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Communication Design Quarterly

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Introduction: Writing Infrastructure

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ABSTRACT
This article is the introduction to the second of two Communication and Design Quarterly special issues focused on conceptualizations of infrastructure. While there are more continuities than differences between the themes and methodologies of articles in the first and second issues, this second issue leans towards articles that have taken up infrastructure as it pertains to writing and rhetoric. This introduction frames the value of infrastructure as a metaphor for making visible how writing and rhetoric structure and enact much of our world, especially for writing pedagogy. In addition, this article concludes by introducing the six contributions in this issue.

CCS Concepts
Information Systems

Keywords
Infrastructure, writing studies, technical communication

“Standing in the chilly, roaring machine room that houses the supercomputer among rows and rows of black metal cases that enclose 786,432 processors capable of processing 10 quadrillion calculations per second, nothing could be more certain than the supercomputer’s substantial materiality.

What is less immediately comprehensible is how the supercomputer was built, or “stood up” in the parlance of high-performance computing, since none of the rhetorical, political, technical, or manual labor required to build the machine leaves an explicit trace on the supercomputer.” (Read 2020, p. 7, emphasis added)

And this is the problem with most of the writing that builds the world…it leaves no trace. When we look around as we move through our daily routines of work, personal, and public life, we don’t see the massively complex assemblages of genres of documents reaching across time, often years, authored by countless, usually unnamed, people, processes, and technologies. Certainly, the supercomputer tells no tales about its origins in acts of Congress or electricity contracts, and neither do the farmed oysters in Ryan Weber’s article in this issue explain their debt to the Alabama Administrative Code. The good news, however, is that mute supercomputers and oysters make work for the writing researcher to document and, more importantly, shed light on how writing, understood comprehensively in this issue as product, process, and suasive and epistemic rhetoric, functions as infrastructure for, to put it in the grandest possible terms, civilization as we know it.

This special CDQ issue on infrastructure is the second of two and thus this is the second editor’s introduction. As a new and apparently emerging genre, the second editor’s introduction is free to set its own conventions, primarily a pledge to not repeat the first one (too much) and to explain the special emphasis of the contributions collected in this issue. If you are reading this introduction as a summary of infrastructure and fields related to writing, rhetoric, and communication, we recommend that you go back and read the introduction to the first issue as well.
We’ve been thinking about writing as infrastructure for a long while now. Sarah, the lead editor of this issue, began with an interest in writing and had a coffee shop epiphany during graduate school that connected her childhood fascination with Richard Scarry’s detailed illustrations about how houses are built and mail is delivered in Busytown (1968) with her emerging interest in how writing gets the world’s business done, mostly without fanfare or much notice. Jordan, however, came from an infrastructural background and his epiphany went the other way. Whereas Sarah developed her ideas about infrastructure through her initial interest in writing, Jordan came to the idea of infrastructural writing through his initial interest in infrastructure. His second and third book focus on material infrastructure, and while researching them he realized that beneath all that material lay layer after layer of a different type of infrastructure: documents…countless documents of standards of policies of meeting minutes. In other words, Sarah got to infrastructure through writing theory and Jordan got to writing theory through infrastructure. These two paths into infrastructural theory acknowledge the duality at its heart: that material infrastructure and discursive infrastructure are co-constitutive, or to put it more simply, one doesn’t exist without the other.

One of the most memorable Scarry illustrations is of a house under construction with the framing and plumbing and other essential infrastructure that makes a house function made visible as the worker animals put them in. Plumbing, electrical and HVAC systems are of course the infrastructure that enable our comfort while indoors, just like writing course syllabi structure a learning environment that meets regularly and is, or should be, organized, fair, and productive. By equating a course syllabus with bathroom pipes, we are construing writing as equivalent material infrastructure to the building systems hidden in the walls. While limited in some ways, we argue this powerful metaphorical relationship between writing and building systems and material objects is broadly accessible to people within or outside of our scholarly community. Given the accessibility of the concept, writing as material infrastructure is a powerful place to start talking about how writing enables and structures social environments and processes, and organizations, especially in a classroom setting.

Yet, as developed in the introduction to the first special issue on infrastructure, we know that metaphorically construing writing as infrastructure at the level of materiality only gets us to the doorstep of what “infrastructure” as a metaphor for understanding the function of writing can offer. The concept of infrastructure has been taken up in studies of information systems and knowledge work to construe more than a material “substrate” that “sinks into an invisible background” (Star & Griesemer, 1989, p. 112) upon which something else operates. The term infrastructure has been taken up in technical communication and writing studies (DeVoss et al., 2005; Read & Swarts, 2015; Swarts, 2010) as a relational concept that foregrounds how infrastructure dynamically shapes social practices and organizational structures. As developed in the introduction to the first special issue, this relational notion of infrastructure is inherited from the work of Susan Leigh Star (1999) and her colleagues (Star & Ruhleder, 1996), especially Geoffrey Bowker (Star & Bowker, 1999). Many of the articles in this special issue also carry through this relational notion of infrastructure.

INFRASTRUCTURE AND WRITING STUDIES

The relatively undeveloped notion of infrastructure construed metaphorically as both material and relational has been circulating in writing studies and technical communication for at least 15 years. However, because infrastructure has emerged simultaneously in the work of scholars from different areas of the field, the object of infrastructure has varied depending on the study and sometimes within the study. For example, Vee (2013) applied the term to the practices associated with literacy, which she understood as the successful use of technology-mediated communication practices (e.g., symbolic writing systems or, more contemporarily, digital technologies) in order to navigate daily life. Hart-Davidson et al. (2007) applied the material and social notions of infrastructure to writing practices in an organization. Another useful notion of infrastructure in Writing Studies scholarship is that of writing programs as infrastructure (Grabill, 2010). For Grabill, infrastructure “does work” (p. 15, see also Grabill, 2007; Read, 2015), which means that an assemblage of people, things, technology, and documents cannot be considered infrastructural until what it is infrastructural to can be identified—the assemblage must do something for someone. Within this understanding of infrastructure as emergent, what counts as infrastructure is determined based on its real-time outcomes rather than on the existence of a static collection of objects that have conventionally been identified as infrastructure. In other words, a bridge to nowhere does not count as infrastructure.

As we detailed in the introduction to the previous issue, these two special issues of CDQ dedicated to the topic of infrastructure were born of what Sarah and Jordan saw as an exigence to consolidate and centralize scholarship informed by notions of infrastructure in a way that it has not previously been. For the first time, these special issues bring together scholarship specifically organized around “infrastructure” to assert it as a durable, capacious, and productive lens for scholarship in writing studies, technical communication, and communication and media studies. Our inspiration for editing these issues was based on work each of us has done on infrastructural writing (Frith, 2019, 2020; Read, 2015, 2019, 2020), which has theorized infrastructure under the banner of our own fields. One of our major hopes is that our fields take up infrastructural concepts and make them our own rather than continue to borrow and appropriate theory from others. Until our collaboration on these special issues, we worked in parallel to theorize the material, social, technological, and relational functions of writing, communication, information, standards and other essentially discursive objects and practices.

While there are more continuities than differences between the themes and methodologies of articles in the first and second issues, this second issue leans towards articles that have taken up infrastructure as it pertains to writing and rhetoric. Each of the articles in this special issue continues the work of refining and expanding the territory for understanding the function of writing as infrastructural. For the sake of fulfilling our jobs as guest editors, we have categorized the six pieces in this second issue into three groups of two: Publishing and Scholarly Infrastructure, Qualitative Infrastructure Inversions, and Rhetorical Theory and Infrastructure. Information architecture, after all, is an essential infrastructure for usability and cognitive processing. Categories, while useful for motivating critical discussion, can also be overly deterministic, so...
it is important to acknowledge that more than any article belonging fully to an assigned group, the articles are all writing infrastructure.

**PUBLISHING AND SCHOLARLY INFRASTRUCTURE**

Scholarship and the broader business of academia is, by nature, largely writing based. Thus, in writing and rhetorical studies, disciplinary rhetorics (e.g., the rhetoric of science) and scholarly writing and editorial practices have long been rich objects of study. Two contributions to this issue extend the focus on academic discourse by revealing infrastructures that both dramatically shape and limit: citation practices and academic publishing conventions and platforms. In writing studies and allied fields, scholarship enacts the disciplinary community that it also studies.

In their article, “Citational Practices as a Site of Resistance and Radical Pedagogy,” Cana Uluak Itchuauqiyaq and Jordan Frith skillfully argue that academic citational practices work as a mostly invisible discursive infrastructure, which they understand as both the material citation infrastructure in academic writing and scholarly databases as well as the cognitive and social practices that motivate scholars’ citation choices. They argue our fields are currently facing a “moment of breakdown” that is revealing how citational practices have perpetuated the historic and systemic suppression of women’s and BIPOC scholars’ voices. In response to this breakdown, Itchuauqiyaq and Frith present a case study of an infrastructural intervention that aims to reframe citational practices as sites of resistance and pedagogy: The multiply marginalized and underrepresented (MMU) scholar database. The MMU is a list of scholars who self-identify as MMU and also a bibliography of scholarship. The MMU database functions to restructure citation practices by brokering alliances among scholars and embedding inclusion in our discipline. Importantly, the creators of the MMU database have structured it so that users must actively engage with the material citation infrastructure (e.g., scholarly databases and search tools) to search for and access scholarship, which ensures algorithmically that this scholarship will become more visible and surfaced over time.

The second contribution, “The Text-Privileging Infrastructures of Academic Journals,” is, as an infographic, which by design is a bit unusual for an issue of academic scholarship. This very fact that it would be described as unusual, however, speaks directly to Carrie Clegg Gilbert’s astute observation that technical and cultural academic publishing infrastructures, such as publishing guidelines and platforms, including the ACM Digital Library that hosts this issue, and editorial review processes, privilege textual forms of knowledge over visual ones. Despite recent increased attention to the importance of visual literacy and multimodality, publishing infrastructure continues to treat visually-based knowledge as secondary, and subservient to, text-based scholarship. This bias towards text misses opportunities to make complex concepts accessible to a wider audience and limiting the types of knowledge that can be accepted within the realm of scholarship.

**QUALITATIVE INFRASTRUCTURAL INVERSIONS**

While the methodology of infrastructural inversion underwrites many of the articles in this issue, the third and fourth articles in this issue perform qualitatively informed infrastructural inversions (Star & Bowker, 1999) to build new theory. As a methodology, an infrastructural inversion makes the invisible visible via a researched reverse engineering that reveals the multiple stakeholders, technological decisions and standards, and embedded organizational processes that shape the experiences and situations of daily life. Qualitative research, normally in the form of interviews of stakeholders and the collection of documents and other artifacts from the field, adds the insider or the expert perspective to the study of the infrastructure in question. This real-world data, often including photos and direct quotes of stakeholders, lends a verisimilitude to the accounts that elevates the facts of the specific infrastructure to the same level as the generalizable contribution to theory. In other words, both of these articles could be read to learn specifically about the experiences of redeeming nutritional benefits or oyster farming in the gulf coast, regardless of an investment in the theory of writing studies.

Dana Comi’s article, “It Must Be a System Thing,” reveals how the often-fraught check-out experiences of users of Special Supplemental Nutrition for Women, Infants, and Children (WIC) benefits are shaped by an invisible and remote state-level information infrastructure called the Approved Product List (APL). For users, the standardization of benefits enforced by the centralized APL determines which food items they can and cannot purchase with benefits. When the local store signage, point of sale database and staff knowledge of the system are not aligned with the content of the APL, users of WIC benefits can experience embarrassment, stress, and conflict with other shoppers as their grocery items are scrutinized and routinely deemed unacceptable for purchase. In this case the APL functions as a remote site of information infrastructure that perpetuates systemic inequity by limiting the redemption of benefits and by requiring that already-stressed recipients exert additional emotional and physical energy to develop hacks and workarounds. While Comi’s infrastructural inversion importantly shifts the argument about why WIC benefits are difficult to redeem away from user error to the broader flawed infrastructural information infrastructure, she importantly leaves us wondering what other genres of information infrastructure invisibly perpetuate inequality.

While not explicitly a project of infrastructural inversion, Ryan Weber’s “Making infrastructure into nature” reveals the ecology of genres that has enabled Alabama’s oyster aquaculture to thrive, despite the dramatic fall in natural oyster populations in the Gulf of Mexico. In particular, Ryan develops the notion of performative infrastructural documents, which function, with the support of a broader document ecology, to authorize and enable the construction of physical infrastructure, such as that required to farm oysters. Ryan usefully differentiates the performative function of ALA ADMIN. CODE r. 220-4-.17 – Shellfish Aquaculture Easements from the infrastructural functions of other documents integral to the process of developing the Code, such as documents that support research reporting and advocacy. Performative infrastructural documents enact the realities that they describe because of their power to mandate or legislate the building of or changes to material realities, such as the infrastructure for farming oysters. In other words, it’s not wrong to say that the writing in ALA ADMIN. CODE r. 220-4-.17 quite literally created living creatures.

**RHETORICAL THEORY AND INFRASTRUCTURE**

While qualitative studies of how texts perform infrastructural functions have a fairly deep history outside of writing studies, for
example Michel Callon’s 1995 field study of how “writing devices” (Callon, 2002, p. 192) function as management tools for a cruise company on the Seine, the explicit explications of an infrastructural rhetoric are unique to this issue. Certainly, there are antecedents to the notion of an infrastructural rhetoric, such as the extensive writing studies scholarship founded upon the metaphors of ecologies (e.g., Edbauer, 2005; Spinuzzi, 2004) and networks (e.g., Read, 2016; Spinuzzi, 2008) that have documented how writing, often construed as genres, functions to constitute social actions. However, the articles in this issue explicitly synthesize the theory of infrastructure with rhetorical theory and create a foundation for a new theory and practice of infrastructural rhetorical analysis.

In the fifth article, Jonathan Adams details how his encounter with infrastructures as “malleable rhetorical texts” that “increase our persuasive capabilities” began with the choice between installing cable or satellite internet service in his apartment in the context of teaching remote courses in 2020. While remote from the time and place of decision making, future rhetorical situations would be shaped by this decision, such as an undelivered remote course lecture on a day with cloud cover, should he choose the satellite option. Infrastructures, he argues in his article, “A Theory of Infrastructural Rhetoric,” are rhetorical objects because they shape rhetorical situations, although usually not visibly before they are intentionally identified via the enhanced rhetorical analysis proposed by his theory. For example, the long-ago decision of where to locate a billboard shapes its rhetorical situation today as much as its message or design. Rhetorical decision-making is, therefore, diachronic because past decisions shape today’s rhetorical situation as well as those in the future. To help us organize how to identify and catalog infrastructures as rhetorical objects, Adams proposes a taxonomy, called Infrastructural Mapping, of physical, economic, social, operational and authority infrastructures. These additional elements add holistic and diachronic perspectives to the traditional rhetorical situation of audience, speaker, and message. It’s main value, Adams argues, is to save time in the event of a failed rhetorical situation, since the source of the failure (e.g., a wrong choice of internet provider) will be more available and, hopefully, within the realm of control of the rhetor (what Adams codifies as malleability).

Finally, this issue closes with what is simultaneously a fairly traditional rhetorical analysis via the lens of situational analysis of three historical U.S. public policy texts related to our national infrastructure and also an insightful infrastructural inversion that draws direct lines of causality between the infrastructure-related topics of these key texts and how people and the environments they inhabit are construed. In their article “Using Situational Analysis to Reimagine Infrastructure,” Mary LeRouge, Clancy Ratliff, and Donnie Johnson Sackey show us how three policy documents about infrastructure, in all its shifting meanings, have direct consequences for the lived realities of citizens, especially citizens who have been historically unnamed in official texts, such as the vulnerable, BIPOC communities or others at the margins of society. These consequences are the result of how the texts frame humans and their relationship to their environment, both built and natural. Humans, the authors argue, are always central to infrastructure, even when the texts might seem to be about roads, bridges, and the internet. In any discussion about infrastructure, in this special issue and beyond, this is the paramount point to guide our thinking and actions.

CONCLUSION AND LOOKING FORWARD

A longer-term aim of these special issues is to work towards establishing “infrastructure” as an equally familiar metaphor for writing as “communication.” It is already a public and academic commonplace, and deeply theorized, that writing, broadly understood, functions to “communicate.” We would be hard pressed to find someone anywhere who would disagree with the statement, “Learning to write is important because good communication is essential to professional success.” However, it is a newer idea, and definitely not yet a commonplace, that writing can also function as “infrastructure.”

We might be harder pressed to find someone outside of writing research who would understand the statement, “Learning to write is important because documents function as essential organizational and social infrastructures.” As compelling, but also potentially abstruse, as the second statement is, there is a risk that the powerful notion of writing as infrastructure could be limited to the realm of scholars and scholarship, and so far, it largely has been. This would be a shame, because as the articles in this special issue demonstrate, an infrastructural lens for writing has the power to reveal mechanisms of power and exclusion that have a direct impact on some of the most vulnerable people in society. As those of us who teach writing know, the infrastructural lens already informs our writing pedagogy, whether explicitly or implicitly. Our hope as editors of these special issues is that these articles can become tools in writing classrooms that establish the infrastructural functions of writing as equal to the more conventional communicative ones already supported by standard technical and professional writing textbooks.

NOTES

This article was accepted before Jordan Frith became editor-in-chief of Communication Design Quarterly

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Citational Practices as a Site of Resistance and Radical Pedagogy: Positioning the Multiply Marginalized and Underrepresented (MMU) Scholar Database as an Infrastructural Intervention

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ABSTRACT
Discursive infrastructures are forms of writing that remain mostly invisible but shape higher-level practices built upon their base. This article argues that citational practices are a form of discursive infrastructure that are bases that shape our work. Most importantly, we argue that the infrastructural base built through citation practices is in a moment of breakdown as increasing amounts of people call for more just citational practices that surface multiply marginalized and underrepresented (MMU) scholar voices. Consequently, this article both theorizes citations as infrastructure while also focusing on a case study of the MMU scholar database to help build a more equitable and socially just disciplinary infrastructure.

CCS Concepts
Information Systems

Keywords
Infrastructure, Citations, Social justice, Pedagogy, Discourse, DEI

INTRODUCTION
The process of “becoming” a researcher involves placing oneself inside a conversation and learning the intricacies and contours of a topic. Research training, in other words, is a constant process of catching up on what people have done before. However, researchers know that “catching up” on the conversation means, at best, becoming familiar with just one small corner of the giant room where the conversation is taking place. The best we can hope for is to be able to sound smart enough to the right group of people at the right time.

Maybe the most important way people show their work in research and establish their place in the conversation is through citations. Citations are structural and formative to the research process and are used to build a theoretical and methodological framework and situate one’s argument. Those citational frameworks then are essentially a base upon which someone builds an argument, a base that establishes the author’s ethos and shows which conversations they are taking part in and who they want to highlight as part of that conversation.

Those first two paragraphs are not saying anything particularly novel about the role citations play in research. The idea that citations—and this point is equally applicable to industry reports, academic articles, or hyperlinked blog posts—are used to build support and signal a conversation is widely taught in introductory writing courses. Citations have also become a growing area of research across multiple disciplines, including technical communication (Itchuaqiyaq et al., 2021; Moore et al., 2021). In fact, scientometrics and bibliometrics—academic fields tracking and analyzing academic research itself—have strong lines of inquiry dedicated to citation analysis (Tahamtan & Bornmann, 2019). In other words, many people have thought through how citations work, and we touch upon some of the implications of citations later in this article.

This article, however, builds upon and extends our understanding of citations through a novel theorization that we argue can help us rethink and analyze citational practices in positive ways. Our
main argument is that citational practices do infrastructural work and are a discursive base upon which entire disciplines—including communication studies, design, technical communication, and writing studies—are built. Conceptualizing citational practices as layers of discursive infrastructure enables us to analyze the role citations play in shaping that which is built upon them. That conceptualization also helps link work in our disciplines to the ongoing transdisciplinary discussion about building more socially just infrastructures (Graham & Marvin, 2001). As infrastructural research has often shown, infrastructures tend to be ignored. They tend to fade into the background and are often only noticed in moments of breakdown (Star & Ruhleder, 1996). We argue that the infrastructures of our citational practices are now in that moment of breakdown as more and more scholars have cast light on the unjust and unrepresentative politics of citation and how that affects disciplines and academia as a whole.

Importantly for our core argument, we are using the term “citational practices” intentionally broadly, a decision that was shaped by Star’s (2000) argument that “it’s infrastructures all the way down” (p. 1). In other words, infrastructures are shaped by lower-level infrastructures, and the deeper you dig, the more infrastructural work you will find. This approach to understanding the multi-level embeddedness of infrastructures is similar to the ways la paperson (2017) described the university as a machine within a machine within a machine. As la paperson argued, universities are “giant machines attached to other machines: war machines, media machines, governmental and nongovernmental policy machines” (p. 49). These university machines, whose infrastructures (all the way down) are based on colonial (pp. 16-18), and therefore white supremacist, structures. However, they are also sites of resistance whose smallest parts, such as academic citational practices, can be repurposed and reconfigured to disrupt and dismantle structures based on white supremacy. We embrace that multi-leveled approach in the way we deploy the term “citational practices” to cover multiple levels of work buried beneath published products; consequently, we are using the term “citational practices” to include actual published reference pages, the individual in-text citations within a written work, the databases and search practices people use to find work to cite, citation management systems, and even the pedagogical bases we build through things like qualifying exams and “cannons” that then shape who people cite in their work. Consequently, our use of the term “citational practices” is in direct conversations with Star’s broader point about the layering of infrastructure and is meant to encapsulate the infrastructural work these practices do across multiple levels of the research process. To paraphrase Star, it’s “citational practices” all the way down and these practices are not simply the final decision about whose name to put in a parenthetical at the end of a sentence.

Building upon that point, our first contribution is to theorize citational practices as discursive infrastructure, which builds upon recent work on the infrastructural role writing plays within larger structures. Our second contribution is to then argue for a radical rethinking of the infrastructural role of citational practices and call for an embrace of a more radical pedagogy. We then move on to a case study to describe an intervention one of the authors created that is designed to reshape our citational practices: the multiply marginalized and underrepresented (MMU) scholar database. The database provides resources for people interested in building a more equitable and representative discursive infrastructure of citational practice within their own research and to intervene in citational politics at the disciplinary level. And at a more theoretical level, we draw from Star’s point mentioned in the paragraph above to argue that the MMU database is itself an infrastructure upon which the infrastructures of citational practice can be built. Consequently, beyond our focus on citational practices, we show how writing can layer itself in infrastructural terms, with pieces of writing building bases upon which later writing is supported. The concept of discursive infrastructure, as we hope to show, is expansive and productive for thinking through the hidden, layered work that writing does.

INFRASTRUCTURES ALL THE WAY DOWN

The importance of conceptualizing discursive infrastructures was developed in two recent articles by Read (2019) and Frith (2020). Read used ethnographic work at a Supercomputer lab to show how internal documents and data outputs—in other words, forms of writing we may not even think of as writing—served infrastructural functions. These documents, ranging from progress reports to functionality tests to internal memos, were a base upon which the Supercomputers were built. The documents themselves remained invisible for users of the Supercomputer, but they served— in Read’s terms—“mission critical” infrastructural functions that supported and shaped the Supercomputing systems. If the documents disappeared, the higher-level products would crumble.

Frith’s (2020) work also helped establish a theory of discursive infrastructure through a qualitative analysis of a technical standard. He showed how technical standards are written infrastructure that are invisible to end-users but exert significant agential roles in the development of larger systems. As he explained, standards are documents that become embedded in products and are key to how communities of practice align with one another. The standards documents, in other words, do more than support end-products: they shape them in significant ways.

Read’s work and Frith’s work engaged explicitly with infrastructure studies research to analyze the infrastructural functions of different types of writing. They put forward an alternative way to conceptualize how writing—defined broadly—becomes embedded in the design of larger systems. As Read asked, “What could be a more urgent or timely task for writing studies and technical communication than to make visible the boring, yet essential, things that constitute so much of organizational life, yet are largely invisible to it?” (2019, p. 262). Additionally, the two authors also adapted Star and Ruhleder’s (1996) elements of infrastructure that was initially designed on a seven-point heuristic. Read and Frith condensed that scale to five points of analysis to offer a framework for analyzing the “when” of writing as infrastructure. Their framework, which builds off each other, included five elements (the first four from Read and the fifth from Frith):

1. **Inclusiveness**: A broad definition of what we include as writing, which might include automated data outputs, spreadsheets, and so on.

2. **Relationally defined**: Writing becomes infrastructure in practice, not for clear ontological reasons. In other words, an infrastructural approach examines the work writing of various types does and how it can become infrastructural for different audiences while remaining an object of focus for others.
3. **Alliance Brokering**: Writing creates alliances amongst groups and aligns documents and objects and people in new ways.

4. **Mission Critical**: Infrastructural writing is writing that is essential to the function of the end-product it shapes and supports.

5. ** Embeddedness**: Writing becomes infrastructural when the writing becomes embedded in higher-level products and systems and shapes them in often unnoticed ways.

This framework is by no means the only way of analyzing the infrastructural role of different types of writing, but it does provide a toolkit for looking at the “when” of infrastructural writing. After all, infrastructures—whether material or discursive—are relational and can do infrastructural work in some situations for some groups while being a primary object of focus for other groups (i.e., the second part of the framework: relationality). Or as Star and Ruhleder (1996, p. 113) put it, “we ask, when—not what—is an infrastructure.” And key to this article, we argue that this discursive infrastructure framework can help shed light on the infrastructural role of citational practices in research. As the next section argues, the infrastructural role of citation practices is in a moment of breakdown, and infrastructures “become visible upon breakdown” (Star, 1999, p. 380). More and more people have argued that citational practices tend to be exclusionary and unjust, over-representing white men at the expense of women and BIPOC scholars (Chang, 2009; Chakravarty et al., 2018; Delgado 1984, 1992; Itchuaqiqayq et al., 2021; Medina & Luna, 2020; Moore et al., 2021; Mott & Cockayne, 2017). Consequently, in this moment of breakdown and increased attention, the invisible has, in a sense become visible as more scholars put conscious thought into who they cite and teach as an effort to break the habit of reinscribing what Pimentel (2013) has called white European American (WEA) cultural practices.

To illustrate an example of this breakdown, we turn to Twitter. Technical communication scholar Sano-Franchini (2022a-f), in a response to a conference panel on inclusive citation practices, raised a powerful critique of how “inclusive” citation practices can still be built upon “institutionalized and racialized, gendered hierarchies” as Sano-Franchini claimed, then citation practices themselves are an infrastructure that can support social justice aims, or white supremacy, depending on how it is used. Decolonial scholar la paperson (2017) described how universities—which create the need for academic publication and thus the need for citation—are a machine of “racial-gendered industries within the state” (p. 81). This university machine is an assemblage of other machines that can be reconfigured to create alternative modes of university that are based upon structures other than white supremacy. Scholars are themselves “scyborgs” whose agency is their embeddedness in the structure of the university machine. Scyborgs can hack and reconfigure institutional machinery, such as through modifying their citation practices to center MMU scholars, which then provides new bases to build a more equitable system upon/with. If, as Sano-Franchini described in her tweets, the hack winds up reifying white supremacy under certain conditions, then that hack can itself be broken down and reassembled anew. According to la paperson, “your newly assembled machine will break down. Some other scyborgs will reassemble the busted gears to drive decolonial dreams. To dream it is to ride the ruin” (2017, p. 82).

