in accordance with the values and ideals previously encoded into them" (p. 4). It is only fitting that I turn to Hicks' own work for a historical lineage of technologies that figure trans people as errors to correct and assimilate. Even "everyday technologies" can "produce and reinforce gendered bodies," sometimes through recognizing trans people as exceptions (Hicks, 2015, p. 5). According to Halberstam (2018), bathrooms are a technology of gender that sorts people and produces gender norms (p. 133). As mundane and ubiquitous as they may be, public bathrooms "discipline users in line with particular social and cultural ideals", determining "who is allowed to be where" (Hicks, 2015, p. 1). Historically, women were restricted from "moving freely and independently" by the lack of women's public bathrooms; Chicago, for example, only built them in the 20th century (Hicks 2015, 1). Today, from the risk of violence faced in them by trans people who are not cis-passing, it is clear that bathrooms as a technology reinforce the gender binary and marginalize trans bodies. Commonly,

trans people are recognized by existing bathroom systems as individual errors that can be directed to a single-stall, gender-neutral bathroom; however, many spaces don't have them, paralleling a historical absence of women's bathrooms from public spaces. Furthermore, offering a separate "transgender bathroom" doesn't actually address issues with sex-segregated spaces and instead perpetuates the idea that trans people are an exception to the norm (Halberstam, 2018, p. 135).

As another example, in post-World War II Great Britain, the process of digitizing the welfare state was used to invisibilize trans people and identities, helping "reinstantiate binary gender and all of its attendant inequalities into new institutional and technological realms" (Hicks, 2019). As Hicks (2019) found through their research, the government had for years been keeping a secret register of trans people who were requesting state recognition under their true, albeit binary, genders, and it even granted the requests of some who transitioned in ways that might be most palatable to the public. Despite clearly being aware that trans people existed and would continue to exist, the new computer system was "designed and programmed to… deny the existence" of trans people and "resubmerge…their requests for recognition," institutionalizing gender as binary and immutable (Hicks, 2019). The system prompted an exception case—essentially a "failure" requiring manual resolution—for the accounts of trans people, marking them as different from "normal" citizens. The government declined to "formally institutionaliz[e]" trans people into its new technology's "operating procedures," instead making it harder for them to access benefits out of fear that sanctioning transness would inspire trans political activism (Hicks 2019). Hicks argues that the computerized British welfare state marks a "prehistory of algorithmic bias" that made the "digital realm…a new battleground in the struggle for trans and queer rights," which it remains today (2019).

Gender through Bodies

In addition to recognizing trans individuals by considering them to be siloed exceptions, technological systems place an emphasis on recognizing gender through bodies, reading gender through sex and sex through external physical traits. For example, airport security procedures use gender as biometric information, assuming that everyone's classification as male or female is permanent and aligns with their anatomy and presentation (Currah & Mulqueen, 2011, p. 569). Because gender, for trans and cis people alike, cannot be determined visually, technologies that attempt to do so regulate trans people by triggering security responses to "atypically gendered bodies" (Currah & Mulqueen, 2011, p. 564). Most blatant is the "Advanced Imaging Technology" program, which scans passengers' bodies to search for contraband. In doing so, the technology identifies chest tissue, genitals, prosthetics, and other gender-affirming body modifications or clothing (Currah & Mulqueen, 2011, p. 563). Because the machines are programmed to expect bodies with binary combinations of chest and genital tissues, no prosthetics, and only typical items of clothing, they frequently flag trans bodies as abnormal, further othering and sometimes outing trans people. To address this risk and avoid pat downs, many trans people adopt a more normative gender presentation and attempt to pass as cisgender for their trip to the airport (Kelly, 2011, as cited in Currah & Mulqueen, 2011, p. 573). Thus, the use of gender for identity verification and security protocols, implemented in the wake of 9/11 for the war on terror, polices gender nonconformity (Currah & Mulqueen, 2011, p. 564). Interestingly, Currah and Mulqueen (2011) argue that "securitizing gender does not necessarily secure identity, and indeed may destabilize it," all while exposing trans people to surveillance and potential violence (p. 559). While it's true that trans people's experiences with airport

security technology "reveal the mutability" of gender, I argue that recognizing gender in the body also stabilizes gender systems through logic equating sex and gender that frames both as immutable (Currah & Mulqueen, 2011, p. 558).

Many of the technologies that construct gender in the body do so specifically through facial recognition. Originally funded by the CIA and later supported by other government sponsors, it's no surprise that facial recognition "matured into its role as a tool of the state," serving as "the latest in a long history of systems of surveillance and control" (Stevens & Keyes, 2021, p. 834, 848). Browne traces its origins to the 'surveillance of blackness'; in "reduc[ing]...people to parts," facial recognition technologies carry on a dehumanizing lineage found throughout "technoscientific history," especially for Black bodies (Browne, 2015, as cited in Stevens & Keyes, 2021, p. 834; Stevens & Keyes, 2021, p. 848). These technologies have since been adapted for use in gender recognition, beginning in the early 1990s with surveillance and marketing research (Hamidi et al., 2018, p. 2). Although facial recognition is sometimes used for identifying a specific person, I will focus on technologies analyzing facial features to classify an individual "in terms of specific demographic categories of interest," specifically gender (Scheuerman et al., 2021, p. 3). Known as Automatic Gender Recognition (AGR), these technologies use algorithmic methods to "extract features from images, video, or audio of one or more individuals in order to identify their gender" (Hamidi et al., 2018, p. 2). In doing so, AGR imposes normative gender systems upon trans people, for the gender categories used are binary and differentiated by gendering physical features.

Scheuerman, Pape, and Hanna (2021) use the term "auto-essentialization" to describe the implication of facial recognition technologies that social categories each have an "essence...that can be detected via the face," thus "re-inscrib[ing] essential notions of difference" (p. 2). In the

case of Automatic Gender Recognition, auto-essentialization "incorporates flawed

representations of gender" and "rematerializ[es]...misconceptions about gender in technical

systems and scientific reports" (Hamidi et al., 2018, p. 9). This is because gender cannot "be

accurately read through physical features," and yet AGR attempts to do so, ignoring "internal

and subjective aspects of gender identity" (Hamidi et al., 2018, p. 9). A study that interviewed 13

trans people's opinions on AGR found that participants had both individual and societal

concerns, worrying not only about being misgendered themselves by technology but also "about

AGR algorithms materializing and reifying dominant gender binaries" (Hamidi et al., 2018, p. 9).

In response to these concerns, a co-opted trans movement would advocate for inclusion of trans

identities in AGR systems and for the subsequent attempted recognition of an individual's

transness through analysis of their face. However, this strategy would perpetuate the idea that

gender can be determined visually and that there are clear physical signs that someone is trans,

ignoring the fact that some trans people will pass as cis and others won't express their transness

in the way an algorithm was trained to expect.

It is worth "studying [training] datasets as a site of knowledge/power" to see how facial

recognition technology is a "cultural vehicle perpetuating a particular trajectory of state power

through visuality" (Stevens & Keyes, 2021, p. 835). A technology like AGR that takes a photo of

a face as an input and returns a classification of the face's gender as an output is only able to do

so because it was taught what gender supposedly looks like by a dataset consisting of faces

labeled with their actual genders. This prior knowledge—dependent on human

decision-making—that an algorithm relies upon can introduce bias to a technological system.

Since these datasets are large and complex, they are frequently public and applied in many

contexts, with "researchers…[becoming] increasingly removed from the dataset subjects"

(Stevens & Keyes, 2021, p. 835, 848). One example is the MEDS dataset, composed of mugshots from subjects who were arrested multiple times and had already died by the time the dataset was created (Stevens & Keyes, 2021, p. 842). It over-represents African-Americans, "connect[ing] the US police state to facial recognition technology by making existing state surveillance and photography work a viable source of FRT training data" (Stevens & Keyes, 2021, p. 842). Further, researchers imposed their frameworks of race and gender upon the data by changing any perceived gender inconsistencies across multiple photos of the same subject, potentially erasing gender fluidity (Stevens & Keyes, 2021, p. 843). As another example, the Gender Shades study referenced in the literature review showed that big technology companies' facial recognition tools, trained on disproportionately white and male faces, perform poorly on female and dark-skinned faces (Buolamwini & Gebru, 2018). In this way, "computer vision systems are revealed as reinscribing a history that has weaponized gender categories against women of color, portraying them as less feminine and, as a consequence, dehumanizing them" (Scheuerman et al., 2021, p. 8).

The way that AGR might misgender trans people has a similarly dehumanizing effect. While some researchers did create a dataset of trans people's faces throughout their time taking hormones, the data was taken without full consent, primarily from YouTube videos where people documented their transitions (Scheuerman et al., 2021, p. 11). The project received national security funding, intending to address the potential for terrorists to evade facial recognition by taking hormones and ultimately "position[ing] transgender faces as problematic to facial recognition accuracy" (Hamidi et al., 2018, p. 2; Scheuerman et al., 2021, p. 11). The woman-only app Giggle, which uses "bio-metric gender verification software" to ensure only women sign up, is a clear example of the consequences of recognizing gender identity in the

body (Scheuerman et al., 2021, p. 11). Trans women who don't pass the AGR system's test must go through an extra verification process to ensure they are not men attempting to sneak past the security, reinforcing the transphobic trope of trans women as men in disguise (Scheuerman et al., 2021, p. 11). With all these questions of if, when, and how to recognize trans people through technology, it becomes clear that transness indeed is the new frontier for technological recognition. Again, a neoliberal critique would demand inclusion of trans identities in the training datasets for gender recognition, rather than questioning why AGR technologies need to exist in the first place and investigating the consequences of recognizing gender through bodies. For example, "a move beyond the binary on the advertising interface could increase surveillance of marginalized populations in unexpected ways" (Bivens & Haimson, 2016). The othering of trans people by technologies that construct gender as physical, binary, and static cannot be remedied by modifying AGR systems to include trans identities and recognize trans people, as such changes would perpetuate a false model of gender and produce a normative way to be trans.

Conclusion

In this chapter, I have argued that technology plays a key role in the incorporation of radical trans movements into neoliberal calls for inclusion and recognition by the state. An activism strategy focusing on achieving legal equality and rights from the state incentivizes updating the gender categorization schemes within administrative and technological systems to include trans identities. These updates construct gender itself and produce a legible, normative way to be trans, at the expense of the trans people who are excluded. To recognize trans people as fitting the already-imperfect trans identity categories, gender identity is frequently framed as an individual issue. Technological solutions to gender recognition for trans people thus deal with

them as individuals, commonly framing transness as an exception to the norm of a gender binary or visible on their bodies and equivalent to sex. In the next chapter, I further explore the consequences of the technologically-mediated co-opting of trans movements, from surveillance, violence, and harm affecting trans people's life chances, to misdirected attempts to deal with discriminatory systems, to the privileging of a normative mode of transness.