This current moment is ideal first for understanding the infrastructural work of citation practices, and as we explore later, intervening in them. As Graham and Marvin (2001) showed, infrastructures embed inequality. They build a base often designed to benefit the powerful, whether they are bridges that connect certain areas over others, standards documents that emphasize certain language groups (Gonzales, 2022; Pargman & Palme, 2009), or health infrastructures built for certain types of bodies (Anglesey & Hubrig, 2021; Lengwiler, 2009). And key to our broader point about thinking infrastructurally, many scholars in technical communication and design have made similar points, though without framing the writing as infrastructure. For example, Bartolotta (2019) argued that the invisible (and we argue infrastructural) work of usability testing can “perpetuate injustice and marginalize users” (p.1); Alexander and Edenfield (2021) examined how health infrastructures (though they do not use that term) are designed for cisgendered white bodies and often mark marginalized people, such as Black transwomen, as “noncompliant” to normative care. Infrastructures embed inequality, and the infrastructures of citation are no different.

So, what kind of infrastructural work does citational practices do? We argue citational practices are infrastructural because they are the base upon which research is built; they are the layers or work that becomes buried at the ends of articles and sentences and shape the arguments that are the more typical primary object of analysis. The practices involved in citation remain mostly invisible, just as the reference page itself might not attract much attention unless it is missing something a reader expects or provides a reader with resources for citation mining. In other words, when functioning properly for the end-reader, the citational framework often fades...
into the background of a larger article. And as we discuss in the next section, the discursive infrastructure built through citational practices are built upon the pedagogies we are taught, reproducing limited types of knowledge across generations of scholars.

Citation practices can work as discursive infrastructure for more than just their pseudo invisibility and placement at the ends of documents and sentences. Returning to the introduction, we understand citational practices as the many layers of hidden work embedded in final articles, including searching for research, drawing from the “cannon,” managing references, and finally, including references in an end-document. Consequently, citation practices as discursive infrastructure

- **embrace an inclusive idea of what counts as writing.** With reference management software, reference pages are often automatically produced, resulting in a semi-automated form of writing that could complicate some of the intentionality often ascribed to writing and research practices.

- **are relationally defined.** They are buried at the ends of documents and sentences and the product of conscious choices invisible to the reader. They work as an often-ignored base for many readers. However, that pseudo-invisibility depends on the “when” of the document. For a reviewer making a decision about an article, the reference page might be the first place they check, moving what often remains in the background to the foreground in that situation. They only become infrastructural in certain situations for certain audiences.

- **broker alliances.** Citations align authors with other authors. They are a network that connects bodies of research and brokers alliances between an author and the sources they have chosen to align themselves with.

- **are mission critical.** Citations are the base upon which academic (and in many cases, industry as well) arguments are built. They serve a critical role, and if they were removed or significantly changed, the body of an argument would change as well. They are key to developing and showing the research process.

- **are embedded in documents.** Parenthetical citations are an obvious example of how citations become embedded within broader arguments. But citations and the theoretical frameworks people build also influence argumentation in more subtle ways as a form of discursive embedding. The alliances brokered through the embedding of citational practices shape how arguments are positioned and received even outside of the more obvious in-text embedding.

CITATION AS A SITE OF RESISTANCE AND RADICAL PEDAGOGY

Citation practices are currently in a moment of breakdown as more and more people critically reflect upon how the infrastructural bases traditionally built through citation can be exclusionary and silence marginalized voices. And, most importantly, this moment of breakdown and increased attention provides opportunities to radically rethink our pedagogies and citational practices.

Our conceptualization of citational practices as infrastructure raises necessary questions about citation practices in technical communication and communication design, especially as our fields have become more diverse and calls to make our field more inclusive have become more common. To review, diversity simply indicates a number of MMU scholars present in an institution, but it does not indicate whether MMU scholars are being included meaningfully in that institution (Ahmed, 2012). Because of this often-conflicting reality, it is important to consider how the underlying machinery at work in the most minute academic practices (la paperson, 2017)—the mechanisms of marginalization (Delgado, 1984, 1992)—function to uphold or thwart diversity initiatives and inclusionary action. One site of potential resistance to the mechanisms that keep marginalized scholars at the margins is intentionally diversifying scholarly citation practices because our publications are how members of our field communicate with one another about our concerns, ideas, perspectives, activities, questions, and research. It is within our publications that our identity as a field takes form and our values are enacted (Rude, 2009).

Walton et al. (2019) argued that for technical communicators to understand “our role in systems of domination and injustice, we must first understand the various manifestations of oppression, recognize the ways they have worked, and develop sensitivities to them” (p. 19). One key element in this process of recognition of injustices and coalition building is creating opportunities for cross-cultural understanding to take place in meaningful ways and drive innovation. Collins (2009) discussed the need to recognize the knowledge sharing of members from marginalized communities (particularly Black women) as vital theoretical contributions in socio-cultural research. Ichuauqiyyaq (in press) argued for the inclusion of everyday observations from Inuit communities as vital scientific contributions in climate change research. In other words, innovations in research across the disciplines requires an expansion in whose voices are included as cannon via mechanisms like socially just citation practices and pedagogy.

As many scholars cited throughout this section have argued, academic structures often work as systems of oppression, but within these academic structures, scholars can work together to combat oppression in bold ways. As la paperson argued, academic structures (including citational structures undergirding both research and teaching practices): “are never perfect loyalists to colonialism—in fact, they are quite disloyal. They break down and produce and travel in unexpected lines of flight—flights that are at once enabled by the university yet irreverent of that mothership of a machine” (2017, p. 55). That breakdown la paperson discussed harkens back to the idea of infrastructural breakdown discussed before. It is by breaking down our existing, and often unnoticed, structures and practices that we can then begin to reshape them piece by piece into something more equitable. And as la paperson has argued, to resist and break down the oppressive infrastructures undergirding the university system, one must understand the technologies that drive it.

One of the main technologies of academia is citation practices, which are a technology that often reproduces certain knowledges over others. And of course, like with breaking down and then rebuilding any type of infrastructure—whether discursive or material—people must consciously think about how to rebuild in better ways. After all, as we discussed earlier, the bases we build shape higher level practices. We can see an example of the conscious effort involved in rethinking the infrastructural role of citational practices in our discipline in the passage below:

I remember presenting with Qwo-Li [Driskill] on a MLA panel called “Aristotle is Not Our Father.” The room
The passage above does not use the word infrastructure, but we argue that Driskill’s move is, at its core, an infrastructural one. After all, as we discussed earlier, infrastructures are not a steady ontological category. Instead, it is the “when” not what of infrastructure. The “when” in this case is the enactment of a feminist pedagogical stance in creating course reading lists. Moves like this, we argue, impact our field in tangible, generational ways that only become visible well down the line in publication practices.

To extend Driskill’s argument to create alternate histories of disciplines, we ask: What if we reconceptualized the classroom to include what we (as authors and as the field in general) teach through our academic publication practices? Published academic scholarship is first and foremost a teaching tool, and scholars from all levels are its students. Academic scholarship teaches in many expected and unexpected ways. It teaches about synthesis through contextualizing relevant scholarship and putting ideas in conversation with one another in literature review sections. It teaches about genres through organization and academic writing tactics, such as citation. If scholars are more likely to cite literature that they’ve read in their coursework (and at least the two of us certainly are, even though one of us finished his PhD almost a decade ago), then they are similarly more likely to cite literature that they’ve encountered within the scholarship they read. For example, in researching feminist pedagogy, one might encounter bell hook’s *Teaching to transgress: Education as a practice of freedom* (1994). In this book she discussed the importance of resistance to the cultural norms of knowledge dominance in one’s pedagogical practice. According to hooks (1994),

Progressive professors working to transform the curriculum so that it does not reflect biases or reinforce systems of domination are most often the individuals willing to take the risks that engaged pedagogy requires and to make their teaching practices a site of resistance. In her essay, “On Race and Voice: Challenges for Liberation Education in the 1990s,” ChandraMohanty writes that “resistance lies in self-conscious engagement with dominant, normative discourses and representations and in the active creation of oppositional analytic and cultural spaces. Resistance that is random and isolated is clearly not as effective as that which is mobilized through systemic politicized practices of teaching and learning.”

1 While not included as a rationale for not citing Burke in Driskill’s *Histories of Rhetoric* course, it should be noted that Kenneth Burke admitted to his own antisemitism in 1989, four years prior to his death. Refer to Fernheimer (2016) for more information.

(p. 23)

This passage not only reinforces the concept of teaching as a site of resistance, it also introduces the scholar Chandra Mohanty. After encountering Mohanty’s quote cited in hooks, one may continue on to read the cited article and Mohanty’s subsequent publications. As a result of a similar pathway, Mohanty is now cited in the article you are reading now. Academic scholarship is a site of peer-to-peer instruction as well as a site of resistance to colonial and hegemonic forces in education. Scholars have a choice in whom we cite and how, and we have a choice to resist the reproduction of past WEA-focused citation practices through generation after generation of reading lists and coursework. If scholars mobilize together to resist hegemonic norms of citation and knowledge (re)production, then we have an achievable way to make our field more equitable and innovative. As scholars, we have the opportunity to build a base of more just citational practices that then shapes the citation practices of scholars across our field.

Consequently, pedagogy and rethinking a radical university (as argued by la paperson) obviously has direct impacts on students and professors, but we argue that it also works infrastructurally in often invisible ways. To repeat a Star (2000) quote from earlier, “it’s infrastructure all the way down” (p.1), and these pedagogical examples shows how that can work in practice. The types of pedagogies we embrace, the names in our “cannons,” the doctoral seminars we teach, and the readings lists our students trudge through are ultimately infrastructural. When an article is published, no one sees any of that work. The pedagogical base remains invisible; but much of that pedagogy makes its way into reference pages. Our pedagogical structures, in other words, play an infrastructural role in shaping the later infrastructural citation practices that reproduce certain types of knowledge, which is why we consciously define citational practices so broadly to include all of the infrastructural layering that becomes embedded in published research. Consequently, the next section transitions to our case study of an infrastructural project that explicitly surfaces often marginalized voices and provides resources for people to radically rethink their citational (and relatedly, pedagogical) practices: the MMU scholar database.

**MMU Scholar Database as Infrastructure**

The “MMU scholar list” (see Figure 1) and “MMU scholar bibliography”—AKA the MMU scholar database—was created by Itchuaqiyaq (2022) as a way to intentionally insert MMU scholars’ work into mainstream reading, writing, and teaching practices. This database was born from the list of 86 scholars listed in Walton et al.’s (2019) book—a list of scholars that directly combated what Walton et al. called the fictionalized, but common, statement “I’d love to read and cite more work by marginalized scholars in the field, but there are just not enough Black, Indigenous, minority, transgender, scholars with disabilities, etc. in our field” (p. 169). The MMU scholar database expanded Walton et al.’s list through field-wide survey responses2 (Itchuaqiyaq et al., 2019) where individuals could self-identify as a MMU scholar and self-select to be included in the database. The database also includes a bibliography of scholarship written by MMU scholars. The MMU scholar database has been updated on semesterly basis (in time for

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2 Survey ran October 28, 2019 – April 18, 2020 and received 427 responses. USU IRB protocol #10559.
course preps) since 2020 using submitted information via a Google Form. In these next sections, we will demonstrate the MMU scholar database’s infrastructural nature as a basis for future knowledge production in our field and describe its design using Read and Frith’s framework of discursive infrastructure as a guide.

The MMU scholar database is infrastructural writing

As Walton et al.’s book (2019) and McKoy et al.’s (2021) CFP for the Black in Technical Communication special issue in Technical Communication Quarterly indicated, the field of technical communication is facing a breakdown of status quo (read: WEA) conceptualizations of the field. The MMU scholar database is a set of collaboratively written documents that serve as a base for building a more inclusive field. Although the database itself is not something that was designed to be cited or taught in courses, it is writing that affects future citations and teaching.

The MMU scholar database’s design reflects citational practices’ contribution to the structure of academia. Calls for more inclusive citation practices have existed in academia since the 1980s (refer to Delgado, 1984 for his groundbreaking work on problematic citation practices in civil rights scholarship as well as those that cite his work for more recent discussions). However, identifying marginalized and underrepresented scholars has remained nebulous. Until this database was published⁴, scholars wishing to intentionally shift their citational and pedagogical practices to center MMU voices had to rely on assumptions, personal knowledge, ocular information (e.g., a scholar with a visible marginalized identity), or marginalized identity factors disclosed in scholarship or on scholarly profiles, etc. The MMU scholar database was designed to assist individuals in locating self-identified MMU scholars and provide some professional context. Though the MMU scholar database lists information about the professional identities of scholars, personal information, such as which marginalize identities the scholars embody, are not listed (see Figure 1). For example, one cannot look up all the Black women scholars in technical communication using this database. Nor can one look up all the LGBTQIA+ scholars on the database. This omission was an intentional component of the design of the MMU scholar database because, frankly, doing so could cause unintentional harms related to identity politics and bias.

Returning to the discursive infrastructure framework discussed above, we argued that the MMU scholar database fits withing discursive infrastructures’ broad scope of what counts as writing. And as this section has discussed, the infrastructural work the database does was consciously planned in specific ways, not merely a grouping of contact information on a spreadsheet. Consequently, the database itself is a form of writing that can then shape the later writing influenced by the entries in the database.

The MMU scholar database’s infrastructural effects are relationally de ned

As we discussed earlier, in identifying writing as infrastructure, it is important to critically evaluate when that writing has an effect. The MMU scholar database is just a series of documents about MMU scholars while people are reading it. However, the MMU scholar database becomes infrastructural when it affects whose scholarship we teach and whose scholarship we cite. When the database becomes part of the practice of the field, then it is an infrastructure that shapes how the field is built.

The MMU scholar database’s design also reflects the when of disclosing personal identity factors. Not everyone who has a marginalized identity factor chooses to identify as a MMU scholar. The design of list and bibliography intentionally allowed individuals to decide whether they wanted to be publicly identified as a MMU scholar. As the list of MMU scholars has grown, individuals on the list have both opted in and opted out. When individuals have requested to have their name removed or have otherwise declined to have their name added (and have provided information about why), they have consistently stated something along the lines of not wanting to extend their relative privilege.⁴ For example, though

Figure 1. Cana Ulauq Itchuqaq’s entry on the MMU Scholar List. The other entries are blurred out to avoid including other MMU scholars without their consent.

4 Comments came from both the IRB-approved survey and personal communication with individuals outside of the scope of the survey.
an individual embodied one or more marginalizing identity factors, they also embodied dominant-culture identity factors that allowed them to consistently navigate the world in ways that were relatively unaffected by oppression. This ability to opt in or out at any time is an intentional design feature of the MMU scholar database, and to build upon Star (1999), shows how infrastructures—whether material or discursive—must be actively maintained and “fixed in modular increments” (p. 382) to remain viable.

The MMU scholar database brokers alliances across the discipline
The MMU scholar database is an infrastructure that connects scholars together. The database provides the necessary information for scholars seeking to enact inclusion in their scholarly practice to do so through future actions inspired by the information in the database. In other words, just reading the information in the database itself does not make a scholar’s practice more inclusive, nor does it make the database a discursive infrastructure upon which a base is built. It is up to the scholars reading the database to use this information to build a different base that shapes future practices, such as downloading, reading, and then citing or teaching a MMU scholars’ written work, or prioritizing attending MMU scholars’ presentations at conferences.

The MMU scholar database’s design is meant to help scholars from all backgrounds connect with MMU scholars. However, one might notice that although the scholars’ institutions are listed, their specific contact information is not. Beyond basic security considerations, this exclusion was meant to force scholars to put in some effort in connecting with MMU scholars directly. For example, since the database was published, several scholars have inquired about sending job ads or other such information to the listing of MMU scholars. This database was not designed to give simple “one click” access to MMU scholars for on-demand Diversity, Equity, and Inclusion (DEI) needs. Excluding easy-access features helps to mitigate potential tokenization of MMU scholars because although the MMU scholar list provides the necessary first steps towards identifying MMU scholars (e.g., their names, their institutions, their ORCID ID, and their research interests), engaging with MMU scholarship actually requires a small degree of work. To be painfully clear: the service that the MMU scholar database provides was designed to amplify, not tokenize, MMU scholars. The series of steps that might happen after reading the MMU scholar database (step 1) include engaging with an MMU scholar’s work (step 2) and then reaching out to them to build relationships (step 3) for potential collaborations and opportunities (step 4). Do not use the database to skip to step 4. After all, the MMU database is designed to be a base that shapes the research and teaching practices we build; not a surface-level listserv interface.

The MMU scholar database supports mission critical DEI initiatives
The MMU scholar database is an infrastructure that can be essential to the function of DEI initiatives in our discipline through the ways it shapes and supports this work. Though the MMU scholar database itself does not act to make academia more inclusive, it provides a necessary base from which individuals can build a more inclusive scholarly practice in their own work and help foster it in those they teach through their writing (citations) and their pedagogy (course readings).

The MMU scholar database’s design prioritizes helping the discipline become more inclusive. As this database grows and more scholars enrich their academic practice through engaging with the work of MMU scholars on the database, its impact should become apparent in the references section of publications. There is no guarantee that if a scholar reads another scholar’s work that they will cite it in their future manuscripts. However, the probability of that citation occurring is much greater than if the piece was never read in the first place. How MMU scholarship is engaged with as a citation (e.g., citation occurring as part of a string citation or quoted or paraphrased) is whole other DEI conversation (see Itchuaqiyaq et al., 2021 for more), but it begins with encountering scholarship from diverse voices in the first place. The MMU scholar list on the database, as was described above, was designed to force its users to look up the scholars on the list so that a modicum of investment in MMU scholars had to occur to actually use the information on the list. However, the MMU scholar bibliography could be used as a potential citation extraction site (i.e., people just copying citations and plopping them into string citations for broad, general claims instead of actually reading the scholarship) for upping “diverse” citations. Is this what was intended? No. Is this an ethical way to practice scholarship in general? No. Are the potential risks of tokenization citation practices worth the potential long-term gains toward inclusive citation and pedagogical practices in our discipline? We hope so. What we do know is that databases like this one serve a mission critical infrastructural function for surfacing these voices and pushing back on the claims that people just do not know MMU scholars they can cite.

The MMU scholar database embeds inclusion into our discipline
The MMU scholar database, if used to inform inclusive scholarly practice, shifts the dominance of WEA scholarship by embedding MMU scholarship as an alternate base from which to build arguments (citation) and courses (readings). Further, the database can serve as a new base from which to build new conceptualizations of the discipline (comprehensive exam reading lists).

The MMU scholar database was originally designed to provide an alternative view of the discipline stemming from Itchuaqiyaq’s experience creating her PhD comprehensive exam reading list. As a scholar researching inclusivity within the citation practices of technical communication, she recognized the irony of using “traditional” reading lists that are dominated by WEA authors as the basis of how she proved familiarity of the field. Giblin and Schafer (2008) discussed how consistent author inclusion on comps reading lists provides a strong indicator of their relative prominence in their fields. Itchuaqiyaq wanted her scholarly understanding of the field to reflect the voices she was straining to hear: MMU scholars. She knew it was from these voices that she wanted to build her future scholarship. Typical practice of creating comps reading lists base them on readings encountered in coursework. Although her coursework included diverse authors, there were not nearly enough of them to fill a list of 100 works. Itchuaqiyaq used the list of MMU scholars listed in Walton et al.’s (2019) book and began looking each of them up on databases like Google Scholar to find their publications. When Google Scholar results weren’t clear (i.e., multiple people with the same last name and initial had publications in what seemed multiple fields), she looked up their university affiliation to find a CV or listings of their publications. It was pain-staking work but yielded a bibliography of over 100 scholarly works authored by MMU scholars in the field. Itchuaqiyaq was able to complete her comps exam using a
view of the field of technical communication and rhetoric as told by MMU scholars. It was this initial comps reading list that she posted as the MMU scholar bibliography and shared with others online.

The embedding happens when the MMU database then influences other people’s research practices. The database itself might not be cited or referred to explicitly in research articles, but it becomes invisibly embedded as discursive infrastructure as people who access the database alter who they cite and who they assign. Like with much embedded infrastructure, the impacts may not be immediate, nor will they necessarily be explicitly apparent. But the impacts become embedded, in infrastructural terms, when they shape the end products (e.g., articles and syllabi) that people do engage with directly.

CONCLUSION
One of the core reasons we conceptualize citational practices as discursive infrastructure and call for an intervention in how those infrastructures are built is because, for all its faults, academic research does remain an avenue for freedom of expression and activism. What we have argued here is that our current citation practices are in a moment of breakdown. Prominent scholars across disciplines have argued that existing citational practices builds a base that reproduces WEA, mostly male—sometimes even Nazi —knowledge at the expense of other voices. And going one step further, the discursive infrastructures built through citational practices are not just about who we cite and why; the issue goes to a deeper infrastructural level that traces back to what we teach students and what we construct as the “cannon” that must be engaged with in doctoral work. That pedagogy then does the invisible infrastructural work that shapes the discursive infrastructures that signal a publication’s contributions and alliances. In true infrastructural terms, these practices are almost never apparent in the final research deliverable, but they shape the deliverable in consequently and unnoticed ways.

Consequently, while we argue for rethinking citations through infrastructural thinking, we also want to point out that it’s infrastructures all the way down. We cite who we are taught; we cite who our advisors cite; we build an infrastructural base upon which we then build the discursive base of citational practice. As Mohanty (2003) argued about academia, it is a “contradictory place where knowledges are colonized but also contested … one of the few remaining spaces in a rapidly privatized world that offers some semblance of a public arena for dialogue, engagement, and visioning of democracy and justice” (p. 170). As such, breaking down and rebuilding discursive infrastructures of citational practice requires a systemic politicized academic practice that is more than just choosing certain names over others. It takes the types of radical pedagogy discussed above to lay different metaphorical bricks through which citations are built. As layer upon layer of infrastructure, so much of what we have discussed remains almost completely invisible in published articles. But these published articles are built upon and shaped by bases built far earlier. As Mott and Cockayne (2017) stated, “Careful and conscientious citation is important because the choices we make about whom to cite—and who is then left out of the conversation—directly impact the cultivation of a rich and diverse discipline” (p. 955). To make a lasting change in our field, the fundamental shift towards a more just and representative discursive infrastructure of citation requires acts of radical pedagogy and intervention that help build different bases upon which our future conversations and knowledge making can occur.

The work we are describing in this article will not be easy. Rebuilding an infrastructure never is; it will require conscious thought of everything from the pedagogies we embrace to the practical decisions about who we cite. And at the basic level, one of the challenges many of us face is simply lack of exposure and knowledge. Many researchers and teachers have built their discursive bases in certain ways and tearing them down requires actively searching out different voices, which can be challenging and feel overwhelming. The MMU scholar database offers vital information for those who want to enrich and extend their scholarly circle to include more scholars who self-identify as MMU. It offers a path towards building an alternative infrastructural base upon which we can reshape our discipline. However, knowing who these scholars are will not make our field more inclusive. Engaging with MMU scholarship through reading, citing, and teaching it is an important component to equity in academia and hopefully helps us build an infrastructural disciplinary base that surfaces voices that have been neglected for far too long.

NOTES
This article was accepted before Jordan Frith became editor-in-chief of Communication Design Quarterly

Since the article was originally written, a few new resources have been made available or come to light that we’d like to highlight:

The Contribution of Black Scholars in TPC list, sorted by subject area, created by Laura Gonzales. Ann Shivers-McNair and Rebecca Walton. Located at: https://docs.google.com/document/d/1trENxWuVaFLMfdReKvOtxOt1mT26pG_Ekeij3UApk/edit?usp=sharing


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ABOUT THE AUTHOR
Cana Uluak Itchaqiyaq is a tribal member of the Noorvik Native Community in NW Alaska and is an assistant professor of professional and technical writing at Virginia Tech. Her research addresses how mainstream modes of academic practice often perpetuates the marginalization of underrepresented scholars and communities and consequentially interferes with equity. Her research combines her academic background in both the digital humanities and physical sciences and currently centers on creating accessible online databases of Inuit knowledges and developing natural language processing techniques to extract climate change data from Inuit narratives. She is an author on the upcoming National Climate Assessment 5, Alaska Chapter, and serves on several boards, including the Caleb Scholars Program, Arctic Research Consortium of the United States, Kairos: A Journal of Rhetoric, Technology, and Pedagogy, and Communication Design Quarterly.

Jordan Frith is the Pearce Professor of Professional Communication at Clemson University. His primary research focuses on mobile media and communication infrastructure. He is the author of 5 books and more than 40 journal articles in a variety of disciplines, including communication studies, technical communication, media studies, and geography. He has also published in public venues like Salon, Slate, and The Conversation and edited multiple journal special issues. He is now the editor of the X-Series on Parlor Press and the editor-in-chief of the ACM publication Communication Design Quarterly.
The Text-Privileging Infrastructures of Academic Journals

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ABSTRACT
There is a gap in the academic literature examining how visual elements enhance verbal communication. We intuitively know that a well-placed graph or diagram can help get a complex point across, but the “how’s” and “why’s” remain more art than science. When you look at the average academic journal, this shortage of visual research is not so surprising. Despite all the urgent dialog in recent years about multimodalities and visual literacy, the publishing process makes it very difficult to challenge this “text first” status quo.

CCS Concepts
Information Systems

Keywords
Visual abstracts, Visual rhetoric, Academic publishing

Special note: This article relies almost completely on a visual graphic to make its argument. Consequently, to improve accessibility, the alt text for the image on the next page is very long and includes a narrative of the entire image.

FURTHER READING


ABOUT THE AUTHOR
Carrie Clegg Gilbert is an adjunct instructor in the Technical and Professional Writing Program at Portland State University. She encourages students to explore the role of visual language as they prepare for a technical communication landscape that increasingly extends beyond the written word. She holds an MS in Technical Communication with an emphasis in Human-Computer Interaction from Rensselaer Polytechnic Institute and a BA in Digital Art from San Jose State University.
There is a gap in the academic literature examining how visual elements enhance verbal communication. We intuitively know that a well-placed graph or diagram can help get a complex point across, but the “how”s and “why”s remain more art than science. When you look at the average academic journal, this shortage of visual research is not so surprising. Despite all the urgent dialog in recent years about multimodalities and visual literacy, the publishing process makes it very difficult to challenge this “text first” status quo.

One publisher goes so far as to strip all formatting and graphic elements from its online articles, rendering visually rich content nearly meaningless.

Visual elements can help break through language barriers, jargon, and poor grammar to make our messages easier to understand.

The world grows increasingly multimodal, with visual content constantly demanding our attention. If academia continues to devalue graphics, we will fail to make complex concepts more accessible to our global audience.
ABSTRACT
Drawing on qualitative data collected from program participants in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), I show how federal government assistance information infrastructure often does not remediate, and instead exacerbates, existent inequalities. I use the example of WIC's Approved Product List (APL) to show how the APL, as a genre that’s part of WIC’s information infrastructure, contributes to a hyper-standardized benefit redemption process that increases visibility and vulnerability for program participants. This article argues that increased attention to the genres that make up information infrastructures may help to better locate sites of inequity like the APL, and better understand how systemic/structural problems perpetuate infrastructurally.

CCS Concepts
Information Systems

Keywords
Genre, Infrastructure, Inequity, Access

Victoria, an African-American single mom of two, lives in Amherst, New York. She’s been enrolled in WIC twice: first in 2014, then in 2019. Before the pandemic, and now, she has had a difficult time buying food with her Special Supplemental Nutrition for Women, Infants, and Children (WIC) benefits at the grocery store. She has frequent issues that are altogether mystifying to her. The visibility of her issues at the cash register reveals her status as a WIC participant, creating a negative and stressful grocery store experience:

When you’re Black you have this feeling like, the people in the line and the cashier, they’re all judging you and they’re thinking like, she’s on this program. This must be food stamps or something. I’ve had people say like, “What are you doing? What are those? How are you paying for this food?” Like pointing it out to me saying, like, making it seem like I’m taking advantage of a system. It’s a little dehumanizing. It’s such a long process.

And sometimes I feel like the sideshow at the store. You are told, hey, that’s not the right brand. It’s not the right size. This is everything that fits in this category but for some reason it’s not being counted. This was .1 of an oz over, so now you’re being charged for it. There’s so many times where I have problems.

No grocery trip is the same. It feels very much like a “powers-that-be” situation that dictates it. When you try to figure it out for yourself, like thinking ‘I need these items, in these sizes,’ then you go to the cashier and they don’t work in the system, and you ask the cashier, and the cashier doesn’t know. Then the cashier asks the manager, and the manager doesn’t know. Well, let me try to call WIC. And then WIC doesn’t know. So it’s like, it must be a system thing.

This article posits that information infrastructure genres are sites to investigate systemic problems like the “system things” that Victoria describes and other WIC participants experience. Drawing from an infrastructural inversion (Bowker & Star, 1999) of WIC’s information infrastructure, as well as case examples of WIC
participants navigating this infrastructure, this article provides preliminary findings concerning the role of one genre within WIC’s infrastructure, the Approved Product List (APL), in shaping access for WIC participants.

This study found that although APLs were designed as part of a wider effort to “streamline” and “modernize” WIC through implementing Electronic Benefit Transfer (EBT) (“Making WIC Work Better”), APLs create a hyper-standardized, high-stakes environment in which program participants must decide whether to advocate for themselves to successfully redeem their benefits and increase their visibility as someone “on welfare” or leave the store empty-handed. Ultimately, these preliminary findings suggest that the genres that make up information infrastructures may be key sites to better understand how systemic racism, ableism, and classism and their intersections perpetuate.

LITERATURE REVIEW

This study of the APL extends from the recent infrastructural “turn” in writing studies and technical communication (DeVoss et al., 2005; Grabill, 2010; Frith, 2020; Hart-Davidson et al., 2007; Read, 2019; Swarts, 2010), taking up Read’s (2019) call to “make visible the boring, yet essential, things that constitute so much of organization life yet are largely invisible to it” (p. 262) through better understanding the infrastructural function of the APL. Understanding what Read termed the “infrastructural function” of writing includes taking into account the following:

1. Inclusiveness: a broad scope for what counts as writing;
2. Relationally defined: a focus on what writing does for something or someone (incorporates rhetorical genre theory);
3. Alliance brokering: writing that mediates essential alliances; and
4. Mission critical: writing that is essential to the operations of an organization. (p. 246)

As Read (2019) explained, “the infrastructural function of writing is defined by what writing does for something or someone rather than by the formal characteristics … of any given document or writing activity … the infrastructural function, then, must be able to identify for what or whom the writing functions as infrastructural” (p. 251). Drawing on rhetorical genre theory, and utilizing Read’s elements of the infrastructural function of writing, made it possible to analyze the APL as a genre that is part of WIC’s information infrastructure, then use that analysis as contextualization for the case examples of WIC participants’ experiences in the program. Infrastructure is at once universal and highly situated. Though it is certainly useful to understand the complex web of WIC’s information infrastructure, this analysis alone cannot capture how individual WIC participants experience this infrastructure as they navigate grocery shopping and checkout as they attempt to redeem their government benefits. On a given day, at a specific grocery store, with particular cashiers and managers on duty, WIC participants experience information infrastructure’s mediating influence differently, for better and worse.

WIC is a national program that “provides Federal grants to States for supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children up to age five who are found to be at nutritional risk” (USDA). WIC serves nearly half of all infants born in the United States. Increased access to food, information, and healthcare is central to WIC’s mission, with the specific goal to resolve participants’ food insecurity and nutritional risk, promoting an overall security (both in their ability to attain food and maintain a healthy lifestyle). In order to enable people to enroll in WIC, receive their assigned benefits, and redeem those benefits at the grocery store, there is a vast network of people, processes, procedures, tools, facilities, and technology which “[support] the creation, use, transport, storage, and destruction of information” (Pironti, 2006)—WIC’s information infrastructure. Woven throughout WIC’s information infrastructure are genres that outline program guidelines, processes and procedures, and document information that circulates within the program (Figure 1).

Genres are, as Miller (1984) described, “typified rhetorical actions based in recurrent situations” (p. 159)—the genres that make up WIC’s information infrastructure, likewise, are routinized and help create, use, transport, store, and destroy information across WIC’s federal office and state agencies.

The Approved Product List (APL) is a critical genre that functions within WIC’s information infrastructure, documenting every eligible item a WIC program participant can purchase using their benefits. At face value, the APL resists direct analysis (see Figure 2). It is mundane and highly technical—a massive Excel spreadsheet filled with brand names, item sizes, and categorical markers. Each WIC state agency maintains their own APL that documents the Universal Product Code (UPC), Item Description, Category Code, Category Description, and Subcategory Code for all eligible food items available for purchase through approved vendors (typically grocery stores) in their state. APLs enable WIC state agencies to document eligible food items in a central location through hyper-standardization. In previous iterations of WIC’s information infrastructure, eligible food items were determined by price caps, but APL documentation generates individual approvals for specific food items. Each WIC state agency has an APL manager who is responsible for maintaining the APL. Additionally, each state agency has a small committee of staff workers who are responsible, along with the Director, in setting guidelines for how “strict” of an APL the state should have (Jovi, personal interview). Some states opt for “stricter” and “leaner” APLs that are a smaller file size, easier to manage, and easier to update, whereas other states opt for sprawling, messier APLs that try to more accurately capture what food items are WIC-eligible. Though there are centralized processes at the national level for approving WIC foods, there is significant variation in how states manage this approval, and this variation is reflected across the APLs.

Therefore, the APL is a recurring genre, even given the variation across states. APLs are stored in an online repository called the National Universal Product Code (NUPC) database, managed by the United States Department of Agriculture (USDA). A given state’s APL may be less up-to-date or extensive than another’s, depending on how often it is updated and re-uploaded to the NUPC database. Although the NUPC can only be accessed by WIC state and federal administrators and staff, copies of APLs are publicly available on state WIC websites for vendors to reference.
Figure 1. Genre ecology map of WIC benefit redemption.

Figure 2: Excerpt of Missouri’s Approved Product List (APL)
As a genre, an APL enables WIC program participants social action by permitting benefit redemption within the Electronic Benefit Transfer (EBT) system. EBT is new to WIC, replacing a paper check system for benefit redemption. In an EBT system, WIC program participants redeem their benefits using an eWIC card, rather than paper checks, and all eligible WIC items are documented on the APL. Before EBT, eligible WIC items were processed through standardized price caps. The “paper check system” was criticized as a cumbersome, stigmatizing process for WIC participants to experience, and the introduction of EBT was intended to streamline and modernize benefit redemption (“Making WIC Work Better”).

Though it was apparent from an initial exploration of WIC’s information infrastructure that the APL documented eligible WIC items, it was unclear if (or how) the APL influenced the experiences of WIC participants as they grocery shopped and attempted to pay for groceries using their WIC benefits. I set out to better understand how the APL, as a genre within WIC’s information infrastructure, “worked.”

**RESEARCH DESIGN**

In this article, I work to answer the following research questions:

- How do genres that make up information infrastructures shape access to digitally-mediated government benefits?
- How can an infrastructural perspective reveal inequities that result from a genre that is part of an information system that mediates a process most often engaged with by vulnerable populations?

To answer these questions, I engaged Bowker and Star’s (1999) methodology of infrastructural inversion to contextualize interviews conducted with WIC participants within an infrastructural perspective. Infrastructural inversion is a method developed by information scientists Bowker and Star to bring to the forefront of analysis the classification and standardizations that make up information infrastructure. Bowker and Star have suggested tracing the “cumulative mess” of a given system, a “reverse engineering [that] reveals the multitude of local political and social struggles and compromises that go into the constitution of a ‘universal’ classification” (p. 48). Information infrastructure development and management takes place within institutions and is, therefore, not readily identifiable or visible to those utilizing technology. However, the information infrastructure defines and influences the genres that extend from that system. The standards, protocols, and other technical documents that mediate and maintain the information infrastructure are markedly invisible to everyday people who are affected by them. Infrastructural inversion uncovers how people are served (and not served) by infrastructure. For example, Read’s (2019) study of a supercomputing center revealed that the interpretation of the inscriptions produced by the supercomputing machine shaped the work of the operations team and served an infrastructural function for the operational annual review (OAR) report (“The Infrastructural Function”).

Following this infrastructural inversion, I conducted interviews with WIC program participants (IRB # STUDY00145763, University of Kansas, 2019). The interview data, contextualized within the data collected from infrastructural inversion, helped me understand how WIC participants navigate their grocery shopping experiences mediated by the APL as it operates behind-the-scenes. This study is ongoing, but the case example participants shared in this article are included below (Table 1).

I utilized convenience sampling as the method for recruiting participants for this study by reaching out to self-identified WIC participants on Facebook. These WIC participants posted publicly about their experience on WIC, either on their local WIC page, the national page, or through a status update. Convenience sampling has several affordances for my project, particularly under the constraints of conducting qualitative research during the pandemic (2020-2021). I could reach out to a large number of WIC participants, staff, and vendors across the United States without any kind of initial “filter” that ruled out particular participants, staff and administration, or vendor representatives. Convenience sampling allowed me to make the best of the situation, get in contact with who I could, and work to answer my research question through a flexible means of data collection.

### Table 1: WIC Participant Case Examples Demographic and Geographic Information

<table>
<thead>
<tr>
<th>Participant Pseudonym</th>
<th>Race/Ethnicity</th>
<th>Program Status</th>
<th>Nutrition/ Risk Status</th>
<th>Family Size</th>
<th>State of Residence</th>
<th>Time in Program (in years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lilah</td>
<td>White, NH</td>
<td>PP**</td>
<td>Diet-based</td>
<td>4</td>
<td>NJ</td>
<td>1.5</td>
</tr>
<tr>
<td>Lavender</td>
<td>White, NH</td>
<td>p=****</td>
<td>Medical (Disabled)</td>
<td>2</td>
<td>NH</td>
<td>0.5</td>
</tr>
<tr>
<td>Victoria</td>
<td>Black, NH</td>
<td>PP</td>
<td>Diet-based</td>
<td>4</td>
<td>NY</td>
<td>4</td>
</tr>
<tr>
<td>Harmony</td>
<td>Black, NH</td>
<td>PP</td>
<td>Diet-based</td>
<td>4</td>
<td>KS</td>
<td>3</td>
</tr>
</tbody>
</table>

*Non-Hispanic  **Post-partum  ***Breastfeeding (partially or full)  ****Pregnant

**FINDINGS**

This study found that the APL is the central genre that enables (or prohibits) a WIC program participants’ benefit redemption, even though WIC participants never interact directly with it. If a WIC participant attempts to purchase an item using their WIC benefits, and it is not listed on the APL, it will not be approved. Thus, state agencies that maintain and update their APL must attempt to keep this documentation as accurate as possible. Each state has its own APL and is responsible for updating it to reflect food item eligibility. States must follow national guidelines for food item eligibility (including nutritional value, cost, and availability), and must review every food item against these guidelines before adding it to their APL. If an eligible food item documented on the APL changes in size (even by an ounce), it must be removed from the APL, re-submitted for review, and approved before it appears on the APL again. One WIC director, Jovi, described in her interview that “it’s a constant game of cat-and-mouse trying to keep the APL updated in our system.” Put simply, if a food item is documented on the APL, when scanned by a cashier, it will be validated as a WIC-eligible purchase, but if it is absent from the APL, it will be rejected, even if it is indeed a food item that is eligible to purchase through WIC.

This hyper-standardization creates a high-stakes environment WIC participants must navigate during grocery shopping checkout, even though they have no knowledge of the APL’s existence. On hand, WIC participants may have other documentation genres that outline eligible WIC purchases (Figure 3). They may have their Allowable Foods List (in digital or printed form), previous receipts with their available listed balance, and, during the pandemic, may also bring along a flexibilities flyer that outlines eligible substitutions for certain food items. They place their items on the conveyor belt, sorting out WIC items from items they intend to purchase out of
pocket. They swipe their eWIC card and enter their PIN while the cashier scans the items’ Universal Product Code (UPC). When an item’s UPC is scanned, the item is first compared to the available benefit balance. For example, if a WIC participant has already purchased four gallons of 1% milk and tries to purchase another, the EBT system will flag this item as ineligible.

Second, the item is compared to the APL. If a participant tries to purchase a gallon of 1% milk that isn’t documented on the APL, the EBT system will flag this item as ineligible as well.

Critically, a store’s current APL isn’t necessarily the most up-to-date or correct APL. Stores must manually “pull down” (download) the nightly file of the APL sent from the WIC state agency to their cash registers every day. Even if stores pull down the nightly file of the APL, it still may not be up to date, depending on how recently a state agency has reviewed eligible items for each vendor, as well as processed requests for items to be added.

That the APL functions this way is universal across WIC. However, WIC program participants experience this infrastructure differently, across different grocery stores, APL versions, and unique interactions with grocery store staff. Victoria, Lavender, Lilah, and Harmony’s experiences, as case examples, shows how the APL as a genre operationalizes uniquely for individuals, shifting even day-to-day or store-to-store.

Victoria
Victoria, whose experiences grocery shopping and using her WIC benefits were highlighted at the opening of this article, feels hyper-visible during checkout, even when things go right. During our interview, Victoria described that although using an eWIC card was generally “discreet” and can lead to a “normal transaction” where “[she] doesn’t have to feel like a sideshow that is holding up the line,” most often, problems occur. For example, at the beginning of the COVID-19 pandemic, WIC vendors with limited WIC-eligible items in stock offered “flexibilities” that allowed participants to substitute items with other brands if the original item was out of stock. When Victoria tried to make a substitution, however, she described that she was unsuccessful:

Actually going into the store and attempting to get different sizes and more choices, using the updated Allowable Foods List, and seeing that there are more choices for cereal … they said they don’t have them. So I can get more choices, but they aren’t available. It says on the List we have these expanded options, but when you actually try to check out it doesn’t register in their system. So it’s like, okay, well, there’s nothing cashiers can do about that. And there’s nothing I can do about that, and even if I call WIC there’s nothing they can do about that. So okay, I guess I’ll just pay for this box of cereal, which is pretty inconvenient especially since the List says I can get it.

Although Victoria only mentions the Allowable Foods List as a consequential genre in her attempt to redeem an eligible substitution, the APL is also at play here. The APL is the primary mechanism for individual food item approval or denial during checkout via a matching UPC, or a missing UPC. Because of inconsistent and limited items in stock, particularly during periods of “runs” on grocery stores by panicked shoppers throughout 2020, the APL created further constraints for WIC participants as they attempted to find and purchase eligible items. As the pandemic wore (wears) on, the USDA created a series of WIC COVID-19 “flexibilities” that have been approved for the duration of the public health emergency (USDA/Food and Nutrition Services, n.d.). These flexibilities apply to the full spectrum of WIC activities, from implementing digital enrollment, telehealth visits, remote issuance of benefits, food package flexibility, and options for food package distribution. These flexibilities are essentially a workaround of WIC’s current information infrastructure that was designed for “in-person” interactions. The increased flexibility of food packages is intended to “permit appropriate substitutes” for the types and amounts of certain WIC-prescribed foods if their availability is limited. For example, some states have been approved to allow participants to:

- Substitute milk of any available fat content if prescribed varieties are not available;
- Substitute authorized whole grains in package sizes up to 24 oz. when 16 oz. packages are not available; and
- Substitute 18-count cartons of eggs when 12-count cartons are unavailable (“USDA/Food and Nutrition Service” 2021).

These waivers are intended to expand what is eligible within the WIC program without having to make direct changes to the APL; importantly, these items are only eligible when eligible items are unavailable. The flyers are meant to override the dictates of the APL: for example, if 12-count cartons of eggs are unavailable, 18-count cartons become eligible, even though when scanned they will be rejected as ineligible. This flexibility, at the same time that it promotes an increased range of food item eligibility, also places additional strain on the interaction between cashiers and WIC participants during checkout.

As Jovi, a WIC Director in Montana, explains, this flexibility “positions the cashier as the police” who determine whether or not items are out of stock, and therefore if the alternative is eligible (personal interview). Cashiers must decide whether or not they’re going to accept the waiver as authoritative over the authority of the APL. These waivers work to act as loopholes for the APL, and in doing so, reveal that the APL was designed under the assumption that WIC-eligible items would always be in stock and that substitutions would ultimately not be necessary for WIC participants to fully redeem their benefits. This assumption becomes visible under the changing conditions introduced by COVID because the APL no longer works as it was originally designed. For Victoria, this added a frustrating pattern to an already difficult process—not only were substitutions also unavailable at times, but sometimes substitutions weren’t honored by cashiers (often not up-to-date with WIC’s latest policies) during checkout.

As a Black woman, Victoria is, as Jovi describes, “policed” by the cashier as she works to redeem her benefits. This policing layers on to the ways Victoria describes already feeling scrutinized by fellow shoppers and grocery store staff. Her visibility as a person of color on welfare extends from a history of distrust that women, especially Black women, using welfare are “taking advantage” of the system and thereby not adopting market logics of efficiency and personal responsibility in their own lives (Nadasen, 2007). This distrust stemmed in part from the popularization of the caricature of the “welfare queen;” a Black woman living beyond her means because of the financial assistance gained from enrolling in welfare programs (Nadasen, 2007, p. 58). Although there is
little statistical evidence that women and caretakers enrolled in WIC are engaged in fraudulent uses of the program, an underlying fear of and reaction to fraud is built into WIC’s information infrastructure, in part through the way the APL hyper-standardizes eligibility and creates such a high-stakes checkout experience. And though all women and caretakers enrolled in WIC experience this information infrastructure, the stereotype of the “welfare queen” and a basic question of whether women of color are worthy or deserve welfare are significant historical factors that contribute to this infrastructural design. The APL, as part of WIC’s information infrastructure, has these assumptions, ideologies, and stereotypes baked into its design. Although the APL is never visible to Victoria, her experience of WIC’s infrastructure is a felt experience of these inequities.

The APL’s role in WIC’s information infrastructure contributes to Victoria’s stress about her heightened visibility and vulnerability during checkout. As she explains, “I think, so what happens now? It’s like an unknown force that controls my experience. What do I have to do? It feels very different from store to store, even trip to trip. Every month has a new surprise waiting for me in the grocery store ... we have times where we can use WIC and times where we go without.”

Lavender
Like Victoria, Lavender described feeling hyper-visible during shopping and checkout. As a nonbinary, disabled, pregnant person, Lavender ended up choosing to avoid going into the grocery store altogether and opted for curbside pickup, which is overwhelmingly unavailable to most WIC participants. Lavender lives in rural New Hampshire and has only two WIC vendor grocery stores within an hour’s drive.

Lavender describes that they “used to go to the store, but I got so angry and anxious just walking in” because the process was so overwhelming and required fast-paced decision-making. Lavender explained that they have “executive function trouble,” which makes grocery shopping take longer, and especially so with WIC. Combined with their heightened visibility as a self-described “not super feminine” pregnant person, the fatigue of pregnancy, and the stress and additional health risks introduced by the pandemic, grocery shopping in person wasn’t only inconvenient, it was nearly impossible. Lavender explains that they want to remain as “inconspicuous as possible” as someone on WIC, but also someone who is visibly disabled and pregnant, and described this as the primary motivation for getting pickup. In our interview, Lavender explained that instead of shopping in-person at their nearby store, they drive thirty minutes away for a local chain that has implemented curbside pickup for WIC and Supplemental Nutrition Assistance Program (SNAP) participants.
They’re one of the only grocery stores that offer it. You shop online through their app and when you checkout you select that you’re going to use EBT. Then, you don’t have to prepay for it. You submit your order and get notice your groceries are ready 3-4 days later at a specific time. When you get there, the attendant takes your WIC card and debit card and then they run it that way. They ask for your PIN and they go inside and run your card. They offered that I can go inside and enter my own PIN but I’m fine with it. Then they run my debit card as a credit card.

I have to drive thirty minutes from my house to do this, so I could go to a store ten minutes away, but they don’t do curbside. And since I’m immunocompromised, I’m not going into stores, my partner isn’t going into stores. We plan our grocery trips way in advance, almost a week, so I just use the store app to order what I want. If it’s in stock, great, if it’s not, oh well.

Through this curbside pickup process, Lavender avoids being physically present during checkout altogether, but enables the APL to exert authority to an even greater extent, because they are not present to negotiate or challenge the transaction as it is processed by a cashier. Specifically, Lavender describes that they “find out things are ineligible after [they] pay … which is kind of shitty.” For example, if Lavender orders pepper jack cheese and selects “WIC payment” in the app, goes on the drive to get the groceries 3-4 days later, and gives the attendant their WIC card and backup debit card, they will find out pepper jack cheese is not WIC eligible (not listed on the APL) and that they’ve paid out of pocket for the item after the transaction has already been processed, when the attendant hands them their receipt.

Lavender works to establish invisibility in order to mitigate some of the fatigue and heightened visibility that would likely result from cash register interactions. The processes required for successful benefit redemption by shopping in person do not align with Lavender’s body, nor their desire to remain as “inconspicuous” as possible as a WIC shopper, but grocery pickup also introduces new problems, as well as limited benefit redemption. In a recent article, Konrad (2021) theorized access fatigue, the labor and the exhaustion disabled people experience as they create moments of access for themselves. Konrad noted that the “sheer volume and frequency of the rhetorical work of access” cannot “be isolated from other rhetorical burdens that result from oppression and marginalization” (p. 193). This fatigue resonates specifically with Lavender’s experience, a nonbinary, disabled, and pregnant person who expends time and energy to meal plan weeks ahead, drive to an inconvenient grocery store because it allows curbside pickup, and accept quietly whatever items are accepted or rejected as WIC-eligible in order to both advocate for themselves (to get the food they need) as politely and invisibly as possible. Therefore, the APL’s authority is fully exerted on Lavender because they have opted for a benefit redemption process that prioritizes their well-being over one that prioritizes spending as little money out-of-pocket as possible.

Lilah

Lilah, a white woman living in New Jersey with her husband, Jackson, and two children, did not report experiencing any hypervisibility, discomfort, or feelings of being scrutinized by cashiers or managers during her descriptions of her experiences redeeming her WIC benefits. Instead, Lilah reported that meal planning, selecting items at the grocery store, and understanding her WIC benefits to be “relatively smooth-sailing” and that people paid little notice. However, like Victoria, Lilah experiences consistent issues at the cash register when attempting to check out. Between unhelpful cashiers who haven’t completed WIC transaction training, to frustrated customers behind her, using WIC was an “upsetting, embarrassing time, every time.” Most often, at least one item she knew was WIC approved was denied.

Even though she had purchased the item before using her benefits, another store would deny the item (an indicator that the item is not documented on that store’s most recently downloaded APL). Lilah described the full process of WIC benefit redemption as “humiliating, time-consuming, and stressful.” She said that she often asked herself “Is it worth it? Can I make it through without using this check, this day?”

However, Lilah developed an innovative strategy to mitigate these frustrating checkout experiences after having an unusual experience with a cashier:

I grabbed the wrong milk. I went up to the register, waited in line, and then realized. I apologized and asked the cashier if she could run someone back to go get the correct milk. And she’s like, ‘Oh, I’ll just substitute. I’ll override.’ And I was like, ‘What?’ And she’s like, ‘It’s not a big deal.’ But I told her up until the point it really has been a big deal, up to this point nobody has substituted anything for me. And I left with almost no groceries. And she said, ‘Oh, well whoever told you that is wrong. We’ve been told to substitute to get you want you need.’ So I wrote her name down, and decided I was going to get her work schedule because all the other cashiers and supervisors that I asked said no.

From this point forward, Lilah called ahead to get “Callie’s” work schedule, and only grocery shopped when she was working. Callie was resourceful, solutions-oriented, and as Lilah describes, developed a “rapport” with her that felt supportive. Grocery shopping around Callie’s work schedule was not convenient, and was only possible when it aligned with Lilah’s work schedule, but avoided inexperienced cashiers and frustrated fellow shoppers.

However, as the pandemic continued, Jackson lost his job, Lilah’s hours increased, and Jackson became the point person for grocery shopping and WIC benefit redemption. Callie stopped working at the Wal Mart, and they could no longer rely on her support. During this shift, Lilah describes that it became clear that Jackson experienced far less pushback from cashiers and stigma from fellow shoppers than when she grocery shopped. Unlike Lilah, Jackson challenges cashiers frequently. As he describes,

It’s horrendous. I know I’m going to get in line, and I try to get my WIC stuff out all organized, and if you get a young kid [as a cashier], they complain. They say, “Oh, I hate this WIC stuff” … I’m organized, I’m ready to go. I know my WIC stuff, I got it lined up. Now I’m at the mercy of the register, the cashier. They’re like, well, it’s not my problem we don’t have your WIC stuff. I say, well, it is, because you need to replace it. You have an agreement with the state to provide this, so my understanding is you are required at this point to offer a substitute.
Often when Jackson challenges the cashier, they yield and make the substitution, or find a cashier or manager who knows how to process the transaction. Thus, Jackson creates his own loophole of sorts and circumvents the authority of the APL as a genre by leveraging his authority and privilege. Jackson feels more comfortable with confronting the cashiers, even though it’s an unpleasant experience. As a white man redeeming WIC benefits, he experiences some of the same challenges as Lilah, but seems to be able to more readily redeem their WIC benefits because he is not fazed by the inviting conflict and challenging the cashier and extending the time of the transaction. His privilege seems to protect him from the hyper-visibility that WIC participants like Victoria and Lavender experience, as well as the humiliation that Lilah describes when it becomes apparent she is using WIC. Thus, Jackson’s experience of WIC’s information infrastructure, and the influence of the APL, is markedly different from that of the other participants interviewed for this study. Jackson appears to leverage his privilege with cashiers, demanding that the WIC vendor grocery stores uphold their end of the bargain, rather than accepting the outcome of a WIC transaction to remain inconspicuous or avoid scrutiny. Here we can see how the assumptions, ideologies, and stereotypes baked into the APL as part of WIC’s information infrastructure do not particularly marginalize or harm Jackson. Ultimately, Lilah benefits from Jackson’s assertion of his privilege because of a net increased benefit redemption, but this inequitable treatment is damaging for Lilah; she is concerned about what will happen when Jackson begins to work again full time and she has to redeem WIC benefits again without the help of Callie.