Chapter 3: Violences and Normativity

As radical trans movements are co-opted by the neoliberal state (and market?), the inclusion and recognition of trans identities and people by existing administrative and technological systems produces harmful consequences. Ranging from misgendering and increased dysphoria to surveillance and outing of someone's trans status, the consequences of the technologically-facilitated incorporation of transness are violent for trans people. Further, the shift towards a neoliberal framework of gender identity reshapes gender itself and ultimately produces a normative, legible trans identity, instantiated technologically and characterized by medicalization, binary gender norms, and wealth and whiteness. In addition to aiding the co-optation of trans movements as outlined in the previous chapter, and while reifying a normative transness, technological systems play a direct role in allocating life chances, from prosperity to punishment, in part through distributing consequences of incorporation. Attempts to address these harmful consequences are often misguided, focusing on discourses of ethics and fairness rather than radical structural change to when, why, and how technologies are applied. In this chapter, I once again rely on Hoffmann's application of Spade's analysis, in which she relates his work on administrative systems and violence to technological systems and what she terms data violence. In going over the production of harmful consequences, namely violences of inclusion and recognition, transnormativity, and misdirection of activism, I show that trans people overall are made more vulnerable by the incorporation of their identity and activism into neoliberal systems.

Administrative and Data Violence

As discussed in the previous chapter, Dean Spade's book *Normal Life* (2011) conducts an analysis of state administrative systems and the violences they enable. In line with the social constructionist and STS frameworks used previously in my exploration of gender categorization schemes, administrative systems "invent and produce meaning" both for the gender categories chosen and for gender itself (Spade, 2011, p. 11). Spade explains how rather than being objective and neutral, these systems distribute life chances differently based on which of their categories apply to various populations, leaving some communities with increased vulnerability while distributing security to others (Spade, 2011). Because administrative systems manage interactions with government agencies in essentially every realm, from incarceration to health to child welfare and more, they are instrumental to population management and state control over citizens, residents, and visitors (Spade, 2011). The "structured insecurity" created by the norms that administrative systems produce is largely why the incorporation of transness into said systems "directly disserve[s] and further endanger[s] and marginalize[s]" trans people, especially those already most vulnerable to state violence (Spade, 2011, p. xvi). For example, consider a poor trans person of color who doesn't access welfare services or state-administered healthcare because they would have to out themselves, and thus can't afford to change their name or undergo the gender-affirming surgical procedures that some states require in order to legally change sex. If this person becomes incarcerated due to the over-policing and surveillance of Black and brown communities, they may be outed, misgendered, and harrassed in a sex-segregated facility for people of their sex assigned at birth. The administrative violence this person faces as a result of their gender and its intersection with their class, race, and potentially even other identities illustrates the power of administrative systems to distribute life chances.

Spade's work provides a crucial framework for understanding how administrative systems distribute privileges and marginalization based on gender. Technological systems function in the same way; their seemingly-neutral methods of classifying people, from gender categories on dating websites to databases encoding gender as binary, impose power and control (Hoffmann, 2017, p. 8). Not only does technology shape gender categories, it "distributes both penalty and privileges to individuals based on their [social] location" (Costanza-Chock, 2018). Through constructing gender itself, frequently as binary and unchanging, design decisions render some bodies and identities illegible to technology, resulting in what Hoffmann (2017) calls "data violence," paralleling Spade's theory of administrative violence (p. 11). When technology excludes trans people and identities, or includes, recognizes, and subjugates them, it affects life chances, increasing risk of mental health disorders and harassment, and limiting access to employment, medical care, and other services (Hoffmann, 2017, pp. 9, 11). Data violence is inflicted not only by government systems, many of which are indeed technologized, but also by private technological and information systems. Hicks' (2019) work on the digitization of the post-World War II British welfare state, which I referenced previously as an example of how technologies incorporate trans identities as an exception to the norm, exemplifies data violence inherent to a system that is both administrative and technological. Eubanks' (2018) book about how automated technological systems frequently target the American working class through algorithmic decision-making provides yet another example of data violence.

Using Hoffmann's lens of data violence, this chapter surveys many of the harmful consequences that result from the co-opting of transness by state and technological systems. I will begin by addressing violences prompted by inclusion and recognition. First, however, it is important to understand the history of state recognition of identity. Adair (2019) offers an

important genealogy, demonstrating that demographic markers on identification documents in the United States originated via the "anti-Black regulation of domestic mobility" through driver's licenses during and after the Great Migration (p. 572). He describes the way that "racial and gendered data collection on identification documents" became a "normative state practice" used to control "which types of people are permitted to move through public space" (Adair, 2019, p. 572). This lineage of surveillance and control in the United States, particularly of movement, traces back to chattel slavery and on through the Jim Crow era, and therefore many of the administrative violences that trans people of all races face today are rooted in anti-Blackness. Adair draws this connection to the racialized history of administrative violence because it is frequently missing from uses of the term, which as he argues is "primarily used by white trans scholars to describe the methods by which trans subjects are excluded from public space" (2019, p. 572). I agree it often goes unacknowledged that anti-Blackness is central to the state regulation of gender, and for that reason choose to acknowledge it directly here. I will clarify, though, that in this paper I use administrative violence to reference a multitude of phenomena, not simply those excluding people from spaces. Also, although Adair's analysis is based on the history of the United States, it can certainly be applied to other spaces with administrative systems and histories of racism.

Violences of Inclusion and Recognition

Inclusion

Including trans identities in technological systems leads to discursive violences. First, rhetoric around inclusion and incorporation "work[s] to scatter opposition to structural

inequality, reinforce unequal relationships, and maintain data science and technology's potential for violence" (Hoffmann, 2020, p. 2). As technologies incorporate trans identities—responding to the neoliberal co-opting of trans movements—inclusion discourse obscures systemic data violence, framing instances of violence instead as discrete, individual, and aberrant. This preserves the conditions conducive to other harmful consequences. Another discursive process that Hoffmann (2020) identifies as a type of data violence is "datafication," or the assigning of value, significance, and (il)legitimacy to "human life" through various quantitative and statistical methods (p. 5). It functionally "disaggregates" people into data through the normative lens of power systems (Gandy, 1993, as cited in Hoffmann, 2020, p. 5, 6). Datafication makes trans people vulnerable, enabling data-driven decision-making using data grounded in gender norms, and contributes to the construction of trans identity itself via the choices underlying gender categorization schemes. Despite these discursive processes inflicting data violences, there are some arguments to be made that categorical inclusion of transness into technological systems is beneficial for trans people. For example, through strategic essentialism, embracing stable gender categories concretizes transness into something various actors can rally around and build a coalition to support (Spivak, 1988). Singer (2015) writes that "categories create places for resources to accrue and enable the redirection of social services toward marginalized people in ways that increase their life chances" (p. 72). Doan (2016) would agree, asserting that a better count of trans people legitimizes their need for various public services (p. 89). Arguably, then, essentializing gender is one tool useful for combating the administrative and data violences that limit life chances for trans people. However, due to the discursive consequences of including trans identities in technologies and the subsequent consequences, to which I turn next, of offering

recognition to trans people, classification of transness must be undertaken with extreme care and only when necessary.

Recognition

The technological recognition of transness produces violences both when it does and when it doesn't recognize someone as trans. Though similarly affecting life chances and safety, these violences apply in different circumstances. One mechanism of recognition clearly distributing administrative and data violence is surveillance. As Beauchamp (2019) argues in his book *Going Stealth: Transgender Politics and U.S. Surveillance Practices*, surveillance practices enforce "regulatory gender norms," producing gender deviance itself despite "purport[ing] to simply identify" it (p. 6, 2). Hinging on the notion that they are deceptive and should be monitored in the name of public safety, surveillance targets people with "transgressive gender presentation" due to their gender-nonconformity, whether or not they identify as transgender (Beauchamp, 2019, p. 8). Because state and private surveillance typically leads to violence against those who are intensely surveilled, greater inclusion and visibility of transgender identities only further perpetuates violence against the already-visible and vulnerable population of gender-nonconforming people. Likewise, "greater recognition of transgender people from police, prisons, or biometric screening technologies exacerbates rather than mitigates harm" (Beauchamp, 2019, p. 18). Indeed, Beauchamp demonstrates the crucial role of technologies, from bathrooms, to security scanners, to identification documents, in producing and recognizing deviant modes of gender to the detriment of those made visible (2019).

Thus, to be recognized as trans by surveillance technologies is to be made vulnerable to the data violences they commit; representation within an oppressive system poses a danger to

those being recognized. For example, facial recognition technology performs poorly on darker-skinned faces, but remedying this issue would mean further exposing Black and brown communities to the already-unjust ways that such technology is used for surveillance and criminalization (Hoffmann, 2019, p. 906). Rather than "making systems 'work' for marginalized populations," it is important to question what a system's purpose is and whether or not its continued or perhaps even improved function could be harmful (Stevens & Keyes, 2021, p. 834). The Reclaim Your Face campaign in the European Union, a "civil society initiative to ban biometric mass surveillance," is one instance in which calls for change demand an end to certain technologies, rather than inclusion, recognition, or visibility within them (*Reclaim Your Face,* n.d.). Airport security scanners used by TSA to vet passengers provide another classic example of data violence from surveillance systems, since gender-nonconforming bodies are recognized as a threat. Ultimately, "gender's unreliability as an unchanging measure of identity" causes more problems for "the individuals whose narratives, documents, and bodies reveal [its] mutability" than it does for TSA, producing harmful consequences for trans people if they are recognized (Currah & Mulqueen, 2011, p. 558).

Another risk of systems incorporating transness to the point of recognizing trans individuals is the violent potential of a census. As a result of datafication, once trans people have been distilled into a (trans)gender category, they could be counted without anonymity in such a way that makes their trans identity available to the state or powerful private actors. Historically, population and census data has been used in multiple state-sponsored genocides, from the forced relocation and murder of Native Americans in the United States to the Rwandan Genocide founded on Belgian colonial data systems (Hoffmann, 2020, p. 3). Although data violences against populations being quantified existed before computers, they have been "extended and

amplified by computational tools and techniques," the most well-known example being IBM's role providing "material and computational support" to Hitler's Nazi regime and the genocides of the Holocaust (Hoffmann, 2020, p. 3). In the contemporary context of transgender people, recognition by technological systems in the form of data collection is dangerous. As the United States Census Bureau begins tentatively collecting data on sexuality and gender identity, and bills in state legislatures regulating trans youth proliferate, the chance that government agencies will specifically target people recognized as trans increases (File & Lee, 2021). At the time of this writing, the Department of Family and Protective Services in the state of Texas has begun classifying gender-affirming treatment, like puberty blockers, for trans minors as child abuse, requiring doctors and teachers to out trans youth to the state (Paúl & Parks, 2021). Clearly, and in line with previous discussion of outing homeless trans people for the sake of survey data collection, processes of identifying trans individuals while quantifying trans populations create the conditions for future administrative and data violences.