Harmony
As her self-chosen pseudonym suggests, Harmony’s experience with WIC differs distinctly from every WIC participant interviewed so far from this study: it is relatively harmonious. Harmony is a Black woman living in rural Kansas, with access to only one WIC vendor grocery store, but to date, has not experienced any major problems when redeeming her WIC benefits. Although Harmony describes grocery shopping during the pandemic and using WIC as “stressful” because of the lack of pickup or delivery options, overall, Harmony says she “can get whatever she needs” when she shops. Checkout takes longer, but she “hasn’t had any issues with things not being in stock or things not scanning correctly.” Cashiers seem to be consistently trained and know how to process WIC transactions, are polite, and fellow shoppers don’t complain or ask her invasive questions, like Victoria. Harmony did not report feeling hyper-visible as a Black woman on welfare, nor did she report that she feels embarrassed or stigmatized by others during shopping or checkout.

Harmony’s experiences with WIC highlight how experiences of information infrastructure operationalize uniquely at an individual level—is her benefit redemption unproblematic because of a consistently accurate APL? Yes, and it also seems that knowledgeable and polite cashiers and managers, fellow shoppers who don’t create a scene when in line, and a generally well-stocked and organized grocery store all layers on to the APL’s functionality to support and generate a positive overall experience. If the APL began to be inconsistently pulled down to registers (perhaps because of a new, inexperienced manager), or if WIC items went unstocked, or if a new wave of cashier hires created a negative culture of stigmatizing WIC participants, Harmony’s infrastructural experiences could change dramatically.

Through mapping the APL utilizing infrastructural inversion, this study found that the APL creates a hyper-standardized and high-stakes environment during checkout at the grocery store cash register, creating a shared set of problems for program participants:

1) The APL, although not overtly present during checkout, pits program participants and cashiers against one another in the event of a failed transaction. The failure or success message on the cash register, relayed by the cashier, is authoritative, and, program participants must choose strategically when to challenge this authority.

2) The over-reliance of APL documentation to certify or deny food item eligibility can undermine a program participants’ knowledge and expertise of what they can purchase with their WIC benefits, resulting in discouragement and limited benefit redemption.

3) The high-stakes environment at the cash register creates not only inconvenience for program participants, but can create a vulnerable/unsafe environment for marginalized individuals, including BIPOC, disabled people, and LGBTQIA+ people.

Although preliminary, these findings are significant because they demonstrate the influence of information infrastructure genres in shaping access for program participants in WIC. Although the APL is certainly pragmatic (a necessary document for EBT functionality, an important documentation site), it affects the day-to-day lives of WIC program participants, and not equitably.

IMPLICATIONS
Understanding how the APL mediates and can generate high-stakes negotiations during checkout clarifies how genres that make up information infrastructures can significantly shape access to resources, like the food WIC participants should be able to purchase using their government benefits. Even without direct knowledge of the presence of the APL, WIC participants must choose how and when to advocate for themselves in the hyper-visible environment of checkout, where cashiers and other customers draw their attention to the nature of a participant’s payment method. These WIC participants carry all responsibility to choose the correct items, yet they have little agency to challenge item eligibility at the point of sale, highlighting that the EBT system contributes to a WIC grocery shopping experience that relies on the APL as a primary authority, regardless of how accurate it is. This seems to hold WIC participants to an impossible standard—to be personally responsible in their food item selection, following the rules exactly in order to optimize their benefit redemption, and to submit to the authority of the APL without question.

This study’s findings have implications for studying information infrastructure genres and the ways writing studies research might take up greater attention to infrastructures in qualitative approaches to locate sites of inequity. The APL is a genre which produces a relationship between cashier, cash register, and WIC participant that heightens visibility to bodies that may already be more visible (Black, disabled, pregnant) and, therefore, already subject to unwanted attention, surveillance, and/or policing. Ultimately, this study found that APLs do not affect WIC participants equitably. What other genres that function as part of information infrastructures might also inequitably affect access? What “systems” contain these oft-unnamed, invisible genres?
It is hard work to be on government assistance—especially in the pandemic, but to an extent always—even if it works. If it doesn’t work, that’s even more work, and work that tends to place blame on participants, increase their visibility in a process that can already be stigmatizing, and wear on their bodies. Studies of WIC participant shopping experiences (Bertmann et al., 2014; Gleason et al., 2014; Najjar, 2013; Todd et al., 2010) have recognized that negative grocery store interactions result not only in embarrassment and stigmatization, but lowered program participation rates and high attrition. For example, Bertmann et al. found that “barriers,” including “experiences of negative interactions in stores, dealing with misunderstandings over WIC benefit redemption rules, or feeling embarrassed or judged in relation to using WIC benefits” (p. 56) are directly related to an under-redemption of benefits. Bertmann et al. suggested that understanding how “more experienced WIC participants make use of … benefits and whether these strategies could be taught to new WIC participants as they enter the program” (p. 57) could be useful. In part, this study suggests that there is much to be learned from the workarounds, loopholes, and technical labor that people perform to create access for themselves as they navigate the genres of information infrastructures.

Without the context of the APL’s role as part of WIC information infrastructure, a genre analysis of WIC benefit redemption genres and the recurrent situation of stymied benefit redemption may uphold the narrative that WIC participants are ultimately at fault when their transactions fail. A genre analysis without this infrastructural context might position the error message present on the cash register interface as authoritative, uncomplicated—it says the item isn’t WIC eligible, so it must not be. WIC participants must be selecting incorrect items from the shelves and trying to pay for them with their benefits. This genre analysis might conclude that WIC participants engage in strategies to create access for themselves because the rules of the program are confusing—which is why they’re selecting the wrong items, for instance. An analysis of WIC participant’s benefit redemption texts and interviews with WIC participants would uphold the APL’s role as an invisible, and ultimately unnoticed, genre.

Adding an infrastructural perspective to genre analysis adds another lens to studying the world through “genre-colored glasses” (Devitt, 2015) that enriches our study of genre access. These genre-infrastructure glasses (I picture them as steampunk glasses) help us to see that the interaction between a WIC participant and a cashier at the cash register is mediated not only by visible resource genres (assigned food package, Allowable Foods List, flexibilities flyer, eWIC card) and EBT technology (cash register, scanner, PIN pad), but also invisible genres that make up the information infrastructure, like the APL. In fact, both the visible resource genres and EBT technology are mediated by WIC’s information infrastructure via the APL (see Figure 1). An infrastructural perspective locates and provides an understanding, then, of why WIC participants need to engage strategies to ensure successful benefit redemption, as well as what these practices actually address in terms of the disconnect between the local and global in supporting social action.

Although we learn (and learn through) genres in order to get things done in the world, genres that make up information infrastructures like the APL seems to complicate things. Miller (1984) described that learning a genre means better understanding a given situation and taking on a particular orientation towards what is possible by developing a “cultural rationality” (p. 165). This study of the APL, I think, showcases WIC participants’ genre knowledge (drawing on their resource genres) and a kind of infrastructural knowledge. Interestingly, though, this study doesn’t show that WIC participants “learn to understand better the situations in which [they] find [themselves]” (Miller, 1984, p. 165) – they develop sophisticated strategies for navigating “the system” without understanding why what is happening is happening. WIC participants learn how to effectively navigate grocery shopping as they participate in the program. The WIC participants interviewed for this study did not understand why benefit redemption kept going poorly, only that if they wanted to acquire food through WIC, they needed to employ these strategies. Although they drew on the available benefit redemption genres and employed these sophisticated strategies for ensuring successful transactions, this genre action was a form of cultural rationality that responded to a problem, the source of which was unknown.

Because the APL operates truly behind-the-scenes, I’m not sure if it’s accurate to describe participants’ strategies for creating access as a traditional kind of genre knowledge. Instead, this infrastructural (genre?) knowledge seems to be similar, in that it’s deployed strategically and is context-bound (in terms of time and place). In the case of the APL, WIC participants still interact with the text, but the APL mediates the direct interaction with the cashier and cash register. The relationship between the information infrastructure genre (APL) and more “present” genres (participant-cashier negotiations, resource genres like the Allowable Foods List) seems to be mediation, or perhaps more accurately, adjudication. A WIC participant brings food items to the conveyor belt, with evidence of their eligibility (often through the Allowable Food Items List and/or flexibilities flyer), and the APL file adjudicates, makes a final judgement, on whether items are eligible or not. The cashier or manager can act as intercessor (like Callie) who intervenes and “overturns” the decision based on evidence, or can uphold the “law” set out by the APL via the cash register. In this metaphor, WIC participants are, in a sense, “on trial” at the cash register and bear the burden of proof to show food item eligibility, and therefore at times must go to great lengths to guarantee as uncomplicated of a transaction as possible, even though the “law” (the specific APL file downloaded) often differs from store to store. That genres like the APL within information infrastructures may vary widely across large organizations like WIC, therefore shaping individual experience of those organizations significantly, suggests that adding an infrastructural perspective to more traditional genre analysis is needed to get the full picture.

The APL is a “system thing”—as an information infrastructure genre, it both enables and restricts social action; it enables WIC’s EBT system “to work” and at the same time, actively works against many WIC participants, especially so against people already overburdened, under-resourced, and vulnerable. There’s no quick genre “fix” for the problems the APL generates, and no one-size-fits-all intervention into WIC’s information infrastructure that resolves the barriers currently present for program participants. However, better understanding the root of the problem (genres like the APL) within information infrastructures is a good start for writing researchers interested in bureaucratic and institutional critique and intervention.

LIMITATIONS

The COVID-19 pandemic was both a limitation and opportunity to study how a genre, the APL, as part of a wider information
CONCLUSION

The genres that make up information infrastructures work invisibly to shape people’s access to resources. In the case of WIC, the hyper-standardized environment at checkout generated by the APL’s function as an information infrastructure genre created problems for WIC program participants who were already more visible and vulnerable. As a genre that is “behind-the-scenes” in WIC’s information infrastructure, the APL has serious consequences for benefit redemption, and does shape the experience of WIC program participants as they attempt to get the groceries they need. The APL is one example of a genre within one large organization’s information infrastructure that affect’s people’s well-being, dignity, and health, and writing studies and technical communication as a field should turn greater attention to these “behind-the-scenes” genres within information infrastructures. Federal programs like WIC, the Supplemental Nutrition Assistance Program (SNAP), and Temporary Assistance for Needy Families (TANF) all may be beneficial sites to study to further understand how the genres that make up information infrastructures influence despite their invisibility. Pursuing this kind of infrastructural analysis would provide more insight into the relationships between writing, infrastructures, and access and further develop the growing “infrastructural turn” within the field of writing studies.

As a result of these findings, scholars in writing studies and technical communication studying writing infrastructures might also consider the following:

- When collecting genre samples for analysis from an organization, consider whether there are relevant samples that derive from a site’s information infrastructure (government programs like WIC have these publicly available on their website)
- If conducting in-person observation of genre interactions, review the infrastructural functions of genres that are unavailable to observation, but may influence these interactions
- Pause before discarding technical documents that resist direct analysis

Ignoring the genres that make up information infrastructures risks identifying the symptoms of a problem without locating an underlying cause. Locating and analyzing the genres that make up information infrastructures is one way to “drill deep into … the infrastructure of inequality” (Grabill, 2010, p. 455) of complex systems and large organizations.

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Making Infrastructure into Nature: How Documents Embed Themselves into the Bodies of Oysters

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ABSTRACT
This article contributes to a growing research area in writing studies that examines how documents perform infrastructure functions. The article uses document analysis and interviews to examine the ecology of documents necessary to establish oyster aquaculture in the state of Alabama. The results show that performative infrastructural documents exist in a larger ecology of documents and that they can embed themselves in natural environments and living creatures. This analysis extends the analytical framework of infrastructure-based writing studies by connecting writing and infrastructure with the natural world.

CCS Concepts
Information Systems

Keywords
Infrastructure, Ecology, Performative, Oysters

Oyster populations have plummeted in the Gulf of Mexico, down 50-85% from their original levels (Bendick et al., 2018). Although oyster populations have fallen dramatically in the last 100 years (RB, personal communication), events in the last two decades have hastened their decline. According to The Nature Conservancy (Bendick et al., 2018), oyster populations have suffered from “[c]hanges in freshwater flows to the Gulf’s estuaries (from both droughts and floods), sedimentation from increasingly frequent storms, inconsistent replacement of cultch and heavy fishing pressure” (p. 3). Water pollution and low oxygen levels make oyster survival more challenging (RB, personal communication). Several hurricanes, going back to Ivan and Katrina, hit oyster reefs hard (RB, personal communication), and the shellfish also suffered from an increase of oyster drills, one of their key predators. Further devastation came from the Deepwater Horizon oil spill in 2010 and the subsequent recovery efforts, which may have killed as many as 8.3 billion oysters in the Gulf (McCormick & Hill, 2021).

The decline of oyster populations raised alarms with state governments, wildlife agencies, and the fishing and seafood industries. The animals serve important ecological functions by filtering massive amounts of water and constructing reefs that serve as natural breakwaters. Oyster reefs also provide nurseries for many species of fish. This concern caused several stakeholders to invest in oyster restoration projects, including oyster planting, oyster farming, oyster gardening, oyster fishing and harvesting restrictions, and oyster shell recycling programs. Although it is too early in 2022 to judge the successes of these initiatives (BW, personal communication), they represent the best opportunities for restoring Gulf of Mexico oyster populations.

Although all of these efforts to restore oyster populations illustrate the connection between infrastructure and ecology, this paper specifically focuses on oyster aquaculture in the state of Alabama. In doing so, it argues that we cannot always draw clear lines between natural ecologies, the infrastructures that sustain them, and the documents and communication acts within those infrastructures.
By tracing the documents and rhetorical moves that made Alabama’s oyster aquaculture infrastructure possible, this article argues for a direct relationship between infrastructural documents and the existence of living beings. Particular oysters are literally alive today partly because of documents written to support the infrastructure of their existence. In this way, oyster infrastructure illustrates the importance of performative documents to natural ecologies; according to theories of performativity developed by scholars such as Austin (1975) and Callon (2007), performative documents do not simply describe the state of reality but rather work toward “enacting the realities that they describe” (Callon, 2007, p. 7). Many performative documents, such as policies, laws, and regulations, have tangible impacts on the material world. These documents shape physical and even ecological environments, giving them a vital but overlooked role in infrastructure.

Performative rules and regulations have very specific effects on oyster ecologies that make often overlooked documents visible. As one manager of an Alabama oyster aquaculture program said, “From our research farm, I can see the Mississippi oyster farm and we have really different rules and regulations on how they can not only grow but specifically how they can sell their product” (RG, personal communication). My analysis follows the lead of Frith (2020), who argued that writing serves as infrastructure by becoming embedded in processes and material objects. Frith wrote, “The documents must fall away for end users and become figuratively buried inside objects” (p. 422). Although Frith envisions material objects like RFID tags as the places where infrastructural documents like technical standards become embedded, I take this analysis one step further by arguing that infrastructural documents can become embedded in the natural world by facilitating the existence of biological creatures and the habitats where they live.

This paper also takes inspiration from Callon’s (1984) work examining researchers trying to determine whether scallop larvae will anchor to a netted bags supported by towlines in St Brieuc Bay. Much of this analysis relies on a principle Callon has termed “free association,” which requires “the abandonment of all a priori distinctions between the natural and the social” (p. 196). Instead of drawing artificial lines between what counts as nature and what counts as society, Callon has invited us to retrace a variety of actors as they engage in “the simultaneous production of knowledge and construction of a network of relationships in which social and natural entities mutually control who they are and what they want” (p. 203). In Callon’s analysis, researchers enroll other scientists, scallop fisherman, and scallops themselves to try to create alliances that will lead to population restoration and more sustainable fishing practices. Callon argued the researchers must use different devices to interest and enroll different actors in scallop preservation: “for the first group, these devices are the towlines immersed in St. Brieuc Bay; and for the second group, they are texts and conversations which lure the concerned actors to follow the three researchers’ project” (p. 211). Through these various devices, “social structures comprising both social and natural entities are shaped and consolidated” (p. 211). Callon has developed productive analysis through free association by examining natural and social interactions in similar ways. Callon found that the researchers “worked incessantly on society and nature, defining and associating entities, in order to forge alliances that were confirmed to be stable only for a certain location at a certain time” (p. 222).

The story of oyster aquaculture in Alabama reveals a similar situation. Researchers, lawmakers, farmers, institutions, equipment, and oysters themselves formed alliances to make aquaculture possible. This work involves infrastructure, both material and textual. This article inverts the approach of recent research by Wakefield (2019), which analyzes the Living Breakwaters project designed to create a two-mile oyster reef near Staten Island to serve as a breakwater protecting the city against storms and climate change. Wakefield looks at the tangible human and natural work involved in “making oysters into infrastructure” (p. 761), but I examine how documents supporting oyster aquaculture help make infrastructure into oysters. Infrastructure work causes farmed oysters to exist where none existed before, and documents in this case were at the forefront of this process. As with many biopolitical and ecological projects, there is a direct connection in Alabama oyster aquaculture between written documents and the existence of the creatures they describe.

This special issue on the infrastructures of communication, writing, and design asks scholars to consider many topics, including “The role writing plays as infrastructure (social or material)” and “How design and writing play hidden infrastructural roles in essential processes.” This article responds to that call by examining the hidden but crucial role of written documents and communication in oyster farming in Alabama. My research looks at the way that writing foregrounds and enables an activity that combines social, material, and natural processes. This article follows many others in considering the relationship between water, biological life, and infrastructure (Bennett, 2019; Cousins, 2020; Cousins & Newell, 2015; Lewis & Ernstson, 2019; Nost, 2020; Wells et al., 2021). However, this article is one of few pieces that explicitly outlines how written documents function as infrastructure that embeds itself in the natural world. This piece also directly links the performative and infrastructural functions of documents and texts. In doing so, it extends the purview of writing studies related to infrastructure beyond social and material contexts by connecting “natural” ecologies and human-made infrastructures. In this work, the article answers the following research questions:

- RQ1: What documents were necessary to enable oyster farming in Alabama?
- RQ2: What infrastructural functions do these documents perform?
- RQ3: How to performative documents contribute to the creation and maintenance of infrastructure?
OYSTER AQUACULTURE

Oyster aquaculture, the process of raising oysters in controlled farms for commercial sale, involves significant infrastructure, material, and documents that both describe and enact this process. Understanding the operations of oyster farming helps clarify how documents undergird and participate in this infrastructure. Although this infrastructure is largely invisible to many of the people who eat farmed oysters, it involves a complex system that requires regulation, physical infrastructure, biological entities, and an entire supply chain of processors and wholesalers. Therefore, oyster farming exists in what Wells et al. (2021) termed a “water infrastructure,” which involves “social and technical assemblages of materials and matters as well as people and their behaviors” (p. 1). This article highlights the operations of oyster farming infrastructure in order to clarify how documents participate in water and natural infrastructures.

Documents supporting and facilitating oyster aquaculture contribute to a process that requires creating a suitable environment for oysters to mature and then seeding the area with oyster “seed,” “larvae that’s grown in a nursery in a specific way that allows it to become individual oysters” (Alabama Oyster Aquaculture, 2021). The seed permanently attaches to surfaces where it becomes oyster spat that hopefully matures into full oysters. Once the oysters mature, they are harvested and sold to restaurants and seafood markets. Oyster aquaculture requires significant time, resources, and knowledge. Generally, farmers use one of three methods to raise oysters, each of which either involves creating new infrastructure or repurposing existing infrastructure.

- **On-Bottom Farming:** This method involves placing “culch” (such as limestone and oyster shells) on the seafloor to give oyster spat a surface to attach and grow.

- **Off-Bottom Farming:** This method requires suspending oysters above the seafloor in mesh containers (similar to the research with scallops that Callon (1984). Though this method is newer in the Gulf of Mexico, it protects oysters from key predators, improves their appearance, and allows them to grow in more varied environments. Off-bottom farming involves sophisticated equipment, such as adjustable long-line systems, floating cage systems, and floating bags.

- **Off-Pier Farming:** This method suspends oysters in floats or baskets under existing piers that have been permitted for oyster farming.

![Figure 2. On-bottom oyster farming](image)

Oyster aquaculture involves not just material infrastructure but also infrastructural writing—documents and communication acts that do “mission critical work” in allowing infrastructures to function (Read, 2020). For instance, aspiring oyster farmers must apply for leases, permits, and licenses before they can begin aquaculture efforts. Alabama’s Department of Conservation and Natural Resources (DCNR), Marine Resources Division, handles all leasing and regulations related to aquaculture, but the Alabama Department of Public Health, the Alabama Law Enforcement Agency, the Army Corps of Engineers, and the Coast Guard also provide input on all aquaculture sites (RG, personal communication). To receive permits, applicants must submit maps, equipment drawings, descriptions of aquaculture activities, and other relevant documentation (Alabama Oyster Aquaculture, 2021).

This complex array of documents already attests to the role of writing in oyster aquaculture infrastructure. However, this article focuses on an ecology of documents and communication acts that made oyster aquaculture in Alabama possible in the first place. Complex and expensive leasing processes initially made oyster farming cost-prohibitive in Alabama compared to other Gulf states, such as Louisiana. The state of Alabama relied on legacy regulations and laws governing oyster harvesting that were not conducive to new developments in oyster aquaculture (RG, personal communication). Therefore, through a series of documents traced by this article, stakeholders in Alabama proposed and passed ALA. ADMIN. CODE r. 220-4-17 – Shellfish Aquaculture Easements (2014), which simplified and clarified the oyster aquaculture leasing process. This article traces the chain of documents that helped lead to the creation of this new law (itself a piece of written infrastructure). In doing so, this research positions documents at the forefront of infrastructure. In some cases, documents do not merely report on infrastructural work or even facilitate the operation of infrastructure. In this case, documents actually allow specific infrastructure to exist by laying the groundwork for the material construction of infrastructure. Without these documents, it would have difficult, perhaps impossible, for oyster aquaculture to occur at a large scale in Alabama.

![Figure 3. An adjustable long-line system for off-Bottom oyster farming](image)
LITERATURE REVIEW
This article considers how writing and communication perform infrastructural functions, but infrastructure itself can be notoriously difficult to define, especially given that the term spans several fields. In the common imagination, infrastructure often consists of material structures like roads, bridges, and pipes that undergird society and allow it to function. However, this definition is limited (for instance, when the Biden administration argued for its Infrastructure Investment and Jobs Act, several Republicans argued that broadband internet services did not count as infrastructure [DeChiaro, 2021]), because it treats infrastructure as disparate material artifacts that serve as infrastructure in and of themselves. Several scholars have been influenced by Star and Ruhleder’s (1996) relational definition of infrastructure, which defines infrastructure not as what something is but how it relates to larger processes. As Read (2019) wrote, “infrastructure is not built to be infrastructure; it only becomes infrastructure when it achieves certain functions for an individual’s or organization’s work practices” (p. 243). Frith (2020) offered a similar definition by identifying several key aspects of infrastructure, including that “infrastructure has agency, infrastructure is often invisible, and infrastructure is relational” (p. 407). By expanding the definition of infrastructure to look at whole systems of how objects, documents, and people function together, we open the possibility of examining both the infrastructural role of documents and the ways that nature and infrastructure (including written infrastructure) intersect.

Infrastructure and Writing Studies
Writing studies, both within and beyond technical communication, has taken a much stronger interest in infrastructure in the last several years. Building on previous work that examines the hidden but important work documents do in upholding institutions, scholars have considered the ways that writing and communication, broadly construed, work to shape, support, and change infrastructures. For instance, Hart-Davidson et al. (2007) analyzed how content management of organizational websites and authoring practices function as “technological and social infrastructure that makes their organization work” (p. 13). In doing so, they argue “Writing is infrastructure, and thus it is both fundamental and invisible” (p. 32). Like many pieces of infrastructure, writing can fade into the background even as it enables complex processes. Just as we seldom consider where the water comes from every time we turn on the faucet, we rarely consider the vast array of documents and communication acts necessary to facilitate infrastructural functions like transportation, information exchange, and power generation.

Read (2019) built on this perspective by exploring how writing performs an infrastructural function even though technical professionals and society often view documents as “boring” or of secondary importance compared to physical stuff, when they view writing at all. Taking a supercomputing site as her example, Read argued that despite their frequent invisibility and neglect in and beyond organizations, “writing, writing products, and writing processes underwrite organizational life, particularly in technical organizations” (p. 234). Writing processes and products become just as important for the functioning of large-scale systems, such as supercomputers, as more physical infrastructures like power grids, to the point where it becomes difficult to conceptually separate symbolic, communicative, and material elements of infrastructure. Writing performs an infrastructural function when it participates in assemblages that make things happen. Documents that sit unread and unused on a shelf or hard drive do not count as infrastructure, but documents that shape organizational practices and material structures are part of a web of infrastructure. For Read, many workplace documents do not merely communicate organizational actions but participate in organizational actions. As one example, Read (2020) cited a preliminary master lease agreement, which must be signed as part of an institution’s process to fund a supercomputer. Read wrote, “Without such a codified agreement it would not be possible to move forward with building a new supercomputer, which includes maintaining compliance in order to continue to receive project funding” (p. 565). Without this (and many other documents), the supercomputer would not exist.

This relationship of multiple documents emphasizes that infrastructural texts exist not independently but within a rhetorical ecology. According to Edbauer (2005), texts do not remain in isolated containers or bounded situations but instead circulate throughout “affective ecologies that recontextualize rhetorics in their temporal, historical, and lived fluxes” (p. 9). Texts influence, and are influenced by, a wide variety of other texts, attitudes, and material structures. Because infrastructural texts are relational, they operate not independently but as part of what Edbauer has described as a concatenation of texts that make up publics, and in many cases, perform vital functions in infrastructure. A single document can rarely function as infrastructure on its own, just as a single pipe or bridge only becomes infrastructure when connected to many other pieces of infrastructure. Although rhetorical ecologies are metaphorical rather than the literal ecologies where oysters exist, the metaphor evokes the dynamic, complex, interdependent existence we associate with the natural world. As Rivers and Weber (2011) wrote about rhetorical ecologies, “One single text or exigence cannot exist apart from its ecology any more than an animal or plant species can” (p. 194). Writing is part of a complex ecology of infrastructure.

Frith (2020) likewise examined the relationships involved in the hidden work writing does to hold larger systems together (p. 402), particularly when it comes to technical standards that serve as “discursive infrastructure” that governs technical and infrastructural processes. As Frith argued, “Standards are an example of how writing can be a substrate upon which material objects are built. The words of documents quite literally shape many parts of the physical world” (p. 423). In Frith’s analysis, technical standards govern the design and function of RFID tags. For Frith, this example illustrates how written standards can become embedded in physical objects. A piece from beyond writing studies illustrates the same point. An analysis from Carse and Lewis (2017) discussed how updated standards for ships travelling through the Panama Canal (the New Panamax standard) has caused officials in U.S. Atlantic and Gulf Coast states to heighten bridges and dredge waterways to increase their depth to accommodate larger ships. In this way, the written New Panamax standards affected the material and even natural world. As Carse and Lewis argued, “technical and environmental standards can be transported across and embedded in landscapes and waterways” (p. 23).