Data violence is also caused by the technological misgendering of trans people. The resulting harms, from the mental toll of dysphoria to the risk of outside violence, take place both in settings where people are recognized as trans and in those where they are not. First, the permanence of internet data and personal records makes trans people vulnerable to harm when they are outed by their internet history and recognized as trans. Safiya Noble (2018) writes, "the tremendous capture and storage of data, without plans for data disposal, undermines our 'social forgetfulness,' a necessary new beginning or 'fresh start,' that should be afforded people in the matter of their privacy record keeping" (p. 125). This means it can be difficult to escape records of the past, which for trans people often include activity undertaken online with a different name, gender, and presentation. Whether or not one believes that individuals should have the right to be

forgotten, there's no denying that "records… and their visibility are power," exposing trans

people to potential threats (Noble, 2018, p. 123). Simultaneously, technologies like Automatic

Gender Recognition (AGR) frequently misgender trans people by failing to recognize them as

trans and, rather, classifying them as their gender assigned at birth. One study found that, "for

many individuals, automatic misgendering is perceived to be *more harmful* than being

misgendered by another person" (Hamidi et al., 2018, p. 9). Such placement of gender in the

body and subsequent enforcement of gender norms by technologies has harmful consequences

for cisgender people too, misgendering some of them depending on their race, bone structure,

and gender presentation (Hamidi et al., 2018, p. 9).

Exclusion and Misrecognition

While misgendering bridges the gap between violences of recognition and of

misrecognition, it is misrecognition that primarily leads to the exclusion of trans people, another

mechanism of data violence. In addition to the consequences discussed thus far of including trans

identities in technological systems, there are also consequences when trans identities are not

included. Spade (2011) writes that the problems faced by people "who are difficult to classify or

are misclassified" are "major vector[s] of violence and diminished life chances and life spans"

(p. 77). The potential mismatch in an individual's data among various systems with different

rules for reporting gender is difficult to deal with. To be classified as the incorrect name or

gender is "more than just an administrative headache," it's a trigger for dysphoria, humiliation,

and potentially even "harassment, abuse, and…death" in "all aspects of a trans individual's life"

(Hoffmann, 2017, p. 9). Whether it's because switching gender markers is difficult or because

the proper gender labels aren't available, being excluded from one's gender of choice in

administrative and technological systems makes trans people vulnerable. This exclusion from a system's gender categories leads to exclusion from the services provided by that system, frequently population-level programs designed for "care-taking" of the national population, ultimately positioning trans people as outsiders and threats (Spade, 2011, p. 75). Even if transness is in some way incorporated to mitigate the total exclusion of trans people, it's likely that only normative instantiations of transness will be recognized, as I discuss shortly. Still, if one argument for categorical incorporation of transness is that it allows for distribution of resources to at least some trans people, the violences caused by exclusion of trans individuals from structures of recognition give another cause to hesitate at unequivocal condemnation of incorporation. Together with the many violences I have shown to result from incorporation of transness, these consequences of not including trans identities at all demonstrate the no-win nature of representing identity in technological systems that demand stable categories.

Beyond datafication, surveillance, misgendering, outing, and counting, the inclusion of trans identities and recognition of trans people can produce a cis-trans binary collapsing extremely different modes of transness into one single category. The resulting lack of gender variance contained in technological systems and data invisibilizes people for whom neither cis nor trans feels like the right label, opening them up to the aforementioned violences of exclusion. In particular, the cis-trans binary has exclusionary consequences for Black women, as it creates a divide between cis and trans Black women despite their similarly "fungible" femininity and "precarious relationships to 'trans' inclusion projects" (Chaudry, 2019, p. 523; Snorton, 2017). Chaudry (2019) engages succinctly with leaders in Black feminist thought to explain how traditional gender categories exclude Black bodies and thus "material realities of (anti)blackness" challenge the cis-trans binary that arises frequently in institutional settings (p.

525). To address this new binary, Ashley (2022) suggests the term "gender modality" to describe "how a person's gender identity stands in relation to their gender assigned at birth." Modalities would include being trans, cis, or having another experience entirely, as some nonbinary and intersex people, among others, have expressed. Gender modality becomes a useful term for potential data collection as it captures the difference between cis and trans women, for example, without invalidating the womanhood of trans women by offering a separate gender identity category for them or lumping them in to a generic transgender category alongside trans men and all other trans people (Ashley, 2022). It could even be used to account for the whiteness of dominant gender categories, and even the whiteness frequently associated with trans itself.

Other Consequences

Transnormativity

In addition to structuring data violences against trans people, inclusion and recognition also have consequences for trans identity and movements. Trans identity itself changes as transnormativity, or the production of normative transness, becomes institutionalized. To properly contextualize and define transnormativity, I will begin by introducing normativity and its other implications in queer and trans communities. If something is normative, it "ascribe[s] to a social set of ideals that are unquestioned and presumed to be essential and unchangeable" and "institutionally and socially enforced" (Vipond, 2015, p. 23). The standards of normativity, then, produce a structural value judgment designating what is normative as good, right, and natural. Interestingly, Michael Warner "attributes normativity to the invention and spread of statistics in the nineteenth century," since the mean or average value of a category came to represent what is

"right," or, if the data relates to people, "what a person should be" (Warner, 1999, as cited in Vipond, 2015, p. 23). This shows that from the very beginning, large-scale data collection and analysis has produced social consequences, though of course data is but one method of enforcing normativities. In the context of queer and trans people, the most obvious normativities are the expectations that all people are cisgender and heterosexual, but normative sexuality and gender standards exist within queer and trans spaces, too.

Stryker's (2008) explanation of homonormativity in queer spaces and analysis of its implications for trans people provide the best setting in which to explore transnormativity as a phenomenon. In her telling, homonormativity originated as a term in the 1990s in trans spaces to describe the impact of homosexual community norms upon people with alternative experiences of gender and sexuality (Stryker, 2008, p. 147). She shows that homonormativity elucidates the dependence of homosexuality as a category upon "constructions of gender it share[s] with the dominant culture" (Stryker, 2008, p. 146). Due to the investment that homosexuality, as traditionally constructed, has in the gender binary and an essentialist notion of biological sex, trans people are often excluded or marginalized by homosexual norms. There is a path to inclusion, however. Duggan writes of a "new homonormativity that does not challenge heterosexist institutions and values, but rather upholds, sustains, and seeks inclusion within them" (Duggan, 2003, as cited in Stryker, 2008, p. 145). Following this usage of the term, which Stryker identifies as having popularized it, one could argue that just as queer people can assimilate to straight society through homonormativity, so too could trans people assimilate into queer spaces. Indeed, within homonormativity, instead of challenging norms, trans "becomes a containment mechanism for 'gender trouble' of various sorts" through "a liberal politics of minority assimilation," essentially incorporation (Stryker, 2008, p. 148). The diffusion of radical

trans potential by homonormativity begs the question, what role does normativity play internally in the trans community?

Normative standards for transness can be referenced by the term transnormativity. Johnson (2016) describes it as "the specific framework to which transgender people's presentations and experiences of gender are held accountable" (p. 465). Vipond (2015), on the other hand, aligns with Duggan's use of homonormativity by naming transnormativity as the "normalization of trans bodies and identities through the adoption of cisgender institutions by trans person" (p. 24). To be clear, homonormativity by Stryker's definition is not an entirely distinct concept from transnormativity, perhaps in part because transnormativity is a newer term. I use the latter to highlight the fracturing of the trans community into normative and deviant modes of transness, leaving homonormativity to describe the norms for queer sexualities. Whether using transnormativity explicitly to describe assimilation through institutional inclusion and recognition, or more broadly for all standards to which trans people are held, it circulates as an ideology in "every arena of social life," such as trans community groups, legal settings, and medical systems (Johnson, 2016, p. 466, 470). Within these settings and elsewhere, as discussed in the previous chapter, technologies that promote incorporation shape and reify transnormative standards through inclusion of certain trans identity categories and recognition of transness in the body.

Typically, a normative mode of transness requires being white, middle class, straight or conforming to homonormative sexuality, and privileged in as many other identities as possible. When it comes to gender itself, transnormativity constructs transness as binary and conforming to gender norms, with masculine trans men and feminine trans women, legally-acknowledged through identification documents, and medicalized, using "born in the wrong body discourse" to

justify hormonal and surgical interventions (Vipond, 2015, p. 23; Johnson, yr, p. 468). According to Sandy Stone (1992), "the essence of transsexualism is the act of passing," and today that holds true for the expectations of transnormativity (p. 16). Its standards create a "hierarchy of legitimacy" privileging those who adhere to the medical model over those who cannot or do not transition medically (Johnson, 2016, p. 465). For the former, it can be empowering to have their trans identity legitimized, though they are simultaneously bound to their normative transness in order to access their medical care, and as I've shown, inclusion and recognition can come with violent consequences (Johnson, 2016, p. 467). On the other hand, trans people who reject binary gender and medical transition, or who are non-normative due to their other identities, are constrained, "marginalized, subordinated, or rendered invisible," unable to easily access gender affirmation (Johnson, 2016, p. 467). Medicalization as framed by transnormativity pathologizes transness as something to cure or treat in order for an individual to be accepted as normal (Vipond, 2015, p. 29). Ultimately, trans people marked as deviant find themselves illegible to administrative and technological systems founded on the dominant gender system.

The whiteness of transness is worth investigating deeper, since it means that transnormativity has a disproportionate effect on trans people of color. Rather than being race-neutral, the gender norms enforced by transnormativity "uphold ideals of white femininity and masculinity" (Vipond, yr, p. 23). This can be seen categorically in the previous chapter's analysis of gender categorization schemes, since most of those that included multiple trans identities still excluded identities specific to people of color, barring a very niche, local example of a group distributing safer-sex supplies in Philadelphia (Singer, 2015). Even transgender as an overall umbrella category perpetuates transnormativity, as Valentine argues it "often functions to exclude… poor gender-nonconforming people of color" (Valentine, 2007, as cited in Chaudry,

2019, p. 524). In addition to categorical inclusion, white gender norms unfold within transnormativity through individual recognition, too, as illustrated perfectly by Automatic Gender Recognition (AGR) tools. While reading gender in the body, AGR essentializes physical characteristics as masculine or feminine, but does so using "the White, cisgender face as the 'natural' standard that must be protected from racialized, gender non-conforming 'others'" (Scheuerman et al., 2021, p. 11). So, the poor performance of AGR on Black women's faces betrays underlying logic that they are less feminine. While AGR technologies don't purport to recognize transness, they still construct Black bodies as gender-deviant according to gender norms.

By homogenizing the trans community, transnormativity narrows the scope and potential of trans liberation, forgoing opportunities for intersectional coalition-building in favor of focusing on issues pertinent to white, wealthy trans people. This history dates all the way back to Christine Jorgensen, the first American who was widely-known to have had sex reassignment surgery. As Snorton (2017) shows, the celebrity Jorgensen enjoyed as a white, attractive trans woman who was able to access medical transition contrasts sharply with several Black trans figures from a similar time period, many of whom were denied sex reassignment surgery or even prosecuted and incarcerated. In addition to marginalizing Black trans people, transnormativity historically and still today normalizes colonial and Western gender systems at the expense of indigenous people, whose gender variance is made out to be nonnormative. Through lumping two-spirit identities into a transgender umbrella, transnormative gender systems and movements "trap…non-Western identities within Western conceptions of gender/sex" (Dutta & Roy, 2014, as cited in Scheuerman et al., 2021, p. 5). In general, when administrative and technological

systems incorporate transness, they divide the trans population into legible and illegible groups, co-opting movements for trans liberation by assimilating legible trans people into the norm.

Many scholars have addressed the transnormativity inherent in technological systems that attempt to include and recognize trans people and their identities. For example, in Hicks' (2019) description of the digitization of the British welfare state, encoding trans people's genders as an exception to the norm had different consequences for different trans people. Despite framing transness as unnatural, the system still allowed those who "fit within the State's fiction of a gender binary" to change their gender in the computer system. Meanwhile, gender nonconforming people weren't recognized as trans, and may not have had their identities included in the gender categories, so they "remained illegible within, and unsettling to, the systems in place" (Hicks, 2019). Spade (2011) writes that such a practice of "add[ing] categories of legibility" into "administrative mechanisms of violent systems" simply expands their control (p. 86-87). In the case of surveillance systems, transnormative standards of gender actually discipline all people's genders, using trans bodies as the example of gender deviance to avoid (Spade, 2003, as cited in Beauchamp, 2019, p. 8). In fact, Beauchamp (2019) argues that trans people who "comply" with transnormative standards become "legible to surveillance mechanisms not as transgender but as properly gendered and thus nonthreatening" (p. 7). This divide between trans people who pass relatively smoothly through administrative and technological systems and trans people whose life chances are diminished via exclusion from those systems results from the co-opting of trans movements into demands for incorporation.

As I have shown to be the case, even trans people who become legible to technological systems face data violences, and incorporation has consequences for the construction of (trans)gender itself. When the state allows individuals to change their gender, and the medical

system performs gender-affirming interventions, a "paper trail of past identity markers" is created (Beauchamp, 2013, as cited in Vipond, 2015, p. 31). This prompts many of the violences discussed previously, from misgendering and outing to surveillance and the vulnerability of being counted. As an "X" gender category is added to some identification documents like the United States passport, with the first one gendering someone as neither male nor female having been issued in 2021, it's too soon to say what the impacts will be on "trans and nonbinary identity formation," but Adair warns that "such designations do not carry with them solely affirmative recognition" (Hauser, 2021; Adair, 2019, p. 589). Given my arguments thus far, it seems likely that if it hasn't already, "X" could rapidly become a third gender category incorporated by neoliberal systems and bestowing legitimacy to normative trans identities. As a means of resisting this transnormativity, I offer Stone's suggestion in her essay "The Empire Strikes Back" that trans people create a "posttranssexual" discourse, embracing a "gender identity outside of the gender binary as *other*, without creating a problematic and monolithic 'third gender.'" (Stone, 1991, as cited in Vipond, 2015, p. 35). Unfortunately, acknowledgement of the harmful consequences of incorporation of transness has largely led to misguided solutions within co-opted trans movements.

Misguided Solutions

Mainstream movements working to address data violences frequently turn to technologists and technological systems themselves for solutions, illustrating the pervasiveness of the belief that technology provides the best solution to most problems, termed technochauvinism by Broussard (2019). Inclusion discourse, despite admitting the harms caused by a given system, "position[s]… data science and technology as ultimately the solution to these

violences–as long as we design and deploy them in more inclusive ways" (Hoffmann, 2020, p. 10). The very technologies and tech companies maintaining "oppressive social orders" are thus framed as "integral to social progress" (Hoffmann, 2020, p. 13, 12). Naturally, powerful actors construct themselves as necessary and neutral, if not benevolent. Consequently, instead of radical change, reformist solutions like training and hiring more trans technologists become central to trans movements. Yes, it is important to involve trans perspectives throughout the design and development of technologies, whether or not the resulting systems interpret gender (Hamidi et al., 2018, p. 9). To do so, soliciting opinions through frameworks such as participatory design may be more effective than simply hiring trans technologists as token representation, as I discuss further in the next chapter. However, more disruptive solutions grounded in an understanding of administrative and data violence would require "questioning instead the very terms on which…[technological] systems operate" (Beauchamp, 2019, p. 18). Instead, not only does the incorporation of trans liberation movements lead to data violences, it also misdirects efforts to remedy any harms caused by technological systems.

Finally, inclusion is not the only discourse limiting and derailing liberation movements in the realm of technology. Hoffmann (2021) describes fairness and inclusion as "dual imperatives" of ethics, two intertwined, liberal ethical responses to "bias," in this case meaning the unequal distribution of life chances and resources, in technological systems (p. 1). She problematizes the focus on liberal concepts such as these, for though they are "practical for making data-based harms legible (and auditable) within dominant juridical and Western ethical frameworks," they are not enough to prevent or respond to data violence (Hoffmann, 2021, p. 1). Common progressive responses include rhetoric of responsibility, social good, and humanity, framing ethics as "iterative improvement" rather than "justice or radical social transformation"

(Hoffmann, 2020, p. 7). First of all, this implies that technologists are the best people to solve ethical problems, or at least are well-suited to do so. Many so-called solutions, including some proposed by Shelton et al. (2021) while purporting to offer change "at the root," would offer anti-bias education and ethics training for technologists, as if systemic injustice can be remedied on an individual level (p. 10). Liberal initiatives for change shouldn't be unequivocally rejected, as, say, tracking police violence is better than funding predictive policing algorithms, but they must be carefully attended to and critically analyzed (Shelton et al., 2021, p. 9). Hoffmann (2021) further critiques data justice, data feminism, and other movements responding to neoliberal data ethics for their limits too, registering an "unease" or "hesitation" that I adopt in my criticism here of Shelton et al. (2021) for the solutions they proposed in the final paragraphs of an otherwise radical analysis of gendered data violence in digital technologies that uphold the gender binary. After this analysis of misguided solutions to data violence, applicable directly to trans movements, I'm left with a concise yet complex question: what should we do with technologies instead?

Conclusion

This chapter surveys the harmful consequences that result from incorporation, discussed in the previous chapter, of trans people, identities, and movements into inclusion and recognition within technological systems. Following scholarship on administrative and data violence, I elucidated a range of ways in which trans people are vulnerable, beginning with the discursive effects of inclusion and datafication. In describing further data violences, I showed that trans people face potential harms both when they are recognized by technologies, through surveillance, data collection, and forced outing, and when they are not recognized, via

misgendering and exclusion. Then, I addressed transnormativity, one of the impacts that the incorporation of trans identity has on the construction of gender and transness. Transnormativity legitimates transness that is binary, medicalized, white, wealthy, and otherwise privileged, positing other forms of gender variance as deviant. By dividing trans and gender-nonconforming people into the legible and illegible, transnormative standards dictate who is included and recognized, and who is not, in different scenarios, distributing data violences accordingly. Following data violences and transnormativity, the final consequence of the incorporation of transness that I unpack is the misdirection of solution-seeking movements, trans-centric or otherwise, aiming to address data violences and technological bias. Ultimately, inclusion discourse and the concepts of ethics and fairness lead to limited reforms that fail to create structural change to the technological systems marginalizing trans people and co-opting trans movements. In this context of neoliberal incorporation and its consequences, I turn my attention in the next chapter to the radical potential of technology to disrupt the dominant gender system and further trans liberation.

Chapter 4: Liberatory Technologies

It would be a mistake to conclude this paper without considering the radical possibilities of technological systems, as I do not mean to imply that all technologies past, present, and future are inevitably oppressive and transphobic. Yes, within the established context, it is clear that technological systems facilitate the neoliberal incorporation of trans movements into demands for inclusion and recognition, frequently enable and commit data violences against trans people, and stabilize a transnormative construction of trans identity. However, we must not overlook historical and existing uses of technology to challenge the gender binary and further trans movements, even if these examples have yet to reach a scale comparable to data violences. Beginning with an overview of past and present radical trans technologies, I show that creative uses of technology have been liberatory for trans identity, individuals, and movements, destabilizing gender itself and connecting trans people to resources and community. I then consider the potential for contemporary activists and technologists to create liberatory systems for the future. Through the framework of design justice, I analyze the qualities and conditions necessary for technology to produce structural change as a tool of trans liberation, contending that technologies encoding radical values should be built by and for trans communities. Finally, I address technology governance and funding through an anticapitalist lens, ultimately arguing that technological systems should be separated from state control and corporate funding.

In order to conceptualize the role of technology in expanding opportunities and possibilities for trans people, it is helpful to understand the general qualities of a radical trans movement. Following his analysis of the legal equality political strategy in which trans movements seek antidiscrimination and hate crime legislation, Spade (2011) writes of an

alternative practice that he terms a "critical trans politics." This politics seeks to "meaningfully transform the existing distribution of life chances" by "working to dismantle [violent administrative systems] while simultaneously supporting those most exposed to their harms" (Spade, 2011, p. 19, 116). Thus, a critical trans politics opposes all oppressions and dovetails with other liberatory social movements; it is a set of strategies for trans liberation, as I have defined it previously, striving for a world without capitalism, imperialism, prisons, or any other obstacles to collective self-determination for trans people and for all. Crucially, it "aims to center the concerns and leadership of the most vulnerable and build transformative change through mobiliz[ing]" bottom-up, participatory resistance (Spade, 2011, p. 19). Spade offers some values that organizations practicing a critical trans politics may share, including ongoing self-reflection, leadership development, and accountability (2011, p. 109). He goes on to describe organizational strategies conducive to those values, such as non-hierarchical governance, grassroots funding, and good pay and benefits for employees (Spade, 2011, p. 110-111). These elements will resurface throughout this chapter as I investigate past, present, and future technologies that contribute to or embody a critical trans politics. I will consider liberation of individuals, identities, and movements separately, despite their interconnectedness, to conceptualize the multitude of ways that technologies can advance radical outcomes.