The embeddedness of infrastructural documents highlights how texts can serve a performative role within infrastructure. The idea of performatives was first developed by Austin (1975), who argued that some sentences are not true or false in the conventional sense but rather make things true upon their utterance. In this way, some statements are not “mere words” but rather the performance of an action. As Austin wrote, in these instances “by saying or in saying something we are doing something” (p. 12). He offered the
example of making wedding vows; when we say “I do,” as part of a marriage ceremony, “we are doing something—namely, marrying, rather than reporting something, namely, that we are marrying” (p. 13, emphasis in original). Of course, not every speech act carries this weight; small children playing wedding do not actually get married when they say “I do.” Still, under specific circumstances, speech and writing makes things true, and this performative work of communication is critical the infrastructural function of writing. Writing and technical communication scholars have long called for more consideration of the performative nature of texts (Graham & Herndll, 2013; Jahn, 2018; Sauer, 1993), and infrastructure studies offer an excellent avenue for this analysis. For instance, Frith’s analysis about how standards documents embed themselves in RFID tags illustrates this point. Specific standards documents declare what can be true about the specifications of RFID tags, and then the tags must follow these performative declarations. Through this performative function, writing embeds itself in the physical and even natural world. For instance, when the state of Alabama Department of Conservation and Natural Resources institutes a rule that “All oysters harvested must be a minimum of 3 inches in length,” (Alabama Department of Conservation and Natural Resources, 2021), the rule functions as a performative document that dictates which oysters remain on the seafloor and which get consumed by humans.1 These performative documents become embedded in living creatures. This example connects with the longstanding, interdisciplinary discussion about how nature and infrastructure intersect.

Infrastructure and Nature
The infrastructure turn within writing studies and technical communication is informed by a broader scholarly turn toward infrastructure and a reconsideration of what infrastructure is and what it does. Scholars across several disciplines have returned to infrastructure to consider it not just as physical “stuff”—such as roads, pipes, power lines—that serves as the foundation for complex societies but also the institutional and social forces that contribute to the production and maintenance of that physical stuff. As a social and political artifact, infrastructure involves social and political forces, what Chester and Allenby (2019) described as “the accumulation, layering, and interconnectedness of technologies, institutions, rules, and policies” (p. 2). Although infrastructure often comes about through engineering projects, Cousins (2020) has reminded us that engineering infrastructure “is a political process that entails the reconfiguration of sociotechnical systems” (p. 928), involving rules, standards, policies, beliefs, and power relations that shape and embed themselves in material structures. However, scholars have also moved beyond simply incorporating less tangible social and political forces into definitions of infrastructure to considering how human and natural forces connect in infrastructure projects. Because the Earth supports human-made infrastructure by holding pipes, roads, and other artifacts, nature and cultural infrastructure physically intertwine (Barry, 2016). According to Chester et al. (2019), in the Anthropocene, when humans increasingly manage and impact the environment, distinctions between human infrastructure and nature blur. On the one hand, “natural systems are becoming increasingly, and in some cases entirely, managed by humans” (p. 1006), wrapping up so-called “natural environments” in human infrastructures. On the other hand, as humans create increasingly complex infrastructures that incorporate natural materials (water, fossil fuels, electricity), and as nature contributes to infrastructure, “our infrastructure becomes our environment” (p. 1011). From this perspective, Chester et al. have defined infrastructure as ways to “design nature and the planet, integrating relevant human, natural, and built systems in design through technologies that support local, regional, and even global activities” (p. 1009). As an example of this blending between natural and social infrastructures, the authors specifically mentioned aquaculture, which “represents the development of marine infrastructure and associated technologies to directly manage populations” (p. 1009). This insight aligns with Lewis and Ernstson’s (2019) analysis of how ecosystems and infrastructure connect in the Mississippi River Delta. They argued that “the distinction between ‘landscapes’ and ‘infrastructure’ is increasingly blurry, especially along coastlines and waterways” (p. 5). To analyze these blurry relationships, they forwarded the concept of “infrastructural zones” that function as assemblages of ecosystems, physical products (e.g. pipes and canals), technical standards, scientific expertise, and other forces to facilitate communication, movement, and environmental transformation.

Other scholars also consider the relationship between infrastructure and water (Carse, 2012; Carse & Lewis, 2017; Finewood et al., 2019; Nost, 2020). Water is an essential natural and also cultural force, and much of our infrastructure involves providing, moving, and diverting water. As Bennett (2019) argued, “the world’s oceans and coasts are awash in politics as powerful actors, organizations, and states employ various strategies (e.g. knowledge creation, policy negotiation and formulation, facilitation of planning processes, privatization, and enclosures) to promote diverse social, economic, political, and environmental agendas” (p. 2). Writing specifically about water infrastructures, Wells et al. (2021) argued that recent research conceives “of water infrastructures broadly—as social and technical assemblages of materials and matters as well as people and their behaviors” (p. 1). These water infrastructures have sociotechnical, technopolitical, and phenomenological dimensions, because they allow people to live but also reinforce power relations and colonial ideologies. Water infrastructures also provide an excellent opportunity to blur the often-artificial categories of “natural” and “social.” In considering the political and historical influences of water supply infrastructures in Los Angeles, Cousins and Newell (2015) argued that urban infrastructures “have multiscale and multi-sited effects on climate, biotic communities, and the health of humans and non-humans within and beyond the city, metropolis, and region” (p. 40). Our infrastructure affects far more than human society.

A specific strand of research examines the infrastructural function of oysters. Wakefield and Braun (2018) examined New York City’s “Oyster-lecture,” a series of proposals to plant oysters into a “living breakwater” that can lessen the impact of waves caused by climate change and increasing hurricanes. In this process, as oysters live and die, they create a growing seawall for human purposes. As Wakefield and Braun observed, “Part of what makes the oysters-as-infrastructure unique, then, is that over the course of living its life, and passing over into death, it builds the infrastructure and is the infrastructure” (p. 11). Although city planners hope to enroll billions of oysters in an infrastructural assemblage designed largely to serve humans, Wakefield and Braun have remained skeptical that nature can be so easily corralled. Wakefield (2019) made a similar point in another analysis of oystertecture: “nonhumans are active, ¹ Of course, harvesters can ignore these written rules, but the written rules also allow for punishment of rule breakers. Also, these rules apply only to fished oysters and not farmed oysters.
autonomous agents, not raw material for human needs. Their agency includes refusing to work or be enrolled in governance, by living in ways that resist functioning as infrastructure” (p. 778). Much as Callon (1984) charted the fraught “negotiations” between scallops and the scientists attempting to study them, Wakefield has wondered whether the partnership between humans and oysters to construct infrastructure will unfold as humans intend.

**METHOD**

This study analyzes how documents and communication acts play an infrastructural role in the creation of oyster aquaculture in the Alabama Gulf. Specifically, it examines the documents necessary to pass ALA. ADMIN. Code r. 220-4-.17 – Shellfish Aquaculture Easements (2014), which standardized leasing prices and processes for oyster aquaculture. For this analysis, I used a mixed-methods approach involving both document analysis and stakeholder interviews. This mixed-methods approach of uniting document analysis and interviews takes inspiration from several studies on infrastructure. Read (2020) employed both document analysis and interviews to examine the infrastructural function of documents at a DOE-funded supercomputing facility. Cousins and Newell (2015) used both interviews and historical analysis to analyze water infrastructure in Los Angeles, and Finewood et al. (2019) used a case study and qualitative interviews to explore the politics of green infrastructure in Pittsburgh’s stormwater system.

To conduct document analysis, I gathered relevant documents as described by news articles, reports, and government documentation about the passage of ALA. ADMIN. Code r. 220-4-.17 (2014). The discovery of initial documents related to the code also allowed the discovery of additional relevant documents. In this way, the document collection method was similar to the “snowball” subject recruitment methodology in that documents pointed to other documents for analysis. Once the documents were collected, they were analyzed for their stated purpose in developing an oyster aquaculture program as well as their intertextual elements. Despite every effort to collect all relevant documents, the list presented below (see Table 1) is certainly an incomplete list, given the challenges of identifying and accessing every document relevant to the creation of new state administrative codes. Relatedly, the timeline of documents examined (2011-2014) is somewhat artificial, given that rhetorical ecologies of documents often expand through decades (for instance, in the case of the legacy laws that previously governed oyster harvesting) or even centuries. However, some artificial bounds must be placed on the period of study to create a manageable analysis.

In addition to document analysis, I conducted six interviews with stakeholders involved in oyster aquaculture and restoration in the state of Alabama. Subjects were initially discovered through research about individuals, organizations, and state offices involved with oyster restoration work. However, interview subjects also recommended further interview subjects, so this study deploys a snowball recruitment methodology. These interviews were approved by the Institutional Review Board of The University of Alabama in Huntsville. The purpose of these interviews was to identify documents that participate in this oyster ecology and determine how documents interact with oyster infrastructures. Interview subjects were asked about the state of oyster conservation, their role in this work, the documents and infrastructure they need to perform their work, and the purposes and responses to those documents. This approach is similar to Cousins and Newell (2015), who analyzed water infrastructure in Los Angeles by supplementing document and historical analysis with stakeholder interviews that “explore the social and environmental dimensions typically lost in quantitative approaches to urban metabolisms” (p. 42). The interviews inform this article by providing first-hand stakeholder perspective on the purpose, reception, and relationships of documents, and the infrastructural functions these documents perform. The interview subjects also recommended additional documents to add to my analysis, creating a snowball recruitment methodology. Interview quotes are provided mostly verbatim, though filler words and false sentence starts have been removed.

This methodological approach helps identify and analyze the infrastructural function of documents and their impact on environments, but it also contains limitations. Because I did not conduct discourse analysis on the interviews, this article does not rhetorically analyze how stakeholders speak about their work or involvement in oyster aquaculture. Additionally, this article focuses most specifically on the effects of infrastructure documents on biological creatures and environments, so this article focuses less on the human and sociological impacts of oyster aquaculture, though further research could examine the human and environmental effects of oyster aquaculture infrastructure.

**FINDINGS**

This case reveals that infrastructure documents exist in a complex ecology of texts and rhetorical acts, and that infrastructure studies needs to consider a broader range of documents as part of its analytical approach. The interviews and document analysis reveal an entire ecology of documents and communication acts that ultimately resulted in a performative text, ALA. ADMIN. CODE § r. 220-4-.17 (2014), which established a clear, consistent, affordable permitting and leasing structure for oyster aquaculture in the state of Alabama (see Table 1 for list of documents). This state admin code is a clear example of a document functioning as infrastructure, in that it facilitates the creation of physical infrastructure. Without the leasing schedule and process created by the administrative code, the construction of oyster farms and their associated infrastructure would be very difficult in Alabama, because leasing land for oyster aquaculture would have been too confusing and cost-prohibitive for many aspiring farmers. This analysis reveals that performative documents, which can mandate or legislate infrastructural specifications and thereby create and shape infrastructure, often precede the development of material infrastructures. However, this case study also demonstrates that research and advocacy documents often precede the creation of performative infrastructure documents. As one participant currently involved in oyster aquaculture described the implementation of the new regulations, “I say this like they just pulled out the regs and wrote in the margins, but this took months” of work to put into place (RG, personal communication). Much of that work involved documents that led to the regulation changes. Therefore, those preceding documents should be considered infrastructure documents as well, even though they do not necessary function as performative documents that directly enact change in physical spaces. The infrastructure documents related to oyster aquaculture tend to follow a developmental sequence where research documents inform advocacy documents, which lead to the creation of performative documents.
The Role of Research Documents in Infrastructure

Within the period of analysis discussed in this article, many of the early documents involved developing and reporting research findings. Researchers at Auburn University’s Shellfish Lab explored the feasibility of specific oyster aquaculture methods and equipment for the Gulf waters, specifically testing the potential effectiveness of off-bottom oyster aquaculture, which uses equipment to suspend oysters above the sea floor. Several institutions partnered on this work. According to the fact sheet “Off-bottom Oyster Farming,” produced by the Alabama Cooperative Extension System, “Auburn University, Alabama Cooperative Extension System, Louisiana State University, Mississippi-Alabama Sea Grant Consortium, Louisiana Sea Grant and National Sea Grant, and private farmers have partnered since 2009 to address the barriers to oyster farming” (Extension: Alabama A&M & Auburn University, 2019, p. 3). As described by one of the researchers involved in this project, “It was a typical sort of biology test of trying four different types of gear types and evaluating the performance in terms of the biology that you would expect, how oysters grow, how they survive, but also very much trying to look at it in terms of how much each system costs to set up and what was the labor involved, what was your risk to storms, and thinking through some of the other side of the equation as well.” (BW, personal communication). This research required funding from proposals submitted by the researchers (although these proposals are infrastructural documents relevant to this situation, they were not available for analysis). This research led to scholarly articles that documented research about potential solutions for potential challenges of maintaining oyster farms.

Researchers also produced at least two fact sheets which described the purpose, benefits, and challenges of off-bottom aquaculture. Some of these challenges are related to bureaucracy and infrastructure, such as leasing sites and acquiring permits. For instance, the fact sheet “Off-Bottom Culture of Oysters in the Gulf of Mexico” states, “We emphasize that permitting for this type of oyster culture will be substantially more complicated than the permitting for traditional bottom culture” (2013, p. 3). These fact sheets help demonstrate the feasibility of off-culture oyster farming techniques and also the potential for creating and maintaining off-bottom oyster farming infrastructure, including permitting, leasing, and application processes.

Table 1: Select Infrastructural Documents Related to Passage of ALA ADMIN CODE § r. 220-4-.17

<table>
<thead>
<tr>
<th>Document</th>
<th>Date</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Off-Bottom Oyster Farming”</td>
<td>07/12</td>
<td>Explain techniques, challenges, and opportunity for off-bottom oyster aquaculture in the Gulf.</td>
</tr>
<tr>
<td>“Mississippi-Alabama Sea Grant Legal Program Memo 1.”</td>
<td>05/11</td>
<td>Identify how a Memorandum of Understanding could facilitate a more streamlined regulation process for oyster aquaculture.</td>
</tr>
<tr>
<td>“Mississippi-Alabama Sea Grant Legal Program Memo 2.”</td>
<td>05/11</td>
<td>Suggest petition to adopt new rule for leasing submerged lands.</td>
</tr>
<tr>
<td>“Mississippi-Alabama Sea Grant Legal Program Memo 3.”</td>
<td>2011</td>
<td>Suggest an approach for the creation of a joint shellfish aquaculture permit issued by several regulatory agencies.</td>
</tr>
<tr>
<td>HB 361 Alabama 2013 Session</td>
<td>02/13</td>
<td>Passage created a “Shellfish Aquaculture Review Board to develop the oyster aquaculture leasing program.”</td>
</tr>
<tr>
<td>Shellfish Aquaculture Review Board Meetings</td>
<td>10/13</td>
<td>Develop a shellfish aquaculture policy.</td>
</tr>
<tr>
<td>“Off-Bottom Culture of Oysters in the Gulf of Mexico.”</td>
<td>10/13</td>
<td>Identify barriers and risks that may impede oyster aquaculture plans.</td>
</tr>
<tr>
<td>“Template for Alabama Department of Health Oyster Farm Operational Plan”</td>
<td>10/13</td>
<td>Help potential farmers navigate the bureaucratic requirements of establishing an oyster farm.</td>
</tr>
<tr>
<td>ALA ADMIN CODE § r. 220-4-.17</td>
<td>05/14</td>
<td>Allow applications for oyster farming to begin.</td>
</tr>
</tbody>
</table>
This initial research about the technical feasibility of oyster aquaculture led to research documents about the bureaucratic and legal feasibility of the practice. According to one researcher involved in the process, “We showed that the biology could work and for somebody wanting to do this that it would be feasible. Then you run into the social, human concerns: ‘How do we permit this? Are there conflicting uses? How do we make sure those oysters are safe?’” (BW, personal communication). To answer these questions, legal research was necessary. Most notably, the Mississippi-Alabama Sea Grant Legal Program produced three memos providing legal information requested by a researcher at the Auburn University’s Shellfish Lab about ways to address the complex leasing laws that made oyster aquaculture unfeasible under current Alabama law. Each memo begins with the same statement of purpose: “As requested during our meeting on March 17, 2011, the Mississippi-Alabama Sea Grant Legal Program has been conducting research on some of the legal issues raised by your novel proposal to establish an oyster aquaculture ‘farming park’ in Alabama” (Showalter, 2011, p. 1). According to the author of the memos, “We were basically writing those memos at the request of [the researcher] who was saying ‘I can’t move these projects forward. I’m encountering these problems. What do I need to know?’” (SS, personal communication).

These memos emphasize the infrastructural and performative roles of public agencies and documents. The first memo identifies the role that the Alabama Department of Public Health (DPH) and the Alabama Department of Conservation and Natural Resources (DCNR) play in regulating shellfish sanitation and leasing public lands where shellfish are produced and identifies potential points of confusion in the permitting process based on overlapping and conflicting authority between the two agencies. The memo suggests producing an infrastructural document, an MOU between the agencies, to make oyster aquaculture land leasing and regulation more efficient. The second memo identifies current methods for granting riparian easements (granted to submerged lands within 600 yards of shore) and leasing of submerged lands. The memo argues that using the current easement procedures for oyster aquaculture is “a bit like trying to force a round peg into a square hole – it doesn’t quite fit” (p. 7). As the writer of the memo remarked about the policies at the time of writing, “The state leasing structure is just set up for the state to give a lease to an individual or a company and that’s it. They don’t want it to change hands after that or have anybody else come on that property to conduct their operations” (SS, personal communication). An oyster farm would require subleases to individual farmers that become complex and cost-prohibitive under the existing law. Once again, the memo suggests an infrastructural document—a petition for adoption of a rule— as a solution to the mismatch between current easement practices and the leasing needs of oyster farmers. The final memo discusses the challenges in establishing effective permitting practices for oyster aquaculture, which again involves bureaucratic confusion between two agencies, the U.S. Army Corps of Engineers and DCNR. Again, the memo recommends an MOU between agencies to alleviate
these issues. These memos identify how government organizations play infrastructural roles and how government documents function in performative roles. Because of this, the memos are incredibly intertextual, including references to several other performative government documents, such as the Clean Water Act, Section 10 of the Rivers and Harbors Act, the EPA's Section 404(b)(1) guidelines, and DCNR 203 rules on Placement and Configuration of Piers and Other Improvements on State Submerged Lands. These and other documents dictate where oysters can be seeded, where oysters can be harvested, who can harvest them, the safety standards for oysters, and how oysters can be sold. Even before the oyster farming movement proposed any changes, the ecology and life cycles of oysters are heavily monitored and regulated by infrastructural performative documents.

This finding is similar to results from Callon (1984), who found that early rhetorical acts in scallop preservation involved research studies and presentations. These early research documents helped the researchers build alliances among natural and social forces (alliances which in Callon’s analysis ultimately unraveled). As in Callon’s analysis, the research documents described here allow their writers to serve as spokespersons for a variety of actors, both natural and social. The research documents also exist to convince spokespersons, government representatives, environmental agents, other academics, representatives of the oyster aquaculture community, about the feasibility of the proposed alliances. These research documents can lay the groundwork for enlisting various actors to contribute toward shared goals.

The Role of Advocacy Texts in Infrastructure

Ultimately, these research documents laid the foundation for more effective, informed conversations between advocates of oyster farming and state regulators and agencies that control various aspects of oyster farming. Because the oyster farm concept was being advocated by researchers who found the legal hurdles frustrating, the memos helped one researcher “understand the framework better so he could have more informed conversations with the state agencies about ‘You really can do this’ or they could say ‘We have this particular concern. How can we work around that?’” (SS, personal communication). These memos also helped scientific researchers demonstrate to lawmakers and state officials that they understood not just the laws but the rationales for the laws. According to the author of the memos, “if you can communicate to the policy makers, ‘We understand the rationale. We don’t want to change that, but our tweak over here won’t jeopardize that original rationale, but it will make it possible to do what we want to do.’” (SS, personal communication).

These memos laid the groundwork for advocacy conversations and texts between researchers advocating for oyster farming and stakeholders involved in supervising the resources and infrastructure involved in the process. At this point in the process, a performative document enters the picture: House Bill 361 Alabama 2013, which creates a Shellfish Aquaculture Review Board designed to examine and resolve leasing issues identified by the three Mississippi-Alabama Sea Grant Legal Program memos. The purpose of the bill is “to require the board to develop an oyster aquaculture program for the leasing of submerged coastal lands to cultivate and harvest oysters for commercial purposes; and to authorize the Department of Conversation and Natural Resources to implement the leasing program” (Alabama House Bill 361, 2013, p. 1). The bill specifies the membership of the review board and stipulates that the board will deliver recommendations for the leasing of submerged lands for aquaculture purposes. According to the bill, the review board must also make the leasing process as efficient as possible and ensure that that the program does not conflict with other water uses, such as “navigation, recreation, and commercial fishing” (2013, p. 4) or with the requirements of another performative infrastructural document, Section 9-12-20, Code of Alabama 1975, which declares oysters living on public lands in the Gulf of Mexico to be property of the State of Alabama and places them under control of the DCNR. The law also directed the board to develop a leasing approach that “encourages the economic viability of oyster aquaculture in the state” (2013, p. 4).

The Shellfish Aquaculture Review Board held three meetings in the fall of 2013, and these meetings became communication events that contained several infrastructural documents. For instance, one meeting included presentations about equivalent state aquaculture programs and the State Lands regulation process, a proposed template for public health operations related to oyster aquaculture, and discussions about National Permit #48, created by the Army Corps of Engineers to regulate commercial shellfish aquaculture activities. Although it is unclear whether the Mississippi-Alabama Sea Grant Legal Program memos were directly referenced in these board meetings, participants in personal communications attested to the importance of the memos in providing background knowledge that allowed these conversations to occur. According to one of the researchers advocating oyster farming, these board meetings allowed different stakeholder groups to reach consensus. “We got together the group of people from the state and the federal agencies that were involved in this and these were sort of discussions that we worked through some of the hurdles and questions and concerns was the cost of the riparian easement fee.” (BW, personal communication).

The Role of Performative Documents in Infrastructure

Some of the changes that emerged from these discussions required changes to policies, such as changes to the oyster tagging requirements for farmers. However, the meetings also resulted in a legal change in the form of ALA. ADMIN. CODE § r. 220-4-.17 (2014). This code, effective May 20, 2014, establishes a process
for granting riparian and non-riparian easements\(^3\) to individuals conducting off-bottom oyster aquaculture. The code puts the State of Alabama, Department of Conservation and Natural Resources in charge of assessing and granting easements. The code establishes restrictions for shellfish aquaculture, including that it cannot interfere with existing riparian rights, navigation or wildlife, and cannot introduce non-indigenous wildlife to the Gulf. The code also establishes infrastructural requirements, such as acceptable marking of aquaculture sites and minimal distances from marked navigation channels. This code, a performative infrastructural document that requires changes to material infrastructure, also establishes the creation of other infrastructural documents through the creation of a systematic application process. Aspiring aquaculture farmers must follow a rigorous application process designed to ensure that oysters are grown in safe, approved areas that do not interfere with navigation channels or historical or cultural resources (such as sunken ships or indigenous oyster mounds). The full application package includes a description of proposed activities, a statement of potential environmental impacts, site plans, a statement about why the easement is in the public interest, and surveys of the easement area. This application process involves site approval from the Alabama Department of Public Health and the DCNR Marine Resources Division, applications to the Alabama State Lands Division, the U.S. Army Corps of Engineers, the Alabama Department of Environmental Management, the Alabama State Lands Division, and the U.S. Coast Guard, acquisition of an oyster aquaculture license, and final application approval from the Alabama State Lands Division. The application process involves a significant amount of actors, all of whom regulate what environments oysters can inhabit and the infrastructure necessary to maintain them. The transition from documents to physical aquaculture infrastructure mirrors the findings of Callon (1984), who traced how research reports from scientists ultimately intersected with the creation of towlines and netted bags designed to support the ecology of scallops in the St. Brieuc Bay in France.

\(^3\) Riparian easements refers to land use agreements that involve property that meets the shoreline, while non-riparian easements involve property that does not.

DISCUSSION

The rhetorical work necessary to enable widespread oyster farming in Alabama offers several insights that can expand our notions of how writing functions as infrastructure.

Performative Infrastructural Documents Exist in Complex Rhetorical Ecologies

The results of this study reveal that high-profile performative infrastructural documents, such as ALA. ADMIN. CODE r. 220-4-.17 (2014), exist in much larger rhetorical ecologies. Other documents in this ecology support and precede the existence of the performative documents that enable the construction and regulation of infrastructure. This finding connects with previous studies on written infrastructure, dating all the way back to Star and Ruhleder’s (1996) observations about an “ecology of infrastructure.” Read’s (2019) elements of the infrastructural function of writing include writing that is “relationally defined” and writing that performs “alliance brokering” (p. 246). For both these criteria, scholars should consider relationships and alliances not just beyond texts but also among them. For instance, Frith (2020) found that intertextuality is a key feature of infrastructural technical standards. In the tag data standard (TDS) document he analyzed, he found 58 references to other documents. Frith wrote, “The analysis showed that the TDS essentially could not exist without the intertextual references to other standards. In many of the instances of this category, the text builds upon already existing, widely adopted standards” (p. 415). Similarly, the ALA. ADMIN. CODE r. 220-4-.17 (2014) references four other documents, including eight references to Code of Ala. 1975, which contains several provisions

Figure 8: Floating cage systems from farms made possible by the bill.

Figure 9. Text from ALA. ADMIN. CODE § r. 220-4-.17
related to natural resources. It would be difficult for ALA. ADMIN. CODE r. 220-4-.17 (2014) to exist without these other legal and performative documents.

However, this analysis goes further to demonstrate that performative documents like ALA. ADMIN. CODE r. 220-4-.17 (2014) that set requirements for infrastructure also rely on a wide variety of infrastructural documents beyond those performative texts. In this case, those documents included research articles, fact sheets, legal memos, public meetings, and advocacy presentations. Much of this work involved the kind of alliance brokering that Callon and Read identify. According to one of the researchers who advocated for off-bottom oyster farming, “My extension work has always been very much driven by stakeholders, like ‘What questions am I being asked and who needs to be engaged for that?’ So rather than having the general public as who I’m primarily trying to serve it’s been the people who are very involved in those decisions.” Many of these documents, especially the legal memos, served to create alliances that ultimately led to the creation of productive legislation and policies. According to their author, the memos “helped get everybody on one page with respect to the legal background and start from a firmer foundation.” (SO, personal communication). These memos also function as what Blythe (2007) termed “mundane documents”; as opposed to rhetorical superstars like the Declaration of Independence or the Gettysburg Address that command significant attention, mundane documents circulate among smaller audiences in less dramatic contexts with less fanfare and acclaim but carry considerable rhetorical power. It took many infrastructural documents, many of them mundane, to ultimately make the changes necessary to allow physical and biological infrastructure to exist.