Past and Present Technologies

While it may seem like oppressive technologies, ubiquitous as they are, are the natural outcome of "technological ingenuity and good sense," there have always been radical alternatives (Ochigame, 2020). Ochigame (2020) writes that ever since information science

coalesced as a field in the 1960s, "anti-capitalists have tried to imagine less oppressive, perhaps even liberatory, ways of indexing and searching information." This claim holds true in the present day, as I will demonstrate through a multitude of examples, and extends far beyond information indexing and search to the general design and use of technology. For example, when it comes to data collection, Pool (2016) describes indigenous data systems resisting the "colonial order" by returning to the roots of their own culture. He explains that in Māori culture, social and economic relationships are traced by "*whakapapa,*" or genealogies of ancestry, tribes, and villages, which lend themselves to contemporary data on Māori people better than other methodologies do (Pool, 2016, p. 69-70). It becomes clear that not only do pre-colonial indigenous societies offer examples of technologies that weren't oppressive, but modern, unconventional attempts to integrate indigenous concepts serve as proof that there are "radical projects to dismantle [oppressive technologies] and build emancipatory alternatives" (Ochigame, 2020). Before turning to such projects in trans movements, I consider how technologies have supported trans people and deconstructed gender identity itself, since liberation for trans individuals and identities facilitate critical trans politics as a liberatory social movement.

Destabilizing Gender

Radical uses of technological systems have supported trans liberation by breaking down the dominant construction of gender identity and challenging the way computers understand gender. As previously discussed, the dominant system constructs gender as stable and unchanging, embodied, and according to a binary biological sex. Furthermore, as I have argued, technological systems contribute to the production of a normative mode of transness in which someone undergoes medical transition from one binary sex to the other. At the same time, some

technologies have destabilized this transnormative gender. Even something as simple as hormones, surgeries, and other medical interventions can be considered radical technologies because they allow for many configurations of gender transition, enabling individuals to evolve into a more authentic self while embodying a gender unintelligible to the dominant system (Gill-Peterson, 2014, as cited by Haimson et al., 2021, p. 355). Digital media deconstructs gender even further. Stryker (2017) argues that gender in a digital world has shifted away from a representation of physical sex and towards a "fabrication" existing without mapping onto the body (p. 44). In the same vein, datafication translates bodies, including gender, into something digital, represented by numbers or categories. Although digital representations of gender can be flawed, contributing to a stabilized identity, their mere existence subverts the dominant conception of gender. Perhaps the reductive binary gender categories enforced by many digital and data technologies serve as an attempt to quell the inevitable instability of a datafied trans body.

To this end, technologies have been used to liberate gender from its restrictive construction, primarily through allowing for anonymity and imitation. In cyberspace, the human body can be represented however one chooses (Stone, 1999, p. 72). From selecting video game avatars to engaging in cybersex, the internet provides people with virtual opportunities to "cross-dress" and pass as any gender (Stryker, 2017, p. 43; Wajcman, 2000, p. 458). As demonstrated by Alan Turing's "sexual guessing game" in which an interrogator must predict gender based on written responses to their questions, while respondents attempt to imitate other genders, "imitation makes even the most stable of distinctions… unstable" (Halberstam, 1991, p. 443). Virtual reality (VR) technologies provide another overt arena for playing with gender, "enabl[ing] the crossing of gender and identity boundaries and embodying of multiple realities

simultaneously" (Cárdenas, 2011, as cited by Haimson et al., 2021, p. 355). In a fascinating

example, a team of European researchers created what it calls "The Machine To Be Another"

(BeAnotherLab, 2022; Turk, 2015). The experiment allows two users to swap perspectives with

each other, viewing the other person's body as their own and viewing their own body from a

third person perspective, using VR headsets. One potential use of this technology is a 'gender

swap' among participants of different genders, offering an opportunity for individual reflection,

building empathy by seeing through another's eyes. This could be an opportunity for further

research, especially into the effects this technology can have towards destabilizing gender.

Other gender-swapping technologies exist with mixed benefits and drawbacks for trans

people. A viral Snapchat filter meant to swap a user's gender was released in 2019; selecting

female will project makeup and long hair onto someone's face, while the male filter adds short

hair, stubble, and squarer features (Anderson, 2019; Mahdawi, 2019). This certainly reinforces

the idea of gender as binary and physical features as gendered. Many people who aren't trans

have used it for comedic effect, implying that cross-dressing is a joke and trans identity is merely

a costume. However, the filter has also allowed trans people to envision what they might look

like following years of gender-affirming hormone therapy, arguably increasing trans possibilities,

at least for individuals. Likewise, the technology for deepfake voices also offers potential gender

euphoria while continuing to gender different traits, in this case the pitch of one's voice. A

startup making "voice skins" for gamers to speak in the voice of their character found that many

trans people wanted to use this technology to reduce their dysphoria and avoid outing themselves

via video chat (Simonite, 2021a). For example, if a trans woman's profile presents as female, but

she has a deeper voice, she might face harassment from other gamers; using a deepfake voice

could protect her. While "any new technical adaptation won't change the underlying reason

many trans people are wary of public spaces, digital or otherwise," these technologies ease the experience of individual trans people (Simonite, 2021a). Further, it is worth noting that these technologies allow all people, trans or not, to play with different gender presentations, unsettling normative gender identity.

While VR, filters on photos, and other technologies facilitating anonymity and imitation have the power to alter social understandings of gender, challenging technological understandings of gender is also beneficial for trans liberation. One practice—arguably a technology itself—that interferes with surveillance technology's use of gender is drag. Kornstein (2019) offers an analysis of drag as both "a conceptual framework for rethinking assumptions about the users and uses of popular technologies" and "a set of practical techniques" for reducing or eliminating the harms of surveillance (p. 683). They investigate a phenomenon from 2014 in which Facebook's facial recognition algorithms struggled to uniquely identify drag queens, instead tagging them as each other (Kornstein, 2019, p. 681). In addition to illustrating the effects of basing technology design on neat and simple gender categories, drag impedes the profitability of social media by devaluing the data extracted from individuals and their photos, as it is no longer dependable (Kornstein, 2019, p. 683, 685, 687). While drag queens are not necessarily trans themselves, drag as a practice resists the gender binary and in doing so renders technological notions of gender less useful for surveillance purposes. A workshop offered by the Algorithmic Justice League entitled "Drag Vs AI" demonstrates this through an experiment where, after learning about AI-based surveillance, participants actually apply drag makeup and try facial recognition technologies on themselves (Algorithmic Justice League, 2022b). As drag challenges stable, technologically-encoded gender categories, it resists a transnormative gender system, supporting the liberation of trans identity.

Resources and Community

  Although breaking down the gender binary through technology certainly helps trans people, technologies that connect them to resources are arguably the most important for radically changing individual lives. Other than by word of mouth, information by trans people, about resources *for* trans people, has typically spread through independent queer media technologies. For historical examples, I turn to the book *Information Activism*, which traces lesbian information-sharing beginning in the 1970s (McKinney, 2020). This history is relevant as the predecessor to contemporary trans media because although many lesbians are not trans, most lesbian circles contain trans and gender-variant people, especially in the time before transgender as a concept emerged as distinct from sexuality. Likewise, information-sharing among gay men surely circulated resources to trans and gender-variant people as well. Lesbian print newsletters, telephone hotlines, and indexing projects served as technologies "connect[ing] lesbians at a distance" and "put[ting] actionable information at users' fingertips" (McKinney, 2020, p. 28, 29). In addition to supporting social movement-building, which I will discuss shortly, these lesbian technologies were sources of basic resources for individuals, from emotional support, to social spaces and events, to directories of lesbian professionals like doctors or plumbers (McKinney, 2020, p. 28). It is by facilitating lesbian networks that media technologies spread information about resources.

  Similarly, trans networks today liberate trans individuals by providing them with important resources. With a majority of information-sharing taking place on the internet, resources are more readily available than they were through past networked technologies in the form of print media. Though I reserve further discussion of the internet's wide reach as a tool of

liberation for the next section about trans movements, it's important to acknowledge that for individual trans people, online resources about gender identity and medical care can be lifesaving. Even before the development and popularization of social media platforms, trans websites offered a rare opportunity for trans people to learn from media produced by other trans people, even if they didn't know any themselves or would be unsafe attending a gathering in person. For example, Hudson's FTM Resource Guide, started in 2004 and still in existence today, consolidated information from print sources about medical and social transition for transmasculine people on a free, easy-to-access website (*Hudson's Guide*, n.d.). Today, there are countless lists of trans-friendly doctors, apps offering voice training for trans people, and many other resources enabling trans people to live authentically (Haimson et al., 2020, p. 2). There are also technologies promoting safety, mapping safe or gender-neutral restrooms, or simply allowing trans people to share their location with trusted contacts (Haimson et al., 2020, p. 2). There are even trans influencers on social media, many of whom answer questions, provide resources, and document their own transitions. In other parts of this paper, I have criticized some of these same technologies for constructing a normative transness by legitimating only a certain mode of transition. This critique remains relevant, but should be considered alongside an understanding that technologies providing resources or safety can be liberatory for trans people, even as they may have a stabilizing effect on transnormative identity.

As I've touched on in my discussion of individual trans liberation through access to resources, communication technologies are also a very important part of community-building and social movement organizing, making them instrumental for trans liberation. Haimson et al. (2021) write that "from the earliest days of bulletin board systems," trans people have used digital technologies not only for accessing resources but also to communicate and organize (p.

346). Using the social media platform Tumblr as a case study, they elucidate several features of technologies that are especially conducive to the formation of trans communities. First, communities on Tumblr can be "separate from existing or everyday networks," allowing trans people to come out to each other but not to their real-life social networks (Haimson et al., 2021, p. 349). This allows them to share their experiences openly and "present new identities that [will] eventually become real in a material, embodied sense" (Haimson et al., 2021, p. 349). Through the anonymity offered by technology, then, trans people explore more than just imitation; they experience realness, freedom to be themselves. In this way, digital communication technologies have fostered trans community-building, allowing trans people to share support and friendship as their most authentic selves. Sometimes, this support takes place "related to another identity" that intersects with transness (Haimson et al., 2021, p. 352). For instance, trans people of color respond to the whiteness of many trans organizing spaces by "reclaiming community, gender, and sexuality from white cisgender ideology" online together (Haimson et al., 2021, p. 353). The connections trans people make with each other via technology are a crucial part of trans movement-building.

Ideas and Organizing

Another property of technology useful for trans liberation movements is the ability to reach a very large, geographically-dispersed audience. Beyond simply building a larger trans community and allowing activists in different areas to coordinate, the viral potential of the internet can spread radical ideas to people outside the online trans communities that produce them. To understand the contemporary technological potential for trans liberation, I first consider analog communication technologies. Even before the internet, technologies advanced liberation

movements by spreading radical ideas through what Ochigame (2020) calls the "wide circulation

of ideas of the oppressed." After the revolution in Cuba, the lesbian director of the national

library offered radical changes to librarianship in the form of a "popular library," even sending

buses to rural areas as mobile libraries (Ochigame, 2020). Revolutionary librarianship

acknowledged that information organizing is not neutral, and as such, chose to promote radical

literature that had previously been suppressed (Ochigame, 2020). Ultimately, this impacted the

development of Cuba's "computing industry and information infrastructure" as well as the field

of information science (Ochigame, 2020). Later, priests in Latin America in the 1970s worked

similarly to liberate information by challenging the church's censorship, aiming to promote

"development of a critical consciousness involving reflection and action to transform social

structures" (Ochigame, 2020). The "liberation theologians and allied activists" designed an

"intercommunication network" that would circulate information without manipulating it

(Ochigame, 2020). Through print media and the postal service, they published texts analyzing

systems of domination—ideally written by marginalized people themselves—sometimes

documenting struggles for liberation (Ochigame, 2020).

Simply "circulating" the radical "ideas of the oppressed," as Ochigame would say,

enables liberatory movement organizing, and the ease of doing so has increased as technology

has developed further (2020). More modern examples include those in Hatch's (2017)

description of how mass media technologies have impacted Black liberation movements. From

the photograph of Emmett Till's open casket, to the video recording of police officers beating

Rodney King, media has always been integrated into resistance against racism; however,

smartphones and social media create exposure on a completely different scale, circumventing

"traditional corporate media" coverage (Hatch, 2017, p. 128, 129, 130). As another example, the

1999 anticorporate protests at the World Trade Organization's Millennium Summit in Seattle were coordinated through communication technologies (Davies & Razlogova, 2013, p. 14, 17). Different organizations formed a loose and therefore difficult-to-derail coalition "with a sparse bureaucracy, decentralized decision making, and minimal hierarchy," coordinating transnational networks on a scale unimaginable without the internet (Davies & Razlogova, 2013, p. 17). Studying the impact of digital and internet-based communication technologies on many of today's influential social movements has offered several strategies for organizing.

However, the use of technology for organizing is not entirely beneficial for liberation movements. Even without reliance on traditional media corporations, corporate control is still enacted through the content moderation and algorithms of social media companies that promote or prevent posts from going viral (Hatch, 2017, p. 131). Besides, just because radical information spreads far and wide does not mean political action will increase, as "mouse-click online political engagement" does not build the "interpersonal communities" necessary to support movements (Davies & Razlogova, 2013, p. 19). Other downsides of digital movement-building include the relative ease of government surveillance online and the fact that populations lacking access to the internet are subsequently excluded from online organizing (Hatch, 2017, p. 131). Black Lives Matter protesters and organizations, for example, have faced digital surveillance from police in "a recasting of old strategies with new technologies" (Hatch, 2017, p. 130). Finally, both the viral spread of information and the extensive community networks built through social media are used just as effectively by neoliberal groups organizing around demands for inclusion and recognition and by conservative groups spreading potentially transphobic or otherwise bigoted information. Still, the internet is more than a site of oppression; it's also an organizing space with the power to reach new people that may be persuaded to join a radical

movement or support its demands. Trans liberation movements may already employ the digital activism strategies I've discussed thus far, but I name them here as an explicit acknowledgement of technology's radical potential. Likewise, as I now turn to recommendations for design and development of future technologies, I recognize that some of the strategies I propose are already employed by various organizations. However, I offer and explain a multitude of suggestions in order to consolidate the findings of my research, since much of the innovative work being done at the intersection of trans liberation and technology is relatively disparate.

Future Technologies

With the right insights, future technologies can capitalize on their potential to be liberatory. To avoid producing discriminatory social consequences, technologists must incorporate ideas from STS into every phase of technology development, but especially design, as it is the stage in which the final form of a product is imagined and decided. Sasha Costanza-Chock (2018) theorizes the field of design justice, taking after Spade by incorporating an analysis of the ways that technological systems construct and disseminate privileges and harms. They urge technology designers to change their values and get political in order to "ensure a more equitable distribution of design's benefits and burdens." Adhering to the Design Justice Network's principles is one way to do so. The first principle of design justice is the Network's expression of the purpose of design: "to sustain, heal, and empower our communities, as well as to seek liberation from exploitative and oppressive systems" (Costanza-Chock, 2018). This explicit focus on communities and liberation provides two primary means through which

design can intervene in the status quo of oppressive technological systems, participation and values.

Design and Participation

First, design justice aims for "sustainable, community-led and -controlled outcomes," in part through learning from existing community strategies and "uplift[ing] traditional, indigenous, and local knowledge and practices" (Costanza-Chock, 2018). The political nature of centering impacted communities is outlined clearly by Keyes, Hoy, and Drouhard (2019) in the framework of Anarchist Human-Computer Interaction (HCI). They write that "Design Justice also aligns with social anarchist principles of autonomy and self-determination." As a complementary theory, Anarchist HCI encourages decentralized technologies deferring to local communities as those who should have "the powers to modify, adapt, and repair" the technologies themselves (Keyes et al., 2019). This can be achieved in part through affordable technologies making use of open source software, since that allows for communities to make changes themselves, rather than saddling them with standardized infrastructure that can't be changed (Keyes et al., 2019).

There are several different methods that allow for community input in design. In general, they revolve around the idea of participation, a strategy common to critical trans politics as well. Participatory Design, for example, comes from Scandinavia and originally involved workers collaborating on and negotiating the design of workplace technologies, finding great success in part because it relied on local union culture (Irani et al., 2010, p. 1317; Sloane et al., 2020). In general, participatory methods "think of design processes less as ways that designers can formulate needs and measure outcomes, and more as shaping and staging encounters between multiple parties" (Irani et al., 2010, p. 1317). This results in an emphasis on the power dynamics

between user and designer and on the responsibility designers have to future user communities (Irani et al., 2010, p. 1318). Some would argue that the highest form of participation is to have the designers themselves be future stakeholders and users of the final product. Relatedly, Anarchist HCI argues for "a re-evaluation of inclusivity in our field," acknowledging the lack of diversity in the tech industry (Keyes et al., 2019). If, as Chock (2018) writes, community members have "tacit and experiential knowledge" that offers unique and important ideas for design, why not have them be the designers? Haimson et al.'s (2021) description of a "trans technology" includes being "designed specifically by and for trans people" and therefore capturing the "complexities of trans experiences" (p. 357). Thus, in the setting of technology for trans liberation, participation could in part involve training and hiring more trans designers and developers.

Of course, participation itself is not a flawless strategy, and it can easily fall into "participation-washing," or the use of participation to write off any potential harms while subtly exploiting the labor of participants (Sloane et al., 2020). Sloane et al. (2020) write that "design justice can almost be seen as an oxymoron: given the extractive and oppressive capitalist logics and contexts of ML [machine learning] systems, it appears impossible to design ML products that are genuinely 'just' and 'equitable.'" Rather than writing off design justice and other participatory methods as useless or harmful, they simply caution against the notion that participation is all it takes to produce a liberatory technology (Sloane et al., 2020). Indeed, participation can function as a form of inclusion discourse, used as a neoliberal solution that does not inherently guarantee the needs of the trans community will be met. For example, employers may feel their equity work is done upon hiring a diverse workforce, but including trans technologists does not replace actual participatory design methods. Anarchist HCI offers an

alternative, where designers and community members are seen as "accomplices" rather than overseers and participants (Keyes et al., 2019). This framing could prompt more equal exchanges of power between technologists and impacted communities, but even the most collaborative design processes fall far short of liberation if the technologies being designed will contribute to structural violence, as is the case with surveillance technology, for example.

Liberatory Values

In addition to community participation in design, then, it is important to address the actual purpose and uses of technologies. Hoffmann cites Virginia Eubanks, who concisely argues that technology must be built for the intentional dismantling of inequality in order to avoid reproducing existing disparities (Eubanks, 2018, as cited in Hoffmann, 2019, p. 907). Design justice argues that this can be done through intentionally encoding liberatory values. Chock (2018) writes that "typically through user mobilization, platforms and systems can be redesigned to encode alternative value systems." The question remains, what values should designers follow? The report "Technologies for Liberation: Toward Abolitionist Futures" offers examples of liberatory values embedded within what it calls movement technologies, or "tools created and used by organizers" to address community needs (Schweidler, 2020, p. 78). Ultimately there are many ideas about how to steer technologies towards equitable and just outcomes, but I will elucidate several widely agreed-upon values that I believe are most relevant to liberation.

As mentioned in previous discussion of communication systems and the internet, technology enables information to disperse far and wide, but there's no guarantee that the information spreading is radical. It has been established, most famously through Noble's (2018) book *Algorithms of Oppression*, that search engines like Google often promote bigoted content

or misinformation to a higher rank in their search results. This occurs not on the level of individual designers but as more a subtle mechanism within the priorities of the algorithms that decide which websites are "relevant" to display. The idea of critical search, in which search engines "actively strive to increase the visibility of counterhegemonic intellectual traditions and of historically marginalized perspectives," is a proposal to radically reconfigure search engines (Ochigame, 2020). Imagine, for example, if search engines promoted educational materials for people to learn about issues facing the trans community rather than sensationalized articles that may be misleading. While this is a hypothetical project, critical search certainly inherits the lineage of existing communication technologies that transmit radical ideas, in this case deliberately producing a liberatory outcome.

Privacy, autonomy, and consent form another set of values that should be prioritized by technology designers. Data privacy is very pertinent in contemporary society, where surveillance abounds and sensitive information is kept online where it could be hacked. Even something as ubiquitous as the sharing of depersonalized data across platforms can feel like a privacy violation, yet in many cases users cannot opt out of the tracking of their behavior. Several collectives of leftist organizations, described in the "Technologies for Liberation" report, are attempting to address this issue by building their own "solidarity platforms" (Schweidler, 2020, p. 128). May First Movement Technology hosts email addresses and websites on "collectively-owned, encrypted hardware," and Palante Technology Cooperative offers tech support to social movement organizations in need of data storage and security infrastructure (Schweidler, 2020, p. 128, 129). By offering independent, decentralized options, these organizations protect communities from systems designed to exploit their data, illustrating the transformative power of centering privacy when designing technologies (Schweidler, 2020, p.

17). Similarly, allowing users control over their personal data and when it is collected or used is an important feature to add to technologies meant to be liberatory. Anarchist HCI naturally promotes autonomy, as it is a central value of anarchism in general, and with autonomy comes the need for consent (Keyes et al, 2019).

One instance where scholars addressed consent in technology is through the Feminist Data Manifest-NO, a document drafted at a Feminist Data Studies Workshop by a multidisciplinary group (Cifor et al., 2019). The document describes itself as "refus[ing] harmful data regimes and commit[ting] to new data futures," and it consists of a list of refusals paired with corresponding commitments, several of which call for consent (Cifor et al., 2019). The authors write that instead of coercing user consent by requiring the "click of a yes to a terms of service agreement" in order to use a product, there should be a real option to say no to the tracking and use of personal data (Cifor et al., 2019). Indeed, labeling the statement as a Manifest-NO rather than a manifesto underscores the importance of designing for consent through the maintenance of avenues of refusal. In today's world, where so much of our personal and professional lives reside online, few can truly afford to divest from technologies that require us to sign away the ownership of our data. The social media technologies I've described as liberatory for trans people, for example, require agreement to a seemingly-infinite list of terms and conditions in order to access the resources and community hosted on those platforms. Designing with and for consent, it appears, can balance some of the potential pitfalls of participation (Keyes et al., 2019). It remains controversial if the "provision of data" about sex and gender should ever be mandatory for participation, but there certainly should be an option to refuse in cases where gender data is wholly irrelevant to the research being done or the technology product being used (Guyan, 2022, p. 179; Chuanromanee & Metoyer, 2021).