Some of these mundane documents, in turn, developed through even more mundane communication acts such as phone and in-person conversations. According to the writer of the legal memos, “As [the researcher] moved down here and started to do his work in Alabama, questions came up and we would be on calls, like monthly update calls, and we would be at the same conferences, and we started talking about how could we help move [the researcher’s] project forward or move the conversation forward about the need for these changes.” Read (2019) argued that considerations of infrastructural documents must be inclusive and incorporate “a broad scope for what counts as writing” (p. 246). An ecological perspective helps foster an inclusive approach to what counts as infrastructural writing.

The performative text ALA. ADMIN. CODE r. 220-4-.17 (2014) did not just arise from an ecology of documents but also extended it as well. The code establishes a whole range of infrastructural documents that applicants must submit to receive a permits and leases for oyster aquaculture. And once farmers begin their operations, they must continue to produce infrastructural documents such as financial documents, storm preparedness plans, and permit renewal applications (every five years). They also must continue to follow regulations such as health and safety regulations and rules for the sale and marketing of oysters. The researcher who spearheaded the oyster aquaculture program indicates that additional documents are needed to uphold the academic research community that studies oysters farming and the community of farmers themselves. According to this researcher, “A lot of the documentation goes into sharing of information across growers, potential growers, and regulators” (BW, personal communication). Documents such as newsletters, academic articles, emails, and social media posts share information about best practices, requirements, and concerns that must be addressed to keep this infrastructure functioning.

**Performative Infrastructural Documents Can Embed Themselves in the Natural World**

Infrastructure research in writing studies has made the extremely important observation that writing gets embedded into the material world. I argue that this embeddedness is especially common with performative documents, which often set, rather than report, standards, rules, regulations, and specifications that must be followed. Read (2019), reporting on infrastructure criteria from Star and Ruhleder (1996), argued that one dimension of infrastructure is “embeddedness”: “Infrastructure is often sunk into other structures, social arrangements, and technologies” (p. 244). Frith extended this point, arguing that infrastructural “writing becomes invisibly embedded in social practices and material objects” (p. 422). Although recognizing this embeddedness is an extremely important step in acknowledging the power of infrastructural documents, analysis of embeddedness is often limited to the ways that documents embed themselves in human-centered structures. Infrastructure studies sometimes neglects the ways that documents can embed themselves in the natural world as well.

ALA. ADMIN. CODE r. 220-4-.17 (2014) is a performative document that directly impacts the lives and existence of millions of oysters. It does so first by simply establishing a process that allows farmed oysters to exist at all. However, the code further establishes where these oysters can live through the granting of easements for their habitats that include a variety of rules: rules that govern how closely oysters can be farmed related fresh water, navigation channels, water treatment plants, and riparian rights of other Alabama citizens; rules that determine how much oysters can interfere with existing fish and shellfish in the area; and rules that limit non-riparian easements to an “area no larger than five acres.” These rules embed themselves into the ecology, life cycle, and position of farmed oysters, bringing living creatures into an infrastructural relationship with social, written, and material forces. As Carse and Lewis (2017) argued, “even seemingly natural landscapes like forests, prairies, reefs, and wetlands can become infrastructure through the active and inherently political work of investment, management, maintenance, and standardization” (p. 13). These standards can also become embedded in the flora and fauna of those habitats. Living creatures can experience and respond to the effects of written performative documents.

**LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH**

This study attempts to capture the ecology of documents that influences an oyster ecology, but it is not without notable limitations. First, because I conducted interviews in 2021 asking participants to remember events that occurred from 2011-2014, their recollections may not be perfect, as they sometimes admitted. Additionally, some of the texts involved in the creation of ALA. ADMIN. CODE r. 220-4-.17 (2014) are unavailable or lost. Their absence, combined with imperfect reflection of participants, means that article cannot provide a completely comprehensive list of infrastructural documents involved in the creation of codes relating to oyster farming. Further, the article creates a bounded timeline for analysis, when a full accounting of the documents required for Alabama oyster aquaculture would extend further back in time and beyond Alabama (for instance, to look at other states where off-
bottom oyster farming was developed).

Regardless of these limitations, this research establishes that the performative texts of infrastructure exist in a much larger rhetorical ecology and can embed themselves in natural ecologies. Further research could build upon this insight by examining specific ways that performative infrastructural texts embed themselves into the lifeworld of plants and animals. Specific research could also further explore the role of texts in oyster farming and the larger oyster conservation movement in Alabama and throughout the Gulf of Mexico. Research could also examine how infrastructural documents uphold or disrupt existing power relations, ideologies, and environmental work.

**CONCLUSION**

As of this writing in 2022, it is too early to declare oyster farming a success in Alabama, because the effort, like all oyster restoration projects in the Gulf, is still nascent and tentative at the time of publication. However, early indications are positive. According to a 2019 report on the state of the industry, Alabama had 21 commercial oyster farms that sold at least 2,425,000 oysters. The oysters in these farms are also changing their environments. According to an oyster aquaculture researcher, “The environmental side of that is if I put oysters in the water, it doesn’t matter if I’m harvesting them and ultimately making money on them. They are performing some of the environmental functions that an oyster would if it was on a reef” (BW, personal communication). In particular, larger oyster populations help clarify and improve water quality. Anecdotal evidence also suggests that oyster farms serve as habitats for other creatures; charter fishing captains often take customers to oyster farms because the fishing is especially productive there (BW, personal communication). So oyster farming, in addition to directly creating millions of new living creatures, has wide-spread impacts on the ecology of the Gulf. These effects are in part due to infrastructural documents that enable oyster farming to operate. The infrastructure in the water, such as long-line systems and pumps, was preceded by performative legislative documents and a whole ecology of texts that played an infrastructural function. This situation indicates the very real, tangible effects that infrastructural documents can have on the material and natural worlds.

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A Theory of Infrastructural Rhetoric

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ABSTRACT
This article theorizes infrastructures and their components as rhetorical objects for analysis and persuasive use. Though the term infrastructure has been applied broadly to several studies in the social sciences, writing, technical communication, and technology studies, infrastructures have yet to be systematically theorized as an active persuasive consideration for those engaging in communicative practice. This article makes a case for a taxonomic theoretical understanding and conceptualization of infrastructure that may lead to new methodological developments in future research. This theory builds from theories of infrastructures as relational networks of social interaction around objects. The article aims to assist the persuasive endeavors of those engaged in communicative practice in infrastructural settings.

CCS Concepts
Information Systems

Keywords
Rhetorical theory, Infrastructure, Persuasion, Taxonomy, Analysis, Communication

When I moved into my present apartment, the internet providers gave me a choice: high-speed cable internet that would support high-quality video calls in any weather condition or a less expensive satellite option that the cloud cover in the region would occasionally disrupt. After considering the initial uncertain wave of COVID-19 in 2020, it was clear to me which I should select. Though I hoped that classes would be in person throughout the semester, there was a definite possibility that the pandemic might turn for the worse once more and push my courses online. Were that to occur, I would need to deliver high-fidelity online interactions with the students without risk of interruption or disconnection. After all, no matter how informative and engaging a lecture is, verbal and visual persuasion is meaningless if the words and images go without transmission. A lecture undelivered is an audience unchanged—a rhetorical failure. One might chalk up such failure at that moment to the poor technology or bad weather—factors outside of a rhetorician’s control—until we remember that I had an early choice: cable or satellite. It was an infrastructural choice, certainly, but I invite us to consider that it was also a rhetorical one.

It is time to regard our infrastructures as a central consideration in the practice of rhetoric, just as we might consider the purpose of a text or the disposition of an audience. In this article, I ponder what it means to understand an infrastructure’s rhetorical possibilities. Naming these possibilities provides rhetorical scholars who are taking the time to read this special issue with a broader means of engaging theoretically and practically in rhetoric. Of course, I cannot possibly discuss every facet of infrastructural rhetoric in such a limited space, but I provide this discussion and the following malleability heuristic as a framing—clarifying the work for myself and for others who are already engaging with this critical labor in countless ways.

Rhetoric is defined through the choices we make—the options we select (or intentionally deselect) to increase the persuasiveness of our actions. Aristotle defined the study of rhetoric as “The ability in each particular case to discover the means of persuasion” (Aristotle, ca. 350 B.C.E./2007), but it is the choices that we make with that ability that change our world. We should recognize that
our infrastructures—these contextual formations that surround our activities—are full of such choices. These choices within our infrastructural contexts critically affect the means of persuasion available for discovery. Acknowledging infrastructures as contextual objects that both create and harbor rhetorical choice allows a rhetorician to see the wider range of rhetorical choices available to them in a given situation. The following article sets forth to understand, theorize, and set a vocabulary for infrastructure as a rhetorical object of analysis and persuasion. I argue that, like any spoken, written, visual, or body language, we might begin to see infrastructures as malleable rhetorical texts that we can understand and interact with to increase our persuasive capabilities. In doing so, we may begin to use infrastructure to account for new forms of holistic rhetorical practice. To make this argument clear, I start by adopting a specific definition of infrastructure.

**DEFINING INFRASTRUCTURE**

In contemporary writing and technical communication literature, Star’s definition is centralized in infrastructural discussions (Hart-Davidson et al., 2007). In Star and Ruhleder’s (1996) article, “Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces,” they corrected what they deem the incorrect “commonplace metaphors” of infrastructure as only a “substrate or series of objects.” They deconstructed the familiar metaphors of infrastructure, stating that seeing infrastructure as only objects is “neither useful nor accurate in understanding the relationship between work/practice and technology” (p. 112). To form a new definition of infrastructure, Star and Ruhleder constructed a revised definitional model focused on an infrastructure’s temporality and activity. It is not the objects or the people independently that make up an infrastructure in this model, but the activity and use people make of objects while forming relations with them and other individuals that makes an infrastructure. In short, infrastructure is defined as a network of objects and systems imbued with human agency though human activity and interaction.

The notion of objects as relational mediums for human interaction deconstructs the erected binary between human action and object involvement. Though it does not go as far as to support an object-oriented ontological approach, it highlights the contextual power that objects, systems, and people hold in a networked setting. This understanding of infrastructure lies parallel with some of the ecological approaches of the present (see, for example, Barnett & Boyle, 2016; Cooper, 1986) while differentiating itself by firmly focusing on the objects, systems, and power structures intentionally created by humans. This focus on intentionality and agency serves as an invitation from infrastructure to studies in writing, communication, and design.

Many infrastructural works, including works on writing (DeVoss et al., 2005), writing studies (Read, 2019), writing programs (Grabbill, 2010), technical communication (Hart-Davidson et al., 2007), design research, and even data analytics and search engines (Noble, 2018), all use Star’s definition of infrastructure to describe and understand the nature of infrastructure in communication today.

Building directly from Read (2019), Frith (2020) specifically accounted for how infrastructures are “not just neutral substrates that support other practices. Instead, they shape those practices; they exert agency over everything from how we communicate to how bodies move” (p. 406). Frith built upon Read’s work to demonstrate how infrastructures centralize around embedded writings. That infrastructures are documents quite literally taking shape and shaping the physical world (p. 423). Documents serve as persuasive forms of writing that shape infrastructure by being embedded into their creation and maintenance.

The relationship between infrastructure and communication also extends past the scope of writing and documentation. In regard to rhetorical study specifically, Johnson’s (2020, Chapter 1) infrastructural work focused on digital and computer infrastructures—these being some of the most noticeable and impactful infrastructures of the 21st century. Johnson discussed the impact of memory on digital infrastructures and the impact that they have had on the activity of memory.

Acknowledging the significant impact of the work above and specifically building from Frith and Read, we can see that infrastructures are embedded into practices of writing and speaking. However, there is yet some difficulty in identifying and understanding the extent of their use in persuasion.

As Frith (2020) noted, much of the difficulty in considering infrastructure in rhetorical practice stems from the invisible nature of infrastructures. When operating correctly, infrastructures are “functionally invisible” (Star & Ruhleder, 1996). Rhetoricians are only typically able to passively read infrastructures when they break and become momentarily visible throughout our lives, rocketing to the forefront of our attention. If we want to view infrastructures as a rhetorical object, we encounter a problem wherein they remain largely tacit until their objects and networked activity is made explicit. This need to call infrastructures into an explicit existence forms the exigence of this article. Understanding that infrastructure needs to be explicitly defined and analyzed to be read invites a creation of a new lens for rhetorical practice that explicitly defines and demarcates infrastructures. Such a practice allows for the creation of a multitude of future methods to read them.

In sum, despite a wealth of research and scholarship on both rhetoric and infrastructure, infrastructure is still undervalued as a critical component necessary to fully comprehend the traditionally tacit elements of a “complete” rhetorical situation (Bitzer, 1968). Though objects, signs, and locations have been shown to impact the constituents of the rhetorical situation (Grant-Davie, 1997), we have yet to discuss the nature of those impacts broadly, nor how those objects may be seen as malleable toward rhetorical ends. To date, infrastructure has yet to be used to theorize the act of rhetorical practice directly.

**DEFINING AND DEMARCATING INFRASTRUCTURE AS A RHETORICAL OBJECT**

It is now valuable to formally define and demarcate the role of infrastructure in rhetorical situations. I hope that the following serves as a valuable addition to the work that has already been done and inspires future forays into infrastructural rhetorical studies.

**Defining Infrastructural Rhetoric**

To understand infrastructure as a critical component of rhetoric, one must first appreciate that all infrastructure is, in some sense, a sequence of delayed rhetorical conversations, dialogues, embodiments, and writings (Frith, 2020; Read, 2019) among people. Constructing a building, setting a budget, or establishing...
an entire university, for example, involves a series of committee meetings, written proposals, informal talks, public hearings, etc. All infrastructures, in this sense, are a combination or cumulation of communicative persuasive/rhetorical exchanges, peppered with all the misunderstandings, misrememberings, and compromises that such a process would entail if it occurred synchronously.

These objects that have been rhetorically constructed then serve as rhetorical contexts in themselves (Grant-Davie, 1997). A billboard on the side of the highway is constructed of direct discourse in the form of words on a sign, but its location, size, lighting, and public agreement also create its rhetorical situation. The present material realities of such a communicative creation affect the future discourse around it.

In this sense, my apartment complex is as much a construction of rhetoric as it is a physical series of atoms or a position within space and time. The placement of leasing personnel, internet lines, and even the bricks and mortar result from communication solidifying through human physical activity. Thus, communicative activity becomes tangible in various physical elements (e.g., budget reports, codified rules, buildings, managers) but is never totally fixed and remains malleable to future change. Because these elements are subject to change by human choice and activity, these malleable elements can be intentionally understood and manipulated to the persuasive advantage of a rhetorician. Briefly put, infrastructural rhetoric is the ability to discover, understand, and manipulate the elements present in any given infrastructure to persuasive ends.

Such a practice is not only possible, but it can be improved upon and revised by making the tacit infrastructural components in a rhetorical situation known through analysis. However, to engage in this practice, there are three facets of infrastructure that the rhetorician must acknowledge that extend infrastructures beyond traditional rhetorical considerations:

1) Infrastructural rhetoric is diachronic
First, infrastructures exist as diachronic entities and must be approached as such for rhetorical understanding and persuasive success. Infrastructure reaches beyond a single temporal moment (Star 1996), so it is exceedingly difficult to engage with any present infrastructure without knowing the exigencies and history that produced its synchronic state. Moments of infrastructural breakdown that led to adjustments and changes in the infrastructure are critical to understanding its present invisible components. Unlike traditional rhetorical objects for analysis, infrastructures are naturally invisible and unfelt. Their operating invisibility makes them much more challenging to analyze when fully operational. A successful infrastructural rhetorical analysis can typically only occur when a breakdown occurs; in those instances of malfunction, the infrastructure reveals itself in a temporarily synchronic state. The moments of malfunction allow for analysis at these times that can then provide valuable knowledge for further engagement during the return to infrastructural invisibility. Thus, if a rhetorician wants to engage with infrastructure, they must do so diachronically, considering the possibilities of the future against the actions of the past. They will need to begin by asking questions or observing moments of breakdown before engaging with the infrastructure itself. In my earlier example, it was the knowledge of surrounding historical events that allowed me to understand the impact of the offered internet options on future rhetorical online exchanges. I spent my young adulthood in a place with severe winter storms. Large storm fronts with massive cloud structures would frequently cause the satellites in the area to lose their signals, which would disrupt video calls breaking down the infrastructure and making it visible. Underground cabling infrastructure, in contrast, would retain signal and allow for virtual meetings during intense weather. This past knowledge of breakdown and how to avoid it made the normally invisible difference between the two choices apparent and allowed for further rhetorical impact in the present when there weren’t any active winter storms to disrupt service.

Diachronic understanding of infrastructural rhetoric often highlights how patience, inaction, and observation are the best rhetorical tools for an infrastructural rhetorician in a new setting. Attempting to act impactfully without understanding the infrastructure will likely result in a further breakdown. We see this advice echoed repeatedly in various publications, especially in management and administrative writing discussions (Huber, 2018, for example); learn what you can about your setting before rushing in headfirst to change it. This inaction will give the invisible aspects of the infrastructure time to be made visible.

2) Infrastructural rhetoric is holistic
Second, infrastructural rhetoric is hampered by piecemeal analysis. Instead, infrastructural rhetoric takes a synthetic “systems” approach, privileging holistic analysis in a systematic frame. An infrastructural rhetorician recognizes that there is less value in determining the yearly budget for the purchase of a single object in their infrastructure (e.g., the Internet) than there is in determining the range of spending choices under the purview of the total budget. A rhetorician can then see how far the current allocation will extend toward choosing and effecting the various choices toward persuasive ends. Infrastructures are made of malleable choices, but some are more malleable than others. Knowing which choice exists in a state of malleability requires that the infrastructural rhetorician be aware of a broad scope of choices available at all times.

Attuning to such rhetorical choices requires that a rhetorician simultaneously consider the social, physical, economic, authoritative, and operational variables and outcomes that surround their decisions. In this way, an infrastructural rhetorician might find some means of distributing time and effort, not in an equitable or frugal manner, but in a rhetorical manner that will accomplish the furthest progression toward the goals and choices that the rhetorician wishes to support.

Advertising posters provide a simple example of this principle. If a rhetorician generates posters advertising an event for people to attend, how might they determine what to do with them? It’s not enough to know what the text of the poster says or where the audience gathers at one moment. Throwing the posters to the ground in front of the assembled and launching into a passionate speech to evoke attendance will not likely meet with success. The rhetorician must simultaneously know a host of various infrastructural factors: Where do people gather? For how long? Who accompanies them? What income or free time do they have at their disposal? What are they holding that may prevent them from attending to the poster? etc. Questions of authority and the rhetorician’s physical capabilities may even enter the discussion. These infrastructural factors are constraints placed on the rhetorical situation that impact it to every degree that the exigence or genre of the advertisement might. Infrastructural rhetoricians must consider rhetorical decisions within an infrastructure holistically to become aware of how these constraints interact with one another.
Furthermore, infrastructures often span multiple institutions. For instance, although my apartment and the internet company are separate institutions that only interact at this one juncture, they are a united infrastructure when centered on the activity of online teaching. They even enroll other institutions of larger and smaller scale in their infrastructures, such as the federal reserve and my home office. Infrastructures are networks of institutions, objects, and human agents constantly interacting with themselves to produce unified rhetorical outcomes. But those unified rhetorical outcomes are dependent on the interaction of all the components simultaneously being centered on a single defining activity.

3) Infrastructural rhetoric is assembled and upheld by participatory agency

Finally, unlike ecological models, which sometimes observe objects in a state of self-agency (Barnett & Boyle, 2016; Cooper, 1986)—understood as possible agents themselves within their systematic framing—infrastructural rhetoric privileges sapient activity, intentionality, and choice. Understanding how past agential decisions affect current conversations or how everyday conversations in one structure might enable the possibility of persuasion in another is the primary focus of infrastructural rhetoric because it centers the viewing of infrastructure around intentional persuasive ends.

Understanding infrastructure in this way allows rhetoricians to see their own future moments of agency as necessary to enact change in their present infrastructural settings. It is the deliberate choices, even those that lead to unintentional consequences, that infrastructures are built up from and around. If, for instance, the internet company made the active choice to stop accepting the U.S. dollar in exchange for internet services, it would all but debilitate the rhetorical interactions with my class until I made a conscious action to pay for the Internet in the currency the company now required1. It is these back-and-forth deliberate choices by all involved parties that will see an infrastructure continue to change along with all of its subsequent rhetorical situations.

Acknowledging this facet of infrastructural rhetoric, the infrastructural rhetorician sees the possibilities for systematic persuasion in engaging with these choices to formulate new infrastructures, shift existing ones, or generate rhetorical knowledge of the malleability of the infrastructures surrounding them for later use when critical rhetorical situations arise.

Demarcating Infrastructural Rhetoric

Having defined and theorized the nature of infrastructural rhetoric, it becomes easy to see how such a pursuit of understanding might quickly spin out of the rhetorician’s control. If all our surroundings in both the past, present, and constantly fluctuating future are of infrastructural concern, where do we even begin to view the infrastructure as a rhetorical object, and how might we decide which elements to focus on during our infrastructural rhetorical discoveries and interventions? To this end, an initial demarcation of infrastructural rhetoric is helpful. A demarcation of this kind sets artificial boundaries and provides a relatively stable starting point for rhetorical analysis. To understand the possibilities in a given infrastructural rhetorical situation, a rhetorician may find it beneficial to analyze infrastructural concerns within a singular synchronic infrastructural moment. Though they must acknowledge the instability of such an approach, if the rhetorician can conceptualize their infrastructure as a temporarily unified and stable rhetorical object, they can undermine the normally tacit, invisible nature of an infrastructure to view it as a visible object. Such a viewing then assists and enables the practice of rhetoric going forward as the infrastructure is allowed to become unstable and invisible again.

It may help, conceptually, to compare such a demarcation to taking a picture. A picture does not truly capture a moment with all the movement, activity, and emotions involved, nor does it outline the past before the picture or the future after. A picture helps to solidify moments into colors, lines, and shapes that can be reviewed at a later date and analyzed or remembered. A picture represents a form of rhetorical synecdoche—a piece representing the larger truth that might never be fully understood. Like a picture, a demarcation of infrastructure will be imperfect, but that imperfect rendering is preferable to no rendering at all. It allows visibility to infrastructure where there would otherwise be none. With this imperfection acknowledged, I set forth a demarcation of infrastructural rhetoric concerns via a taxonomy for infrastructural rhetoric.

A taxonomy serves two distinct purposes (Gould, 1985, Chapter 3):

1) First, it is a means of limiting redundancy between rhetorical considerations in an infrastructure. For example, while a rhetorician might quickly draw distinctions between the operational importance of emails versus meetings, often, these structures serve similar enough purposes that a detailed examination of one might inspire an analysis of the other anyway. Such a case is likewise true for daily finances and yearly financial concerns. Reducing similar circumstances to a single category ensures that rhetoricians using this taxonomy are not overburdened by a plethora of similar infrastructural foci. Such a reduction also eliminates the need to separate a concern directly overlapping within an infrastructure at infrastructures of different sizes. For instance, while large corporations like Amazon have entire departments for marketing, an elementary school bake sale may simply have marketing as a function of the PTA. Taxonomy, therefore, considers the generalized concepts over the individually mutable factors, which helps to restrict the idea into helpful practice.

2) Second, taxonomy serves as a rhetorical preventative measure to avoid misreading the infrastructural categories below as totalizing or comprehensive elements. One of the dangers of forming a list of common infrastructural concerns is that rhetoricians might take it as complete or criticize it for leaving out critical concerns. In using a taxonomic structure, additional sub-concerns may be added or recategorized at will. By reducing the totality of concerns to a demarcation of five major factors, infrastructural elements like “internet service purchase forms” might be categorized as operational rather than economic if the filing of the forms rather than the financial realities of the forms are at the center of the rhetorician’s concern.

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1 We see these infrastructural shifts and rhetorical exchanges happening in a salient manner in the present finance and computing adoption of various cryptocurrencies and NFTs. As the nature of the digital landscape shifts, the agency and rhetorical power shifts as well. This causes a shift in the power structures that inform the rhetorical choices in the present.
Accepting the value of taxonomy allows us to mark a boundary for infrastructural rhetoric that is simultaneously reductive and expansive, giving a precise way to discuss and compare infrastructures in different institutional settings.

Following this logic, I have developed a taxonomy of five general demarcations of infrastructural rhetoric. These categories were developed by drawing from a wide swath of literature on rhetoric, management, administration, engineering, philosophy, and psychology and creating a long list of independent infrastructural rhetoric concerns. This list of concerns was then winnowed to remove redundancy as described previously in taxonomy point one. The winnowing leaves us with a manageable number of infrastructural considerations for the process of engagement with infrastructural rhetoric. Though one could feasibly extend this taxonomy out to seven or even ten categories, it was assumed that fewer components would make for ease of use in future methodologies. The resulting five taxonomic categories are the fewest number of considerations that the taxonomy could be narrowed down to without losing critical considerations. The resulting categories are as follows:

**Physical infrastructure**

Easily the most identifiable of the concerns of infrastructure, physical infrastructure consists of the embodied and locational presence surrounding the activity of the rhetorician. Physical infrastructure includes aspects of material existence like personal health, building locations, or even natural disasters. Concerns about physical infrastructure significantly impact any rhetorical situation's choices and persuasive actions. The sudden illness or injury of a rhetorician can cause dramatic changes in the rhetorical possibilities of their future. As in the example of online teaching, if a rhetorician is rendered incapable of speech through the removal of their internet, computer, building, or even vocal cords, the rhetorical options left to them reduce to near zero (Blankenship, 2018).

Moore (2018), advising preventative measures for burnout in writing program administrators, enumerated this principle in the following passage:

> I recognized that the very activities I was not making time for (daily walks, lunch with friends, writing, and reading for pleasure) were standing between the present, patient, kind administrative self I wanted to be and the stressed-out, short-tempered, bone-tired administrative self I had become. (p. 98)

For Moore, preventing her body and mind from becoming “bone-tired” by engaging in healthy activity outside of her writing program has a direct impact on how her writing program exists. A choice to take care of one’s body and mental health is a present but diachronic choice to improve future rhetorical encounters in social and operational moments through an awareness of her physical infrastructure. For infrastructural rhetoric, exercise, meditation, and health consciousness are ways to upkeep successful rhetorical practice.

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2 The list was long, but intentionally far from comprehensive or totaling, consisting of 43 infrastructural variables. As it would take up unnecessary space in this article for no other purpose than to allow comment on its incompleteness and detract from the present purpose, I have chosen to omit it from this article.

**Economic infrastructure**

Economic infrastructure consists of the financial earnings, reserves, and obligation structures surrounding the activity of the rhetorician. Economic infrastructure includes concerns of funding, exchange of goods, and budgetary reductions. Exemplified simply, without money to pay for an internet connection, it is unlikely either the cable or satellite internet providers will provide internet to my lectures.

Economic infrastructures are highly present in our lives but rarely academically discussed in terms of rhetorical control over them. Wealthy individuals, for example, know the authority that a financial infrastructure gives them over rhetorical situations. It is not uncommon to see and expect different treatment based on the economic power the wealthy rhetorician holds. “He’s a billionaire” runs synonymous with discussions of ethos, and while the accumulation of wealth by billionaires was likely not made with the sole intent of improving their future communicative exchanges, their wielding of their wealth often has this impact.