Finally, in addition to the promotion of radical thought, privacy, and consent, designing for trans liberation requires actively resisting gender norms and transnormativity. As I've discussed, technological encodings of gender relying on narrow understandings of transness produce a legible trans identity at the expense of trans people who fail to conform to a binary, white, medicalized standard. Trans technologists and scholars have offered many recommendations for technological design that avoids the norming of gender, some of which I reiterate here (Scheuerman et al., 2020). Chuanromanee and Metoyer (2021) suggest that transition-tracking apps challenge a normative narrative of transition that follows a specific sequence of gendered steps towards a final destination. Rinçon, Keyes, and Cath (2021) conclude from interviews with trans people that voice-activated AIs like Siri or Alexa should avoid offering a "gender-neutral" voice, as it would embed stereotypes about trans and nonbinary people, and should instead design for "gender instability" and flexibility, where users can modify the voice and its gendered persona (p. 21). These specific recommendations offer general principles applicable to other technologies, too, like avoiding gender-specific features and not assuming users' genders from names and photos (HCI gender guidelines; Chuanromanee & Metoyer, 2021).

Governance

Having discussed existing liberatory technologies and their characteristics, and offered design recommendations prioritizing participation and liberatory values, I turn to the broader landscape of governance and funding. No matter the stance individual designers may take on trans liberation, and regardless of the effect they may be able to have on individual technologies, it is difficult to produce an "ethical" product or ensure its "ethical" use under a system as

structurally violent as capitalism. For example, despite its image as democratic, much of the internet is controlled by states and corporations; information is regulated, military operations are carried out, and people are increasingly surveilled (Davies & Razlogova, 2013, p. 24, 25). From the perspective of Anarchist HCI and anarchism in general, the state is "fundamentally dangerous" and centers its own survival over that of its citizens (Keyes et al., 2019). Capitalism, too, is driven by power and profit rather than social well-being. Consequently, technologies "metastasi[ze] capitalism and the state's worst intentions and vice versa" (Keyes et al., 2019). Thus, in the current sociopolitical system, most technologies fail to meet the social needs of trans people and therefore do not align with the goals of trans movements or of liberation movements in general.

Radically altering governance and funding structures to avoid the influence of states and corporations would certainly assist the development of liberatory technologies. Scheuerman, Pape, and Hanna (2021) write of the potential for facial analysis technology to be separated from its history of "gender colonialism," arguing that the interests of corporations and "militaristic nation states" must be neglected in favor of equitable values (p. 12). This vision, of "wresting the power of science away from corporate and military control and toward the fulfillment of social needs," was the focus of the Science for the People (SftP) movement that took place in the United States in the 1970s and 80s (Schmalzer, 2017, p. 173). From spreading radical ideas through a quarterly magazine to "providing scientific expertise and technical support to organizations like the Black Panthers," SftP modeled a movement uniting scientists and activists (Schmalzer, 2017, p. 174). Despite SftP's radical analysis, the governance of technology today is still intertwined with the state. Sometimes, existing regulations are reinterpreted for technological systems, or traditional interventions like taxes are used (Caplan et al., 2018, p. 24,

25). Frequently, however, the market and industry are left to regulate themselves (Caplan et al., 2018, p. 25). While tech workers have on occasion organized against their employers—most notably when their products have been used for policing and warfare as with Google's Project Maven—we can't wait for the industry to "regulate itself on the basis of popular sympathies" (Benjamin, 2019, p. 185).

One means of holding technologists and their employers accountable for any harm caused by their work is through auditing. Actual accountability, applying the Algorithmic Accountability report's definition to other technologies besides algorithms, would require audits before and after a product is operationalized, "standardized assessments for any potential harms," and "enforceable policies" to follow in the event it is determined that a technology has adverse consequences (Caplan et al., 2018, p. 22, 23). Benjamin (2019) argues that audits should be independent and involve community organizations, pointing to the Dataset Nutrition Label project, which would offer basic facts and quality measures for a dataset, as an example (p. 186, 188, 190). In general, audits of technological systems must ask whether the systems should be built at all, when they should prioritize individuals versus society, and what unintended consequences they might have (boyd and Elish, 2018, as cited in Benjamin, 2019, p. 186). As of yet, there is no centralized agency charged with "develop[ing] standards, audits, or enforc[ing] necessary policies," but lawmakers could create one (Caplan et al., 2018, p. 25). However, if state-mandated or state-funded, audits may succumb to state interests. For instance, the European Union regulates data protection and privacy for individuals, but these rights are revoked in the event that "authorities" deem personal data necessary for preserving public security or investigating crimes (Benjamin, 2019, p. 187-188). Whether or not audits can detach the governance of technologies from the state and the tech industry depends on who governs the

audits themselves. They best serve trans liberation as a temporary strategy while more drastic changes in governance are made.

An indigenous model of data oversight offers an interesting example of how marginalized communities could hypothetically retain authority over the technologies that impact them. Snipp writes about the conditions necessary for data decolonization, arguing that indigenous peoples must be empowered to guide data collection according to their priorities, determining who counts as indigenous, what data is collected, and who can access the data (Snipp, 2016, as cited in Kukutai & Taylor, 2016, pp. 6-7). In order to meet these conditions, "governance arrangements that allow for institutional oversight of research and data collection" by indigenous people should be formed (Snipp, 2016, as cited in Kukutai & Taylor, 2016, pp. 7). The resulting authority that indigenous peoples would have to manage all data about their members, lands, and cultures can be considered a model of indigenous data sovereignty "rooted in their inherent rights to self-determination" (Kukutai & Taylor, 2016, p. 14). The #MMIWGT2S campaign demonstrates the power of indigenous authority over data. Researchers at the Sovereign Bodies Institute studying "gender and sexual violence against Native communities" created a database of missing and murdered Indigenous women, girls, trans, and two-spirit people (MMIWGT2S) (Schweidler, 2020, p. 71). They did so to counter state reports underestimating the level of sexual violence and used Indigenous methodologies to capture additional data, such as details about burial ceremonies and sex worker status (Schweidler, 2020, p. 71). Clearly, communities are empowered rather than marginalized when they have the authority to determine if, when, how, and what data is collected about them. This model of community control over data proves especially poignant for trans liberation movements, as the various pros and cons of measuring transness should be debated by trans communities.

Finally, I follow several key scholars in arguing that governance of technology should be cooperative and community-run. Given the current climate of governance as I have described prior, and the alternate models I've explored, it is clear that state and corporate power must be transferred to local collective actors. Just as Spade's critical trans politics recommends non-hierarchical governance and consensus decision making, so too does Anarchist HCI advocate for "communalism" and "self-governing voluntary associations" (Spade, yr, p. 109; Keyes et al., 2019). Haimson et al. (2021) argue that sustainable governance of a "trans technology" would resemble "a publicly available technological platform maintained by a cooperatively governed organization" (p. 357). In order to effectively eliminate unequal power exchange, organizations controlling technology should be decentralized, much like the "smaller, regional organizations that for many years formed the backbone of trans organizing" or like the local chapters and bottom-up strategy of SftP (Keyes et al., 2019; Haimson et al., 2021, p. 357; Science for the People, n.d.). Additionally, communities should be centered through "clearly designated access points for member input" to cooperatives, allowing them to decide the terms of social organization themselves (Haimson et al., 2021, p. 357; Keyes et al., 2019).

Building community autonomy enables the development of community alternatives to state and corporate technological systems. For example, hacker collectives like Anonymous and websites that remove paywalls subvert corporate governance and control over information by making private documents accessible to the public (Deseriis, 2013). As another example, in the case of Washtenaw County, Michigan, activists created community ID cards to rival driver's licenses (Adair, 2019, p. 589). The IDs don't have sex markers, making them more comfortable for trans people who may not be able to or desire to change their sex legally, not to mention undocumented people lacking state legibility (Adair, 2019, p. 589). This subverts state

governance of technology and control of trans people's movement, redirecting power to local groups on behalf of the people (Adair, 2019, p. 589). Striving for collective solutions that equalize power relations among designers, users, and other stakeholders provides the best chance for technological systems to meet trans peoples' needs, resists stabilizing gender, and contributes to trans liberation.

Funding

State and corporate interests are perpetuated in technologies through their funding, in addition to their governance. According to Edwards, the origin of the internet itself can be traced to "US military funding and state control of computer science research" in the 1940s and 50s (Edwards, 1996, as cited in Davies & Razlogova, 2013, p. 6). Several decades later, the Science for the People movement identified the "government-corporate axis" as funding research that developed "technologies harmful to human health and freedom" (Schmalzer, 2017, p. 176). Today, big tech funds academic research through partnerships—some of which have produced scholarship included in this paper—with universities using rhetoric of "ethical AI" to avoid governance from the state (Ochigame, 2019). Companies influence their partners' work, and the resulting work thus presents moderate changes to harmful technologies as a legitimate solution to their violences, evading legal restrictions that would cut into corporate profit (Ochigame, 2019). Therefore, a corporate funding structure perpetuates the use of technologies that produce transphobic data violences as discussed in this paper. On the other hand, the "creation and development of movement-led infrastructure" is underfunded, so many movement organizations rely instead on corporate tech platforms, as there aren't enough radical collectives providing

affordable tech support to meet potential demand (Schweidler, 2020, p. 17, 23). This compromises privacy and safety.

In addition to the relatively small platforms that do offer tech support to movement organizations, there are some wider-reaching movements against the current funding structure of technology. The organization Mijente released a report in 2018 that "expos[ed] the financial dealings between the US government and the tech industry," prompting the #NoTechForICE movement (Schweidler, 2020, p. 57). #NoTechForICE is a coalition of migrant communities, tech workers, and organizers "explor[ing] divestment strategies and interven[ing] at the point of sale for surveillance products" (Schweidler, 2020, p. 57). They apply social pressure for companies to reject ICE contracts, or for other organizations to cut ties with companies like Amazon and Palantir, the latter of which has faced the most consequences, having been dropped as a sponsor from major conferences like the Grace Hopper Celebration. The use of state funds to finance the development of violent technologies, as exposed in Mijente's report, demonstrates the need for an alternative model of funding.

First, when self-funding by a community is possible, community control is preserved. Much of the existing indigenous infrastructure is self-funded, for example. Because "FCC funding for broadband infrastructure…[is] based on a colonial internet model," communities have created their own infrastructure through community technology centers (Schweidler, 2020, p. 122-123). The Indigenous Connectivity Summit calls upon infrastructure initiatives in Native communities to prioritize "community-owned networks, sustainability, [and] cultural preservation," among other values, most of which would likely not be considered by state and corporate funders (Schweidler, 2020, p. 124). One such example is the open-source wifi network built by water protectors demonstrating against the Dakota Access pipeline. At a time when

activists were facing cyber-attacks, this network allowed information about what was happening at Standing Rock to spread online, prompting a solidarity movement (Schweidler, 2020, p. 125-127).

Liberatory technologies cannot always be self-funded, however. Even user-donation models are often insufficient and unsustainable, in part because of the "financial challenges [that] many trans individuals already face" (Haimson et al., 2021, p. 357). Instead, Haimson et al. recommend "a variety of funding streams, such as donations, grants, and sliding-scale memberships" (p. 357). As with Spade's theorization of critical trans politics as using grassroots funding or membership dues, member-based funding of "trans technologies" forms a "decision-making collective" where members, who are likely users of the technology in question, "can exert agency" (Spade, 2011, p. 111; Haimson et al., 2021, p. 357). Additionally, though not ideal, individual "forward-thinking funders" could support movement technologies if they "understand the need to couple support for innovation with support for…grassroots organizing" (Schweidler, 2020, p. 17). Finally, organizers often call for "redirecting funding from the prison industrial complex into community resources" (Schweidler, 2020, p. 21). If communities have autonomy and choose to develop collective technologies, they should do so as a part of a broader overhaul of funding based on their values.

Conclusion

This chapter challenges the previous two, expanding understanding of technology beyond the harms it causes. To do so, I survey a large assortment of existing and historical technologies that each, in their own way, contribute to liberation. I begin by discussing those that destabilize the gender binary and then show that even simply connecting trans people to resources,

community, and organizing is radical. Then, I offered recommendations for technologists to try to further trans liberation and avoid encoding data violences. Design offers a key point of intervention through which participation of impacted communities and intentional encoding of liberatory values can make a big difference, especially if the participating stakeholders are on equal footing with technologists and will have some ownership and control over the final product. Additionally, liberatory values like consent, the spread of radical ideas, and an understanding of gender that resists transnormativity should be considered while technologies are designed and implemented. Finally, I reference the governance and funding landscape of different technologies. In the capitalist, neoliberal context of the United States, state and corporate interests dominate technological development; if impacted communities of users become the owners of technologies made for them and data harvested from them, power relations will ideally be equalized and radical aims like trans liberation can more easily be pursued. I suggest that future technology development be geared towards local, decentralized community funding and governance.

Review and Conclusion

To conclude this thesis, I will now conduct a thorough review of my arguments and then will offer some final thoughts. In the first chapter, I conducted a literature review of both trans studies and science and technology studies. During the process of introducing major scholars and theories, I dispelled several common myths about gender and technology that were necessary to clarify before conducting any further analysis. First, I defined gender as a social construct, most typically expressed through the dominant gender system's conflation of gender with binary sex assigned at birth. In reality, gender and sex are not binary, and gender is a social identity that is not natural or essential to the body. Then, I expressed several definitions of transgender, ultimately choosing to use it as an expansive term referencing gender variant experiences outside the binary, cisgender norm. Importantly, I cited Snorton (2017) to acknowledge the racial history of gender in which transness and Blackness are intertwined and Black people are othered according to white gender norms. I also defined liberation as related to a history of anti-capitalist movements seeing an end to all oppressions. Finally, I covered themes of embodiment, radicality, and history in trans studies.

Moving on to an introduction of STS, I traced the field's origins and then defined technology broadly, noting the particular relevance of design and development of "devices and infrastructures" for the rest of the paper (Felt et al., 2017, p. 19). I covered the basics of feminist STS, including the important arguments that technology and gender are co-produced. Like gender, technology and data aren't natural or objective; rather, like knowledge, they are situated. This implies that technology is not inherently good or bad, which provides a foundation for my analysis of both its violences and its liberatory possibilities. After explaining the growth of STS

into the tech industry and to other subfields, I address more myths, explaining that technologies can be biased and oppressive regardless of their intended usage and do not offer the best solution to every problem. To wrap up the introductory chapter, I share that the methods behind this thesis are transfeminist, utilizing case studies as is typical in STS, and conducting discourse analysis of gender and technology.

In chapter two, I argue that technology facilitates the neoliberal incorporation of transness through inclusion and recognition. I begin by explaining the way that radical movements become co-opted by the state and demand legal equality as the ultimate solution to oppression, using the dilution of gay liberation into marriage equality and the prioritization of anti-discrimination legislation as informative examples. Then, I introduce Spade's (2011) work on administrative systems, and Hoffmann's (2020) application of that work to technological systems, as a central framework for understanding the flaws of attempting assimilation via legal reform. Because these systems marginalize vulnerable people, including trans people, seeking acknowledgement of transness from those systems fails to induce structural change and instead perpetuates violence and normativity.

Before expanding upon the consequences of incorporating transness into technological systems, I elucidate the processes of encoding gender through which technology enables incorporation. In order to achieve legal equality, trans identities must be included in gender categorization schemes, but doing so requires choosing new gender categories and thereby reconstructing gender itself. Depending on the subjective decision-making of, say, survey designers, the results of data collection that purports to measure transness will vary. Inevitably, some trans identities will be excluded—typically those furthest from the dominant gender system—and even inclusion creates vulnerability for people who aren't out as trans. I address

several strategies for measuring transness that attempt to both produce better data and mitigate the effects of stabilizing certain trans gender categories.

In addition to encoding trans identities, technologies employ several strategies for recognizing trans people as fitting trans categories. The neoliberal model of identity, naturally present in a movement being co-opted, frames gender as individually self-determined, neglecting the fact that gender recognition is easier to achieve for trans people with more normative identities. An alternate theory of gender and transition as communal is more appropriate for a social constructionist approach to gender, but technologies tend to perpetuate the individualization of gender as they recognize transness. First, trans people are sometimes dealt with as errors or exceptions to the rule, as their gender is recognized in a technology through a workaround that fails to challenge the underlying logics of using gender as demographic data or segregating systems by sex, among other things. Second, technologies attempt to recognize gender through someone's body, policing gender variance and further entrenching the use of sex as a proxy for gender.

The third chapter of this thesis elaborates on the consequences of inclusion and recognition that I alluded to in chapter two. I present Spade (2011) and Hoffmann's (2017) work again as a key structure for the chapter, this time to explain the unequal distribution of life chances, harms, and privileges by administrative and technological systems. I address matters of inclusion, recognition, transnormativity, and misguided solutions as sites of resulting administrative and data violences. Inclusion of trans identities, for instance, prompts discursive violences, obscuring systemic marginalization by technologies and functionally turning people into data. Recognition of individuals, on the other hand, has more tangible consequences. For example, surveillance technologies treat gender-nonconforming individuals as potential threats,

exposing them to extra policing. Similarly, comprehensive data collection makes people recognized as trans especially vulnerable to potential state-sponsored violence targeting transness directly.

I go on to describe other data violences—in this case resulting from the *lack* of inclusion or recognition—that demonstrate the no-win nature of many technologies for trans people. In the event that someone is misgendered by technologies, a common occurrence due to the permanence of internet data and history, they could experience increased dysphoria or even be outed in unsafe situations. Further, mismatches among data across various systems subsequently misgenders and misrecognizes trans people, potentially impacting their ability to access social services. Throughout, people who don't fit typical gender categories are neglected in the collapse to a cis-trans binary that enforces a normative notion of transness.

I define normativity and homonormativity to provide context for the development of transnormativity, which constructs trans identity as white, binary, and medicalized. Transnormative standards fracture the trans community into a group of privileged trans people who adhere to gender norms and a group of deviant trans people resisting or barred from assimilation into the dominant gender system. Trans people whose genders are illegible to technologies even after some trans identities have been included in them frequently hold other marginalized identities, such as their race or socioeconomic status, since transnormativity upholds white, Western gender norms. The final technological consequence of incorporating transness that I analyze is the phenomenon in which de-radicalized movements push for reformist solutions to data violences against trans people, aiming to fix technologies rather than questioning whether or not they should be built or used for certain agendas.

The final chapter of this thesis addresses the radical potential of technology to be used in support of liberating trans individuals, identities, and movements. First, I introduce Spade's (2011) critical trans politics as a model for radical trans organizing. With this context, I cover past and present technologies that I argue are liberatory. I begin by explaining how digital and internet technologies enable a separation from the gendered body and subsequently allow people to experiment with their virtual gender presentation to an audience of strangers. Gender-swapping technologies in particular destabilize dominant gender categories and offer trans people the radical freedom to imagine their future selves.

Next, I address communication technologies as a means of connecting trans people to resources and to each other. Social networks are often sites of information-sharing, sometimes serving as the only way for geographically- or socially-isolated trans people to learn about transition and safety. In addition to acquiring knowledge, trans people can access trans communities online, supporting each other in navigating their authentic identities. With the ease of building connections and spreading information comes the potential for radical organizing towards trans liberation.

I consolidate scholarly insights into the design and development of liberatory technologies to offer recommendations for technologists. I rely on the framework of design justice as articulated by Costanza-Chock (2018), their collaborators, and the Design Justice Network for key principles. In designing technologies, one important factor is participation. While this can be a symbolic, neoliberal solution to violent technologies, participation can also be rigorously-applied to involve impacted, marginalized communities as technology designers, developers, and eventual owners of the final product. Another suggestion for designers is to intentionally include liberatory values, such as privacy, consent, and the expansiveness of gender.

Here, I mention some specific technology cooperatives that work to subvert harmful technological systems with independent, decentralized alternatives.

Finally, I address the governance and funding contexts in which technologies are built. Capitalism inherently produces technologies at odds with trans liberation movements, since state and corporate interests in control and profit take priority over the needs of vulnerable trans people. In order to enact a radical shift in governance, a new model must be introduced; I discuss indigenous data sovereignty and anarchism as examples before arguing in favor of cooperative, community-run technologies. Likewise, technologies should be separated from state and corporate funding. If possible, self-funding by a local community is ideal, but in other scenarios, grassroots funding and membership fees provide alternatives that offer users, impacted communities, and funders each some control through collective decision-making.

It may seem contradictory that I develop arguments contending both that technologies cause harm and that they can be liberatory. However, this paper would not be complete if arguing only one of the two points. With a category as broad as technology, it's the simple truth that some technologies are radical and some are violent. More often than not, technologies have both positive and negative effects. In order to make progress towards trans liberation, technologists must realize that technologies do not have solely good or neutral impacts on trans people, identities, and movements. Simultaneously, trans activists must see past data violences to harness the liberatory potential of technologies. In resisting binary classification as either oppressive or liberatory, it becomes clear that just like gender, technologies don't fit into binary categories either.

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