Furthermore, the concerns of economic infrastructure typically have a cascading quality from more extensive infrastructures. For example, the world’s economic circumstances affect the U.S. Government’s infrastructure, which affects the department of education, the various U.S. universities, their professors, and those effects cascade down to the university’s students. In this way, the activity of economic infrastructure privileges knowledge of hierarchically connected institutions that can be enrolled to assist the rhetorician in times of transition. Without this knowledge and awareness, the rhetorician is left to the mercy of larger economic systems.

**Social infrastructure**

Social infrastructure consists of the inter-human structures surrounding the rhetorician. This infrastructure includes long-standing ideologies, willingness to collaborate, and the identity of the rhetorician. Though most social situations involve recognizable rhetorical exchanges, social infrastructure is separated by its diachronic nature. The social structures that make up a social infrastructure are built upon years of conversations and individual rhetorical interactions, both formally in educational settings and informally among colleagues. Issues like workplace ideology, for instance, are typically developed from personal understanding, epideictic group discussions in meetings, and hiring decisions over decades (Hofstede et al., 2010, Chapter 9). Each of these diachronic moments contains choices that then proceed to affect how a current situation resolves itself and how future similar situations will be resolved. This embedded understanding of social memory and interactions makes up a social network that may be viewed as an infrastructure.

In regard to rhetoric, some social structures are changeable or negotiable through direct effort on the rhetorician’s part. For example, sharing political ideologies with students on the first day of class is an active rhetorical choice that shifts the dynamic of the conversation, even if the students give no verbal response. In effect, this is because the teacher is speaking not only with the students in the present but with their past interactions with their families, communities, and self-reflexive conversations of values. The teacher is bringing these tacit infrastructural constructions into the present to change their own relationship with the students at that moment. Whether or not this action will meet with success on the part of the teacher depends on how much time the teacher has
spent trying to conceptualize the student’s social infrastructure to make it visible.

To clarify further, the term departmental toxicity, a term frequently used to describe academic departments where collaboration is challenging, is an active viewing of the social infrastructure of an academic department at a given time. Statements on department toxicity are not an indication of how strenuous a rhetorical activity is in a vacuum but how difficult that rhetorical activity may become when personal grudges or ideological differences come to bear in the process of acting rhetorically in the present. Infrastructural issues like these may be changed, not simply with an adjustment to the rhetorical activity of the present, but with intentional shifts to the infrastructure before the activity begins.

**Operational infrastructure**

Operational infrastructure consists of the structures and the daily activities needed to upkeep and maintain the continued activity function. These structures include concerns like staffing, daily emails, and timecard keeping. Though operational infrastructure is still diachronic, it is the most immediately negotiable infrastructural concern. This infrastructure occurs through a constant need for upkeep and processing rather than any single centralization of action. Does everyone know how to log on to the online class portal at the same time? Do the students all have a registered email that they can be contacted by if the need should arise? These are operational questions.

For example, though a rhetorician might classify a single email as a traditional rhetorical situation, the standardized number of emails expecting a daily response begins to represent something else entirely. A rhetorician opening their laptop, knowing that they will have to dedicate an hour each day responding to various digital concerns, might block out an hour of their day in advance. That rhetorician that receives so many emails will likely spend less time answering each one individually and look for strategies to mitigate or compress the work. This compression will be reflected in the rhetoric of their responses, as the responses to the emails are left shorter or condensed in nature. The rhetorical situation shifts to fit the operational need.

**Authority infrastructure**

Authority infrastructure is the last but certainly one of the most important infrastructural concerns. It consists of the divisions of power and command surrounding the activity of the rhetorician. This infrastructure includes divisions of labor, codified rules, and disciplinary procedures, or immunity from such policies. Understanding breakdowns in authority infrastructure typically involves acknowledging the invisible or unstated power dynamics in a situation. Who can fire or hire, who controls promotions, and how disagreements are negotiated are all determined by authority infrastructures. Authorities of authority are why my students show up to my lectures in the first place. They control situations by threatening to withhold or deny a free range of action by the rhetors on both sides. Perhaps most importantly, infrastructural rhetoricians should always be aware of the limits of their own authority.

Optimistically, authority infrastructures are often manipulated to gain a beneficial advantage by limiting the authoritative reach of institutions (Townsend, 2016). For example, in recent years, there has been a separation at several higher learning institutions between traditional departments of language study and writing studies. Writing scholars forming independent departments allows them to shift their authority infrastructures to focus solely on developing writing and writing programs separate from traditional language or literature studies. It gives these programs more control over every subsequent rhetorical interaction by limiting the amount of oversight other entities at the institution have.

**Demarcation effects**

These are the five demarcations for infrastructural rhetoric. If we use the definition and demarcations above as a guide, it is possible for a rhetorician to identify a central rhetorical concern or “activity” and make the infrastructure surrounding it visible by identifying the variables surrounding each of these major demarcated structures. This visibility, in turn, may allow for rhetorical actions and considerations that were not previously considered as a part of their rhetorical situation to be studied.

Although I encourage a multiplicity of uses for this theory in future projects, I now provide one brief heuristic in the form of infrastructural Mapping for use and adaptation by those interested in rhetorically analyzing and shifting their own infrastructures. To keep things simple, I continue to use the example of teaching online from a home office.

**MAKING INFRASTRUCTURES VISIBLE TO RHETORIC THROUGH TAXONOMIC MAPPING**

Infrastructural Mapping is an analysis process of learning more about the infrastructural setting of an activity at hand by writing out or visually mapping the infrastructure in a rhetorical situation. Like one might begin a scientific survey of wildlife by taxonomizing the various animals and plants in an area and then tracing their relation to one another, so too might a rhetorician in a new setting map out the infrastructure they find themselves in. Infrastructural Mapping allows a rhetorician to learn and become actively aware of many of the invisible rhetorical elements in their infrastructure. This process invites them to pay particular attention to malleable factors that may be changed or adjusted to make certain rhetorical exchanges more likely to result in desired outcomes. To begin an infrastructural mapping project, it is essential to remember that infrastructure is contextually defined by the activity it supports (Star & Ruhleder, 1996). Therefore, the first step is to identify the traditional rhetorical situation (the activity) to center the map around. This activity could be something small like completing a purchase order for more coffee or sizable and ongoing, like managing a breakdown in a commercial shipping department. For our current case, we will use the initial situation of hosting a lecture from a home office during a pandemic. The traditional rhetorical situation would look something like this:

Figure 1. Traditional Rhetorical Situation
The rhetorical activity should lie at the center of the map and be an activity that is repeated or impactful enough to make the mapping worth the time. Minor activities that only happen once are possibly either not meaningfully sufficient for rhetorical error to matter or not repetitive enough to allow for learning or improvement on the part of the rhetorician as infrastructural breakdowns arise. To map, an activity must first be worth mapping.

Once the activity has been selected, the next step is to map out the infrastructural components of which one is aware. Starting with the taxonomy discussed earlier, a rhetorician might list or map the elements in the infrastructure and the various ways in which they affect the activity. This listing expands the rhetorical situation as seen in figure 2:

Considerations of infrastructural breakdown are an excellent place to start. Questions like, “What would prevent me from completing my rhetorical interaction?” or “Who/What holds power to make the changes I need?” will allow the rhetorician to conceptualize the early stages of the map. The rhetorician should then follow up with the social and financial dispositions of the situation. Are there ways to make the individuals more receptive to your message in advance? Do the finances allow the rhetorical exchange to take place effectively? Finally, assess the physical infrastructure of the task at hand and the ongoing operational qualities that make up the task, if there are any. These written categories will provide a path for further analysis of breakdown and malleability.

In moments where there is a risk of sudden infrastructural breakdown leading to the failure of the rhetorical activity at the moment of occurrence, the map section should be marked with a clear symbol. I have used a Delta on the following page. These moments can then be assessed for malleability (M) using a Likert scale. In this scale, an M of 5 represents an infrastructural factor that one has total control over, like the amount of money spent on their technology. An M of 3 is something that one has some control over, like their personal health. An individual may be able to exercise total control over their health, but changes take time, patience, and dedication. Finally, an M of 1 denotes a variable that is almost entirely out of the rhetorician’s control, though that variable was still intentionally crafted to serve an infrastructural purpose by an outside agent at some point. As the student conduct guidelines in the example given are set by outside committees that I am not privy to, I have no way of interacting with or changing them at this time. That said, they still impact the rhetorical situation and can be used for rhetorical understanding, so they are an important component of the analysis. After completing a brief map of the infrastructural factors, the full analysis can then be displayed as shown in figure 3 on the following page.

This assessment will give a clear visualization of where the rhetorician should spend time and energy within the infrastructure. For instance, the wi-fi button on my laptop has been assigned a ΔM of 5 because, at any moment, I could personally press it, causing a catastrophic collapse of the rhetorical situation. I have high control of the infrastructural breakdown, which presents a new rhetorical option (not one I am likely to take, but it exists). If a situation were to arise where I needed to quickly remove myself from the rhetorical situation without allowing the students to see what had happened to me or my surroundings, I could utilize it. Such use would make my video cut out as I continued to talk, which may lower the fault that the students place on me for the disconnection or obscure my reasons for disconnecting. It would sever the rhetorical moment in a much different manner than saying a formal goodbye. I use this example not to advocate for such a course of action but rather to give an explicitly clear means of showing how the infrastructural analysis provides an entirely new means of rhetorical response that may not be present otherwise.

On a less morally ambiguous note, we see that my personal mood, which is influenced by everything from the music I listened to earlier to what I was eating for lunch, is something I feel that I have high control over. I can shift that mood to have an impact on the course of the lesson. Student values, by comparison, are not likely to be changed in the course of a single lesson, so they are assigned an ΔM of 2. The Δ symbolizes a need to be acutely aware of the constraints of student values so as not to shut down the conversation. I should take time to become aware of student values diachronically before engaging with them directly.
However, this engagement is likely to take significant time, hence the M of 2. The initial goal in this heuristic process is to determine at least one M5 in each category, giving the rhetorician at least five direct ways to interact with the infrastructure directly. Uncertainties in this process are not an unfavorable result. Instead, moments of uncertainty or dissonance may represent a need for further understanding by the rhetorician. This need will encourage the rhetorician to ask questions and observe their infrastructures in a more pointed manner. Pointed questions will, in turn, hopefully, lead to further analysis or the discovery of new infrastructural rhetorical strategies.

If an infrastructural category does not seem to produce an M of 5 on the initial take, it may be necessary to take the map out one step further and begin to analyze one of the infrastructural elements for its sub-components. For example, student opinion has been given a ΔM3. This means that student opinion is capable of breaking down the rhetorical situation, but I may be only moderately capable of swaying it during the course of the lesson. However, because it is not an M of 1, there must be some sub-elements that I am capable of controlling. Thus, we might produce a sub-analysis like the one in figure 4. In the sub-analysis, student opinion is broken into several components that construct these opinions while still remaining firmly infrastructural in scope. Though peer opinion and past experiences remain less malleable, the topic chosen for the lesson would be completely within my control. This represents asshiftable sub-component that will have a direct impact on the student’s opinions during the lesson. It is a brief and meaningful infrastructural understanding that will have a large impact on the overarching rhetorical situation. Paying attention to the smaller elements allows infrastructural rhetoric maps to continue to be useful past the bounds of their initial drafting.

As new malleable infrastructural elements are encountered during the mapping process or through infrastructural breakdown, they can also be added to the map. Infrastructures are often invisible until moments of breakdown occur, so it can be difficult to grasp any operating infrastructure in motion fully. A map of this nature will need to be revisited again and again, serving as a living document for the repeated rhetorical interactions.

Because my example given here is a hypothetical construct, there are many parts of my infrastructural map that remain a mystery. In a complete infrastructural map, there would be pages and pages of interconnecting lines and variables. These variables would shift in their malleability as the activity continued, and more rhetorical options would present themselves. Like practices of rhetorical analysis, much of the work that a rhetorician would be expected to do with such a map could become implicit within our daily conscious operations as we fully adapt to an infrastructural rhetorical mindset.
It is my hope that this brief operationalized heuristic encourages the addition of others’ voices to complete the work it has started. The students’ ideologies and values would be best derived from a series of interviews or conversations with them. Likewise, the strength of the internet could be further illuminated by a phone call to the internet service provider. Just like a navigational map, an infrastructural map becomes stronger when verified by more than one person’s perception. The intention is that future projects will engage in mapping practices with the communities that the infrastructural rhetoric will have a direct impact on. The fundamental goal of this heuristic and theory is to find concrete ways to make an actionable change in situations that need to be addressed in complex and interdependent ways.

Ultimately, mapping out an infrastructure in this way has two benefits:

First, like a traditional rhetorical analysis, it allows us to notice the rhetorical impact of elements that would otherwise go unnoticed. Just as one might bring attention to how certain words or sentences evoke feeling and agreement in an audience, we can also begin to see how rhetorical engagement with one particular person in an institution might meet with more success than another.

Second, it allows for quick revision to infrastructural rhetorical breakdown. If a rhetorical interaction doesn’t go as expected or a rhetorician needs to reevaluate a rhetorical activity, Infrastructural Mapping provides a way to avoid starting back at square one. Instead, a rhetorician can pivot their rhetorical strategy faster by understanding the other infrastructural options available. They may then act on those other options before starting the rhetorical activity over. Like most heuristics, infrastructural mapping is a time-saving measure meant to speed up rather than eliminate complicated processes.

CONCLUSION

The difficulty with a theory of infrastructural rhetoric is the massive scale and complexity of most infrastructures. As such, what I write here must be taken only as a prooemion to a much larger ongoing discussion. Infrastructures are endless and entangled, but to make sense of them, we must have a unified starting point to begin talking about our work within them. That is what I hope I have provided here. This theory of infrastructural rhetoric is a starting point—a place for further work to begin.

My work has taxonomized and theorized rhetorical infrastructure into a pragmatic model that unifies the infrastructural vocabulary for practitioners of persuasion. Infrastructural rhetoric, as it is proposed here, privileges activity, intentionality, communication, and decision-making. It is more apt to successfully respond to (and potentially disrupt) the infrastructures present today, especially those that are standing in the way of meaningful change and goodwill. In the future, I look forward to myself and others using this theory to unpack and dismantle daunting infrastructures of injustice in direct and impactful ways. Like infrastructures, these problems are complex and entangled with material reality, making infrastructural rhetoric essential to engaging with them in ways that may produce meaningful change.

The invisibility of infrastructures makes them difficult enough to analyze and discuss without making our language invisible as well. As we lean forward into an infrastructural turn, undertaking further work on the subject, infrastructure must become a rhetorical term in and of itself, separate from the fields of study from which it has been adapted. My definition and demarcation allow for present and future rhetorical methods to share a unified language around the subject of infrastructure that positions it firmly within the work of rhetorical studies to render the impact of our infrastructures visible in our communication practices.

REFERENCES


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Using Situational Analysis to Reimagine Infrastructure

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ABSTRACT
In this article, we ask what it means to think of infrastructure discursively through situational analysis. First, we consider how policymakers have historically used writing and rhetoric to redefine, reframe, and resituate what infrastructure can be in technical documents. Second, we address the impact of policymakers’ discursive practices on the spaces and material realities of communities. We view the infrastructural function of writing “as a conceptual foundation for revealing structures and foundations of organizations that affect people” (Read, 2019, p. 237). We use three texts as the space of our discourse mapping: President Franklin Roosevelt’s “Fireside Chat on the Recovery Program,” the Green New Deal, and President Joseph Biden’s recently proposed American Jobs Plan. Through these three cases, we argue that infrastructure has always been defined in relation to environment. Any definition of infrastructure is rooted in environment or seeks to change environment. These shifts in definition have been used strategically to bring more visibility to marginalized communities and make their concerns central to the concerns of the United States’ socio-economic agenda. We close with implications for both communities and policymakers.

CCS Concepts
Information Systems

Keywords
Environment, Infrastructure, Policy documents, Situational analysis

Infrastructures, especially those proposed by governmental policy documents, reflect the ways that communities structure both nonhuman and human relationships like a mirror. Whereas infrastructure has traditionally been viewed as made up of buildings, roads, utilities, and extended to the hierarchical social organization found in corporations or institutions, we propose a much more humanistic approach to the concept of infrastructure that acknowledges individuals as having infrastructural agency and purpose. With this focus, it is possible to critically examine the ways that national infrastructure projects and their documents serve to frame human beings as resources in a capitalist political ecology versus unmonetized members of society. The humans as an economic resource metaphor acts to erase the contributions of “nonproductive,” unemployed or underemployed, or disabled individuals to society in destructive ways that contribute to bias. We use three texts as the space of our analysis. The first is President Franklin Roosevelt’s “Fireside Chat on the Recovery Program,” which as part of the New Deal had three interrelated infrastructural goals (i.e., relief for the needy, economic recovery, and financial reform) that were largely achieved through public works programs. The second is President Joseph Biden’s American Jobs Plan, which shifts the definition of infrastructure from solely encompassing transit concerns to including healthcare (care infrastructure), high-speed broadband connectivity (information infrastructure), clean and renewable energy systems (energy infrastructure), and affordable housing (economic infrastructure). The third is the Green New Deal, which attempts to address the challenges created by the New Deal (e.g., fossil fuel–dependent transportation, car-dependent land use, social inequality, and industry based on extraction of resources). In isolation, these texts give us definitions of infrastructure that are rooted in specific times and places. However, if we analyze these texts in relation to each other, we begin to see how the definition of infrastructure has evolved over time. Through these three cases, we argue that rhetorical activity is always rooted in environment. Here we feel it is important to note we are distinguishing between the environment and environment. Whereas the former has often
been defined as nature or a space outside culture, the latter accounts for all spaces—natural and artificial—where people live, work, and play. Environment can refer to the natural world, built world, and the location of rhetorical activity simultaneously. Although in some cases it may be important to distinguish between the environment and environment, environmental justice (EJ) scholars have cautioned that such a split has allowed us to see certain issues as being more related to environmental concerns than others (Taylor, 2000, 2002). Given that EJ defines environment as the spaces where we work, live, and play, there are many issues that are now considered central to environmental action, especially environmental justice, that exist outside traditional constructions of environment as the natural world. For example, failing infrastructure such as crumbling household walls with lead-based paint or urban blight in residential areas traditionally would not be deemed environmental concerns under what Taylor (2000) labeled as the romantic and new environmental paradigms (p. 529-533). If we define environment solely as nature, such a definition would exclude the experiences of many people of color in the United States who experience environment predominantly in urban contexts. Through the environmental justice paradigm, legacies of segregation and urban redlining are treated as environmental issues (Taylor, 2014, p. 146). Environment should not always be understood as solely referencing the natural world. EJ scholars’ push to expand how we define environment has allowed us to see communities and problems once rendered invisible. We hold that any definition of infrastructure is rooted in environment or seeks to change how we understand environment. How we talk about people and frame their role in society, especially in environment, matters. In this article, we address the following questions:

- What is the role of human beings in the rhetoric of large U.S. infrastructure policy documents?
- How can we shift the definition for BIPOC, gender-nonconforming, disabled citizens from invisible (in the New Deal), victims of economic insecurity (in the Jobs Plan), and vulnerable (to climate change in the GND), to valued members of society through attention to the rhetorical construction of their roles in such technocratic infrastructure policy documents (McKenna & Graham, 2000)?
- What can comparative situational analysis reveal about infrastructure policy documents and how human beings are framed to exist in their environment?

Specifically, we ask what it means to think discursively about infrastructure through situational analysis in ways that have direct consequences for the lived realities of citizens. Criticisms of the American Jobs plan center on its environmentally focused elements, which are not seen as central to infrastructure. These criticisms place it as lying on a spectrum between the New Deal and the Green New Deal, which are seen as exclusively focused on infrastructure and the environment, respectively. However, we see each of these infrastructure projects as environmental policy. Each have a definition of infrastructure that shows a concern for environment. Attending to these nuances in language offers advocates an opportunity to counter criticism that dissuade us from considering the centrality of environmental issues in our infrastructural designs. First, we consider how policymakers have historically used writing and rhetoric to redefine, reframe, and resituate what infrastructure can be in technical documents. Second, we address the impact of policymakers’ discursive practices on environment and the material realities of communities. We view the infrastructural function of writing “as a conceptual foundation for revealing structures and foundations of organizations that affect people” (Read, 2019, p. 237).

**MAKING SENSE OF INFRASTRUCTURE AND ENVIRONMENT**

There are precedent-setting arguments in the literature of rhetoric studies and technical communication that force us to attune to the ways that the nonhuman infrastructure and environment are linked to the human condition through writing. Actor network theory has been a useful heuristic in rhetorical studies for examining the social relations between humans and nonhumans across various time periods through cultural-historical activity theory (CHAT). The laminated chronotypes described by Prior (1999) (and originating with the theories of Bakhtin) are accretions of historical activity network layers. These theories have historically maintained a strict separation between the classification of human and nonhuman, actors and actants, externalizing that which is deemed environment.

One way of understanding the relationship between humans and environment has been to turn toward discourse. As Keller (2013) articulated, “the relationships between human beings and the world are mediated by means of collectively created symbolic meaning systems or orders of knowledge” (p. 2). In the Foucauldian sense, discourses are constructive of both subjectivities and regimes of truth. A focus on discourse presents opportunities to deconstruct practices that form the social structures of life. Through “exam[in]g the structure of spoken and written texts in search of politically and ideologically salient features, which are constitutive of the (re)produced power relations,” we can make sense of cultural processes and change (Jaworski & Coupland, 2014, p. 6; see also Chouliaraki & Fairclough, 1999; Clarke, 2005).

Since 2005, there has been a steady stream of research that has focused on discourse, institutions, and environmental policy. Feindt and Oels’s (2005) special issue “Does discourse matter? Discourse, power and institutions in the sustainability transition” in the Journal of Environmental Policy and Planning was one of the first comprehensive collections to apply the lens of discourse studies to environmental policy documents. This marked a shift from the argumentative turn, which was an orientation in policy analysis that represented the study of language and argumentation as essential dimensions of theory and analysis in policymaking and planning (Fischer & Forester, 1993). As a corrective, a Foucauldian discursive approach unravels the complexity of the policymaking process by laying bare the implicit structural forces that grant power to some and render others powerless. In the period since Feindt and Oels’s special issue, discursive approaches to understanding environmental policymaking have grown in scale. This growth is also coupled with changes in environmental discourse. There are issues that are now seen as central to environmental policy due to public mobilization that were once on the periphery (e.g., ocean plastics, redlining, immigration justice, transit justice, energy justice). Leipold and colleagues (2019) emphasized that this evolution in environmental policy and discourse necessitates careful study not only to expand the value of discursive approaches but also to track the relationship between old and new discourses. We believe the current debate over the meaning of infrastructure in U.S. policy deliberations is an opportunity to understand the evolution in the meaning of infrastructure. What is important to us in this moment regards not merely the U.S. public’s reaction to
the perception of infrastructure’s redefinition but also how such a definition tracks alongside understandings of environment.

The standard definition for infrastructure looks at physical and organizational structures designed to support social operations at various scales. These conversations about infrastructure often relegate environment to the background. In fact, we tend not to see the relationship between infrastructure and environment unless environment is explicitly addressed within documents. Those discussions often involve natural environment. However, we believe infrastructure and environment are linked. Moreover, environment is often more-than-nature. Attending to infrastructure through analysis necessitates attending to environment discourses. Additionally, we take inspiration from Frith (2020) who extended Read’s (2019) relational theory of infrastructural writing by turning our attention towards how hidden written technical standards assemble into a discursive infrastructure that supports the material world. Though infrastructures are designed “to blend into the environment,” we notice them “when they stop working seamlessly and stop supporting the behaviors for which they are built” (Frith, 2020, p. 423). The role of policy documents in constructing social and physical realities is central to the practice of professional and technical communication, but it is only by viewing these documents in their full context that it is possible to understand the ramifications of how people are situated in a given ecological framework of both human and nonhuman actors/actants. In this article, our methods for analysis reflect a holistic approach to document deconstruction and reconstruction that makes human beings and environment the main foci of effective policy communication around infrastructure.

We make Clarke’s (2005) methodology of situational analysis central to this analysis. Looking at rhetorical situations through a grounded theory lens involves acknowledgement of the “thick” layers of meanings that accrue over the surfaces of texts that live in social context (Fosket, 2002; Geertz, 1973). In addition, “A key feature of the postmodern turn has been an enhanced theoretical grasp of the analytical importance of the nonhuman in our complex situatedness” (Clarke, 2005, p. xxxiv). We take the documents of infrastructure planning at the national level to retroactively look what infrastructure means through different assemblages of humans and nonhumans as well as how those assemblages situate infrastructure in relation to environment.

USING SITUATIONAL ANALYSIS TO MAKE SENSE OF INFRASTRUCTURE

As a methodology for making sense of the messiness of what infrastructure means, we found Clarke’s situational analysis (SA) to be generative. Clarke unpacked five “recalcitrancies” with grounded theory (GT) that are criticized from a postmodern theoretical perspective as limiting for analysis work. She attempted to resolve these recalcitrancies through the development of SA methods. First, GT lacks reflexivity “about the research process and products” and frames the researcher as invisible while simultaneously purporting to give a voice to the unheard from their own perspective. Second, it is reductionist as it oversimplifies complex dynamics in favor of commonalities and coherence. Third, it simplifies multiple social processes into singular events rather than recognizing them as the dynamic interactions of social words that overlap. Fourth, GT interprets any variation in data as “negative cases.” Because GT coding practices encourage consistency rather than divergence, outliers in data are eliminated. Finally, GT embraces “flavors of 1950s and 1960s styles of American positivism and scientism” as it searches for epistemic purity or a singular truth (Clarke, 2005, p. 11-18). Pushing GT to address these recalcitrancies necessitates interrogating binaries and how power structures the research process. It also allows us to situate GT research as a tool for pursuing social justice.

SA complements GT in order to produce critical accounts of complex social problems. These accounts become increasingly useful and powerful as they have the potential to expose problems experienced by marginalized populations. SA adopts a Foucauldian genealogical approach, which interrogates discourse as flows of power through institutions that produce subjects and differences through an actor-network theory-like “method assemblage” (Law, 2004, p. 13). As a mode of inquiry, it encourages researchers to attend to silences in data and understand those silences as being integral to the structure of a situation. SA uses three mapping techniques (i.e., situational, social worlds/arena, and positional maps), which list the “major human, nonhuman, discursive and other elements” and the relationships among these actors and actants in the matter of concern (Clarke, 2005, p. 559). These techniques cartographically map qualitative data into visual representations of elements surrounding a situation of concern.

We used situational mapping to trace how infrastructure has evolved in U.S. public policy. Situational maps list all of the ontologically different entities that compose a situation. These entities include humans (e.g., individuals and collectives) and nonhumans (e.g., discourses, texts, technology). For example, if we were to investigate what infrastructure meant in the United States during the 1930s, we would need to ask and answer the questions: “Who and what are in the situation? Who and what matters in this situation? What elements ‘make a difference’?” (Clarke, 2005, p. 87). Once the entities are listed, they are placed in relation to each other, and their relationships are described. This relational analysis gives birth to worlds in which humans, nonhumans, and their environments engage in relentless processes of becoming (Clarke, 2005; see also Haraway, 2003, 2016). This is how infrastructure comes to mean.

The documents that we chose for comparative SA each reflect the historical context in which they were written, but they also show a progression from bureaucratic distance and institutionalization of entire groups of society, and often their complete invisibility, toward further acknowledging individuation and diversity of human needs and conditions. We analyze President Franklin Roosevelt’s “Fireside Chat on the Recovery Program” (March 12, 1933) because it attempted to lay out to the general public the purpose and details of Roosevelt’s sweeping New Deal programs that were formalized in the National Recovery Industrial Act of 1933 about four months later. It was broadcast around the country at dinner time, when families used to gather around the warm glow of the radio dial to listen to the news and other programs. We compare the Green New Deal resolution (1998) to the New Deal text because even in its name, it harkens back to the idea of Roosevelt’s New Deal. This intertextuality persists in many of the goals that are stated in both documents, including public works toward greater economic stability and a concern with obtaining access to natural resources and preserving them for future generations. Finally, President Joe Biden’s American Jobs Plan (The White House, 2021), which was published in summary form for the public on the White House website, while unique in name, draws on features from both previous infrastructure proposals. They are infrastructure bills, a genre of policy document that makes large gestures toward future
action and “what should be,” and so they can act as a barometer for measuring social change through analysis of terminology and the social worlds and arenas that the authors build.

Data collection and analysis occurred simultaneously. We looked at each document individually. In line with GT, data analysis occurred on three levels of coding. The first level—open coding—involves identifying concepts, people, place, and things and the creation of categories and subcategories that helped us understand how they mattered as discrete parts (see Figure 1). Next, we conducted axial coding, which allowed us to make connections between our categories and subcategories (see Figure 2). Finally, the third level of coding—selective coding—allowed us to draw connections made during the axial coding phase to deduce a theory of how infrastructure’s definition came to mean within a particular document. Based on Clarke’s recommendations, we circled each element and drew connecting lines. We then asked specific questions about each connection. Figure 3 offers an example of our process through the American Jobs Plan. The following relationships are numbered in Figure 3: (1) How does drinking water relate to the Internet? (2) How do able-bodied and disadvantaged communities relate to each other and areas vulnerable to flooding, drought, fires? (3) What’s the relationship between families, divided communities, and energy sites? (4) How do America’s children, superfund sites, and PFAS chemicals relate to each other? These are just a few examples of questions we asked in this document. At each stage, Clarke’s situational mapping was useful in helping us work through our data analysis. Thereafter, we treated all three documents as a corpus made up of one genre of largescale, public-facing infrastructure policy document. We were interested in making sense of what constitutes infrastructure’s definition between each document, where this definition intersected and differed across historical context, as is shown in Figure 4.

BACKGROUND ON THE THREE INFRASTRUCTURAL PROGRAMS

The New Deal

The National Industrial Recovery Act (NIRA) of July 1933 enacted many of the policies that President Franklin D. Roosevelt discussed during his New Deal fireside chat in March of that year. Goals included the reduction of unemployment and an increase in “public welfare” and standards of living through promotion of greater cooperation between farmers, business, and labor (NIRA, 1933). The New Deal programs created construction and public works jobs for many Americans (excluding convicts), with preference given “to ex-service men with dependents,” and then to citizens and aliens who intended to become citizens who lived in the geographical area where the work was to take place (NIRA, 1933). Projects ranged from road work on “national forest roads, trails, bridges, and related projects” to “roads on Indian reservations,” and “roads through public lands” (NIRA, 1933). The act led to a rise in union power and the establishment of labor laws that protected against child labor, established a minimum wage, and improved safety practices at work. Men (especially former servicemen) with families were given priority for public works jobs, although women could also work for the government if they were the head of their family. This last fact is not stated in the text of the NIRA Act, and nowhere are women discussed in the document. A similar lack of commentary on the needs of women and people of color exists in Roosevelt’s fireside chat that outlines the New Deal Program, although children are briefly mentioned in terms of doing away with child labor in the country (Roosevelt, 1933).

The American Jobs Plan

When he came into office, President Joe Biden established what was an ambitious agenda for his first 100 days in office. This plan encompassed three major initiatives—the American Rescue Plan, which was signed into law, the American Jobs Plan, and the American Families Plan. The American Jobs Plan is the second part of President Joe Biden’s domestic agenda that amounts to $2 trillion in spending over the course of eight years. The projected sum of Biden’s three plans totals more than $6 trillion, which is just slightly less than what the federal government spent in fiscal year 2020. The scale of spending is exactly why administration officials continually describe these proposals as “once in a generation” investments. The American Jobs Plan is a monumental, expansive infrastructure plan that would be the largest jobs program since the New Deal. It makes investments in affordable housing, broadband expansion, drinking water systems, and transportation infrastructure. The plan is part of the administration’s long-term economic vision to keep the United States competitive while also responding to the economic and environmental devastation caused by the COVID-19 pandemic and global climate crisis. What makes the American Job Plan compelling for analysis is the alarm the Biden Administration has created regarding how it has chosen to define infrastructure. Though Republicans see the administration’s shift as an attempt to justify liberal entitlement programs, the Biden Administration insists that its use of infrastructure reflects the social conditions of the current moment. The Administration’s position reflects that our definitions of infrastructure have always been tied to the economy and environment. Furthermore, economists agree that infrastructure is more than just bridges, roads, and tunnels as elements that serve as constituent elements of modern infrastructure (e.g., broadband internet access). Digital equity is an environmental and spatial justice issue (Figliozzi & Unnikrishnan, 2021). The lack of access to broadband internet service reduces access to environmental health information and denies people the right to participate in the economy based on the circumstance of geography. However, some believe that Biden’s definition might be too expansive (Tankersley & Smialek, 2021).

The Green New Deal

The Green New Deal differs from the New Deal and the American Jobs plan in that it is not a policy proposal but rather a set of policy goals. It offers a framework for how the United States should approach action to mitigate global climate change. In 2019, Representative Alexandria Ocasio-Cortez and Senator Ed Markey introduced it as a 14-page resolution (Recognizing the duty of the federal government to create a Green New Deal Act, 2019). It was a significant part of the conversation about climate and environment during the 2020 presidential election. It was most visible as a component of Senator Bernie Sanders’s climate platform on his campaign website. Even then-candidate Joe Biden cited the Green New Deal as an inspiration for his plan to invest in clean energy infrastructure, impose new limits on pollution, and eliminate net carbon emissions by the year 2050. Nevertheless, the Green New Deal is not solely focused on climate legislation. Its focus on infrastructure and change is influenced by ideas of European social democracy (Meyer, 2021).
Figure 1. Section of the unordered situational map of the American Jobs Plan.

Figure 2. Ordered Situational Map of the American Jobs Plan. Each element of the messy map is categorized.
Tacked on to its climate goals are demands for universal health care, affordable and safe housing, and labor protections. Although the American Jobs Plan uses the economy to justify its definition of infrastructure, the Green New Deal centers the environment as the guide for what counts as infrastructure. Carework as climate work is a concept that proponents of the Green New Deal have promoted (Isser, 2019; see also Aronoff, 2021; IWL Rutgers, 2019; Meyer, 2021). For supporters of the Green New Deal, global climate change is so pervasive in its impacts that only a fundamental change to the social contract can address it.

What’s the Situation?

The New Deal

In both the fireside chat from March 12, 1933, and its formalized Act from July 24, 1933, implicated or silent actors include women and BIPOC, gender-nonconforming, and disabled people who are assumed to ultimately benefit from the many programs built to support the paternalistic, White, straight, and able-bodied society that was considered the norm at the time. Human actors are discursively constructed as either “property owners,” “homeowners,” “farmers,” or “industrial workers,” based on the ownership of property and/or ability to contribute economically to society. Conversely, there are the “unemployed” who (through no fault of their own, supposedly caught up in an economic situation out of their control) have just to be given good hard labor paid at a decent wage to bring the country to rights. First, African Americans and other minority groups from the 1930s were not usually home or property owners, especially in southern states, where even if they had the funds saved to do so, laws and institutionalized racism precluded opportunities for them to purchase real estate. Second, many good jobs in both farming (which also required land and was still substantial on a small-scale family basis, despite accelerating industrialization) and industry were given first to White male Americans, with lower status jobs going to Americans with different racial backgrounds and women. So, though some New Deal jobs did go to nonwhite people and women, they overwhelmingly benefitted those who fit the status quo in an unstated duplication of existing economic and labor practices based on U.S. racial and gender hierarchy.

One can say that similarly, the way that nonhuman actants are discussed in both the fireside chat and the act from 1933 reflects a focus on manipulation of the human-built environment to the exclusion of how we now consider environment as having its own agency. Roosevelt and the text of the act discuss natural resources as an unlimited resource meant solely for human use and consumption to be enrolled by the New Deal Civilian Conservation Corps; however, U.S. policymakers now refer to nature as a finite resource that threatens the security of the nation. The New Deal established the Civilian Conservation Corps to engage in forestry and flood prevention work “conserving not only our natural resources but our human resources” (Roosevelt, 1933, p. 4). Both humans and nonhuman actors were supposed to be conserved. This program is what the New Deal is most remembered for doing—putting citizens and natural resources to work for the country. However, it cannot be said that the New Deal preserved the environment—instead, it left a human mark on natural park lands throughout the country through public construction projects that included roads, bridges, buildings, dams, levees, and other massive feats of human physical labor that worked to tame nature for the benefit of human safety and enjoyment.

Finally, we see through the discursive construction of nonhuman actants such as “gold and silver” and “debt” as forms of currency that what was at stake following the Great Depression and banking crisis that precipitated the New Deal programs was belief in the system that underlay the U.S. economy. The gold standard had been the basis for the valuation of the dollar, and many other currencies, since the 1870s, which was abandoned in 1932 in favor of policy that set an exchange rate to help stabilize the U.S. economy following gold “flight” during the Great Depression. Deflation made it impossible for banks to provide loans or underwrite debts that would lose value immediately, banks foreclosed on existing loans, and industry and agriculture could not sell products at a profit, negatively affecting their ability to pay employees. All these factors led to mass unemployment, and the discursive construction of human actors as “the unemployed,” or those who lack currency. The capitalist system relies on the positivist notion that increased production and advancement toward “modernity” will necessarily
lead to prosperity and a higher standard of living, and that these benefits will automatically trickle down from producer to consumer. But after the Great Depression, there was little capital that could be relied on aside from human capital, and, thus, the public works projects enrolled the economic value of human labor.

What stands out here, is the vast amount of invisible labor that while not mentioned in the fireside chat or NIRA of 1933, served to pull the U.S. economy out of the depths of the deepest economic depression to date. The NIRA programs further solidified the employability of White American men through physically difficult public works projects in construction (a sector even more male dominated at the time than many others). At the same time, women’s work in the home and their communities that supported men’s work remained unseen, unpaid, and often unappreciated as it was expected to take place in the internal sphere of domesticity, unacknowledged. One cannot say that the work of BIPOC Americans during this time was invisible because of its “sphere” of influence, rather it was deemed to exist in the public sphere in a supporting role to the work of White men, which overshadowed it. Therefore, both groups held unspoken supporting roles, sometimes multiply intersecting with other factors such as disability and/or gender nonconformity, which served to limit their image in public policy texts. None of this discussion looks to explain this historical situation in a positive light, and as we have seen from the ensuing civil and women’s rights movements of the 1960s and beyond, many changes have been made to try and rectify these social injustices. But vestiges of the same historical social hierarchy persist, affecting the language of public policy documents to this day.

**The American Jobs Plan**

The administration’s primary task has been to shift the meaning and conversation of what denotes infrastructure. This is a monumental rhetorical charge that requires gathering actors, their spaces, their commitments to space and other actors, as well as making visible the work they are doing together. In short, the Biden Administration situates infrastructure as a more-than-nonhuman enterprise. Modern uses of infrastructure rely upon an alignment of institutional, human, and material factors to categorize infrastructure in relation to economic development. The primary focus has positioned material elements (e.g., roads, bridges, energy and water distribution systems, sewage services) as central actors supported by human capital (e.g., the available workforce population) and a combination of regulations and institutions that bound what is possible in time and space. This traditional definition has framed people’s value only in their ability to be grouped into a single entity. The new definition raises the importance and expands the scope of human infrastructure (or care infrastructure). Human infrastructure is no longer a background element. Instead, the Biden Administration places material and human infrastructure on the same level and emphasizes they are not mutually exclusive. Their message: we cannot invest in material infrastructure without also investing in human infrastructure.

What makes the administration’s rhetorical work compelling is that it still retains the focus on nonhuman actors and their role in economic development; however, it situates these actors in a larger discursive arena that highlights silent implicated actors’ powerlessness and the potential to be empowered. Social justice is a concept that links material and human infrastructure into a unifying vision of infrastructure. Social justice in the American Jobs Plan is a combination of environmental and economic justice. Principles of social justice ask that we consider basic fairness between individuals (e.g., equal access to economic, political, and social opportunities) as integral for meaningful participation in society. Approaching social justice necessitates working from the interests and needs of vulnerable communities. The Biden Administration is apt to enroll into its revised definition several communities in relation to their vulnerabilities. **Hard-to-reach, people in need, divided, vulnerable, disadvantaged, people with disabilities, and impacted** are all used as discursive constructions of communities.

Although the Biden Administration only mentions environmental justice once in the entire document, a thematic read of the document illustrates several tenets of environmental justice as integral to the work of infrastructure. At the most basic level, environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The definition here is expansive to include justice in transportation systems, equity rather than equality, and justice in spatial access. The focus on the need for greater participation in public deliberation is the need to correct exclusions from minority, low-income, indigenous populations and geographic locations in the United States that experience disproportioned environmental harms and risks. This disproportion impact has resulted in greater vulnerability that includes exposure to additional environmental hazards, negative health outcomes, and lack of socioeconomic mobility. A portion of this environmental agenda involves environmental remediation. The Biden Administration points to “26% of Black Americans and 29% of Hispanic Americans living within 3 miles of a Superfund site” and the impact of that proximity on the health of children. It also points to the need to make a $55 billion investment into water infrastructure to replace lead service lines and mitigate exposure to Per- and Polyfluorinated Substances. The focus on transit justice is a significant advancement of the environmental agenda that achieves not only removing polluting vehicles from roadways and replacing them with zero emissions vehicles but also expanding transportation access for other types of mobility (e.g., construction of protected bike lanes and sidewalks) and previously excluded communities (e.g., people with disabilities, rural communities, redlined minority communities).

Nearly every program is concerned with economic justice. The $110 billion of new funding for roads, bridges, and other major transportation projects is framed mostly in terms of its economic benefits to communities. The building of the electric vehicle infrastructure will target “rural, disadvantaged, and hard-to-reach communities” with manufacturing jobs. The largest focus on economic justice is the proposed investment in broadband infrastructure. The Biden Administration notes “more than 30 million Americans live in areas where there is no broadband infrastructure that provide minimally acceptable speeds—a particular problem in rural communities throughout the country.” Framing internet access as integral to a 21st century definition of infrastructure emphasizes the internet as a constituent element of economic mobility. Americans increasingly need the internet for work, to participate in school, to access health care, and to stay connected across communities. The Biden Administration compares the effort to ensure access to reliable high-speed internet to the effort the federal government made to ensure every American household would have access to electricity.

**The Green New Deal**

Situational analysis reveals that infrastructure is inseparable from
environment in the Green New Deal. “Critical infrastructure” recognizes this link, and “public infrastructure” are continuously threatened by climate disasters such as wildfires, severe storms, and droughts. Unlike in the New Deal, in which environment is imagined as a malleable resource for humanity’s use, and the American Jobs Plan, in which environment is one of several significant factors that must be considered but not the central factor, the Green New Deal is aimed at bringing about a radical change in the sources and uses of energy and simultaneously the extremes of wealth and poverty.

In the Green New Deal, human actors and actants are positioned at the poles of economic power. There are “the top 1 percent of earners” who benefited from 91% of the economic recovery gains after the 2008 Great Recession and are mentioned only once in the document. Also with key roles in the Green New Deal are farmers, ranchers, businesses, and academics. The rest of the resolution attends closely to workers, families, and communities: the average White family, the average Black family, women, men, Indigenous peoples, communities of color, migrant communities, deindustrialized communities, depopulated rural communities, the poor, low-income workers, the elderly, the unhoused, people with disabilities, and youth. These groups together are named in the document as frontline and vulnerable communities.

The first two whereas statements of the resolution, making up the first two pages of the document, outline the stakes of the climate crisis, including sea level rise and extreme weather events that will eventually lead to mass migration and trillion-dollar damage to “public infrastructure.” The second statement acknowledges that while climate change is a global problem, the United States is among the nations causing the most environmental harm and must be a world leader in climate action. The next three statements explain the economic justice problem that is co-constitutive of the climate crisis and the ways that both crises harm people. Climate, it states, acts as “a threat multiplier,” with consequences for the economy, national security, and “social stability.”

We then see intertextuality with the New Deal; the GND cites the precedent of “the Federal Government-led mobilizations during World War II and the New Deal.” As interpreted through the Green New Deal, the historical predecessor “created the greatest middle class that the United States has ever seen,” although many segments of the population “were excluded from many of the economic and societal benefits of those mobilizations.” The statement continues, explaining that “a new national, social, industrial, and economic mobilization on a scale not seen since World War II and the New Deal era is a historic opportunity” right the wrongs of the past that still affect most Americans now.

What follows in the nine-page resolved statement is a fully realized, future-looking discursive construction of the integrity of human actors in writing about infrastructure. Situational analysis shows that people are part of infrastructure as it is being planned, as it is being built, and as casualties when infrastructure fails. A society’s infrastructure is only as strong as its frontline and vulnerable communities. The document states five goals: 1) to achieve net zero carbon emissions; 2) to create jobs; 3) to invest in infrastructure and industry; 4) to provide everyone with clean air, water, healthy food, “climate and community resiliency,” “access to nature,” and “a sustainable environment”; 5) justice and equity for frontline and vulnerable communities. Though the New Deal saw aiding primarily White working men as the means to economic recovery and reinforcement of infrastructure, the Green New Deal suggests that the economic recovery after the 2008 Great Recession has effectively failed, with no significant mitigation of the harmful effects of climate change and no tangible economic security for frontline and vulnerable communities, or indeed for anyone else except those in the top 1 percent of net worth.

The resolution calls for “repairing and upgrading the infrastructure in the United States” and “ensuring that any infrastructure bill considered by Congress addresses climate change.” It states the need for action in multiple and overlapping sectors: power grids, the built environment, manufacturing, agriculture, transportation including “zero-emission vehicle infrastructure and manufacturing,” various projects in local communities according to needs, restoration and preservation of land and ecosystems, addressing existing lands polluted by hazardous waste, and other projects that may be identified.

It is in the description of resources that are required for implementing the Green New Deal plan that we see most clearly the human role in infrastructure. Instead of attempting to quantify amounts of materials or money needed for mass installation of rooftop solar panels or conversion of offshore oil rigs into offshore wind turbines, for instance, this section of the Green New Deal explains the importance of public ownership of projects, and collaboration among people with different areas of expertise in writing technical documents about infrastructure and in the building process. It calls for the government to be accountable in project planning for “ensuring that frontline and vulnerable communities shall not be adversely affected.” It calls for high quality education and “democratic and participatory processes” for all U.S. residents. It requires that jobs are guaranteed, nondiscrimination policies are enforced, and that local workers are prioritized, and that workers may organize to advocate for better working conditions. The Green New Deal specifically mentions Indigenous peoples’ rights as part of the plan: treaties must be honored, and land rights and sovereignty must be respected. The document ends by resolving that every person must have “high quality health care” and “affordable, safe, and adequate housing.” Interestingly, there is no mention of childcare or parenting in the resolution, so again, that labor is not visible in this text about infrastructure. The discursive concept of infrastructure set forth in the text of the Green New Deal emphasizes climate and community.

CONCLUSION: IMPLICATIONS FOR COMMUNITIES & POLICYMAKERS

What is infrastructure? In our definition, infrastructure depends on the arrangement of people and nonhuman actors in a fluid relationship. Humans are always central to infrastructure, even when they are subsumed under discussion of nonhuman elements such as roads, bridges, and buildings. It is the arrangement of people and things in relationships characterized by actor networks, which, in their symmetry, do not distinguish between human and non-human actors in terms of agency that gives infrastructure meaning. What does it mean to situate humans as part of the nonhuman infrastructure? It is an attempt to make the invisible populations visible in infrastructural policy documents and to hold government policymakers accountable for not only who is included in their documents, but also who is missing. Focusing on the human aspect of infrastructure documents allows us to take a critical look at systemic injustice against certain groups of people.
In so doing, we must also attend to infrastructures of writing and design, which have a complicated relationship of logical priority to material infrastructures. Infrastructure that does not yet exist (broadband in rural communities) and infrastructure that is in disrepair (water systems) is envisioned, co-created, and somewhat predetermined by the language used in the written plans for it. However, the written plans that predate infrastructure building projects are themselves immersed in existing infrastructure. The narrative about infrastructure throughout these three documents, with approximately 90 years separating the New Deal and the other two plans, reflect a changing definition of infrastructure that discusses what “should be” more than “what is.” For example, we see throughout recent U.S. history the rise of suburbs, housing discrimination, and redlining that persists to this day despite grand plans to distribute wealth and opportunity more equitably.

In our comparative situational analysis diagram, shown in Figure 4, there are some actors/actants that all documents address, such as workers, farmers, the unemployed, children, human resources, industry, and railroads. These concepts (because at this comparative level of discourse analysis, it makes more sense to speak in terms of words having more than one referential definition over time than the simple actor/actant) have remained important to U.S. infrastructural policy documents over a period of almost 100 years, reappearing. However, there are several concepts that we find are outliers, for example the concept of international cooperation, which is present in the New Deal and Green New Deal documents but is conspicuously absent from the American Jobs Plan. This lack could signal a turn toward isolationism on the world stage – even during what was considered a patently isolationist era during the interwar period, the New Deal considers international cooperation part of the plan. In addition, it is only the New Deal and American Jobs Plan that have Civilian Corps and veterans in common, both signifying organized bodies of citizens meant to serve the country through domestic or military service. The New Deal is also the sole document concerned with military armaments, as the country was just recovering from WWI. Why were these concepts not included in the Green New Deal text, and how did this affect its reception? Finally, we see a number of concepts common to the American Jobs Plan and the Green New Deal that, as discussed earlier in our individual document analysis, speak to certain populations such as women, BIPOC, disabled, and elderly groups that do not appear at all in the New Deal document. We take this as a positive sign that such groups are acknowledged in the more modern policy documents; however, there is still a persistent focus in all three documents on the economic value of human life and a distinction between those who are perceived as contributing to the economy, such as homeowners, workers, and farmers, and those who are perceived as not valuable, such as the unhoused, migrants, low-income communities, and disadvantaged communities.

Implications for Communities

The concept of frontline workers has existed even since the time of the New Deal, from soldiers sent to the front in the trenches of WWI to farmers and industrial workers struggling to make a living after the Great Depression. The American Jobs Plan frames the concept of frontline workers in the context of the COVID-19 pandemic as those who are most vulnerable to infection and death: medical staff, teachers, grocery store employees, care workers (including mothers at home), gig workers, and other service sector workers who interact with the public in-person. The Green New Deal, however, explicitly states that “frontline and vulnerable communities” are “indigenous peoples, communities of color, migrant communities, deindustrialized communities, depopulated rural communities, the poor, low-income workers, women, the elderly, the unhoused, people with disabilities, and youth.” So, the American Jobs Plan at least acknowledges that these types of service sector workers (who are also predominantly POC) merit government support but stops short of naming the root cause of their vulnerable status by instead linking their worth (and risk) to their job function in the U.S. economy.

Situational analysis reveals not only what is said in a document, but also what is overlooked, as is shown in Figure 4. Specifically, workers who participate in the gig economy, a growing sector of labor in the United States, act as independent contractors for large companies and, therefore, do not receive the benefits of full employment, including access to reduced cost healthcare, disability pay and time off, and the ability to build savings through 401k plans. However, during the COVID-19 pandemic, gig workers stepped in to fill the gap when mass transportation was not safe (through ride services like Uber and Lyft), when grocery shopping in-person was not safe (through food delivery services like Instacart and GrubHub), and when workers who could afford to stay home, did, an army of temporary service workers filled employment gaps. The most dangerous jobs in the sense of exposure to COVID-19 were filled by those who could least afford to get sick and were least protected by the companies that employed them. And neither the New Deal nor the American Jobs Plan tackle the shadow economy made up of migrant workers who are even more vulnerable than gig workers who can legally work in the United States. It is only the Green New Deal that notes migrants’ presence as a frontline and vulnerable community, whose numbers are likely to grow as climate change makes migration the last resort for many.

So much investment has gone into extractive industries such as oil and gas mining that also pollute and exacerbate climate change, to the detriment of investment in low-carbon jobs such as care work,
the concentration of wealth. Only the Green New Deal explicitly recognizes this link. Though a shift to investing in sustainable energy sources is key to breaking this cycle of environmental pollution, it does not change this concentration of wealth in the hands of energy industries—it is also imperative to invest in the very people who make our lives livable through the service economy. For there is no environment that is sustainable without the care work that individuals do on a daily basis, which is in this economy undervalued and underpaid.

In practice, we blame others for the destruction of an externalized environment, especially those who have the least say in how it is managed—the economically disadvantaged lower classes. When individuals are asked to “save the environment” by recycling their garbage, they are given the responsibility to clean up the waste that corporations produce in the form of packaging developed for marketing purposes. However, this wasteful and oftentimes non-biodegradable packaging is not regulated by the government to lessen its effect on the environment, and corporate interests have no reason to change the packaging if it increases profit. The individual consumer is handed the responsibility and the blame for purchasing this product. Similarly, theories that blame human population growth on the deteriorating environment and mass extinction of other species mark humans as a type of vermin, needing control and even extermination, especially in terms of “outsiders” such as migrants and asylum-seekers. What is not discussed in this cycle of blame is how governments plan to move forward and take responsible action to manage the human and nonhuman environment in socially just ways. Much political energy of governments is spent avoiding responsibility for the management of both human and nonhuman resources, which instead transfer the blame and responsibility for confronting environmental and social problems to frontline and vulnerable populations.

**Implications for Policymakers**

How might a shift in meaning of infrastructure to intentionally include humans, making visible what was invisible, help us address a world of ever-increasing complexity, entanglement, and precarity? We’ve always redefined infrastructure. We’re limited by where we are in history. If we promote environmental sustainability and justice with major construction and manufacturing investment (in supposedly green technologies) that we hope will stimulate the economy and improve living conditions for vulnerable communities, this makes sense only if those goals carry through how the contracts are granted and carried out. It is just as likely that such investment and the financial gains for the shift to sustainable energy will be limited to a select group of wealthy individuals who maintain the status quo. As something of a compromise version of the Green New Deal, the American Jobs Plan takes on the mantle of investing in green infrastructure, but does not completely tackle the problem of social sustainability that underlies the dilemma of “frontline” communities. Looking at the language used by policymakers in the three documents to describe the people who will be most affected by their respective infrastructure plans, it is obvious that while their policies are well-intentioned, people are primarily identified by their labor potential and economic worth, which is problematic at best.

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