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Expanding the Boundaries of Digital Inclusion: Perspectives From Network Peripheries and Non-Adopters

Edited by Rob McMahon, Nadezda Nazarova, and Laura Robinson

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Editorial

Expanding the Boundaries of Digital Inclusion: Perspectives From Network Peripheries and Non-Adopters

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Abstract
In this thematic issue, we present research from authors who seek to contest, challenge, and reimagine what digital inclusion is and what it might be. Authors present work from understudied vantage points and "hard to reach" terrains, such as communities that remain geographically, technically, socially, economically, and metaphorically "disconnected"—sometimes by choice. Through their attention to the role of intangible factors like relationality, social capital, emotion, sovereignty, and liminality, the articles collectively push against and expand the boundaries of digital inclusion research and practice.

Keywords
broadband access; digital divides; digital equity; digital inclusion; digital inequalities; network society; technology adoption

Issue
This editorial is part of the issue "Expanding the Boundaries of Digital Inclusion: Perspectives From Network Peripheries and Non-Adopters" edited by Rob McMahon (University of Alberta), Nadezda Nazarova (Nord University Business School), and Laura Robinson (Santa Clara University).

1. Introduction

Research in the growing field of digital inclusion has evolved from questions of access, adoption, skills, and use to consider broad issues of social inclusion/exclusion (e.g., Asmar et al., 2022; Carmi & Yates, 2020; Gallardo et al., 2021; Park, 2017; van Dijk, 2020). Researchers have examined how the design, deployment, and adoption of digital technologies threaten to perpetuate existing hierarchies and introduce new forms of marginalization in areas such as class, race, gender, age, and (dis)ability, among others (e.g., Dutta, 2020; Robinson et al., 2020; van Deursen & van Dijk, 2013). Scholars are also identifying how intersectional analysis lends itself to a more fulsome consideration of these issues beyond the limitations of a "one-size fits all" model of digital inclusion (Goggin & Soldatić, 2022; Moran & Bui, 2019; Tsatsou, 2021). As Reisdorf and Rheinsmith (2020) point out, digital inclusion is also shifting from a focus on deficits—that is, on digital divides and inequalities—to strengths-based initiatives working to ameliorate those challenges through the active efforts of individuals, groups, and communities (see also Gurstein, 2012; Reina-Rozo, 2019). Concepts such as digital capital (Ragnedda et al., 2020), network sovereignty (Duarte, 2017), digital disengagement (Kuntsman & Miyake, 2022), digital colonialism (Couldry & Mejias, 2019), and adverse digital incorporation (Heeks, 2022) tease out how actors resist and challenge inequalities that emerge alongside the widespread adoption and use of digital services and infrastructures. Recent work also encompasses a geographic and institutional shift from traditional foci of formal organizations based in the Global North to an orientation that pays close attention to culturally and locally specific interventions taking place around the world (David, 2003; Elers et al., 2022).

Collectively, these developments point to tensions in ontological understandings of a singular, globalizing network society. Logics embedded in infrastructural design have tended to presume a development process that extends out from centers of power to more peripheral areas that are drawn into the dominant system. Critical scholars surface the ways these logics are reflected in discourses, practices, and policies of digital inclusion that seek to integrate marginalized individuals, groups, and territories without attending to their autonomy—or to the unequal social relations too often encoded in technical form and function. For example, Starosielski (2015, pp. 10–11) argues in her study of the undersea cable network that "centralizing forces continue to permeate and underpin the extension of [global] networks," while at the same time surfacing the "conflicts, contestations, and negotiations that shape [these] systems on the ground" (p. 82). Emerging research and practice is also countering the tendency to focus on those individuals and groups who *want* to be included—a position that might assume that everyone desires ubiquitous connectivity. Yet around the world, non-adopters resist when presented with opportunities to connect. These observations draw attention to the ways that people and communities located at the nodes of globalizing networks push back against the totalizing forces of certain forms of digital inclusion.

2. Reflections on the Contributions

In this thematic issue, we present research from authors who seek to contest, challenge, and reimagine what digital inclusion is and what it might be. Authors present work from understudied vantage points and "hard to reach" terrains, such as communities that remain geographically, technically, socially, economically, and metaphorically "disconnected"—sometimes by choice. Through their attention to the role of intangible factors like relationality, social capital, emotion, sovereignty, and liminality, the articles collectively push against and expand the boundaries of digital inclusion research and practice.

Geographically, the issue draws on perspectives from the Global South—as reflected in articles from Uganda (Gallagher et al., 2023), India (Bhatia-Kalluri & Caraway, 2023), and Chile (Pavez et al., 2023)—as well as from Indigenous nations in the "Fourth World" (Manuel & Posluns, 2018) contending with the ongoing impacts of settler colonialism in territories now known as Canada (Toso & Forward, 2023) and the US (McMahon et al., 2023). These contributions include an international comparison of digital inclusion in global digital peripheries. A second set of articles focuses on perspectives from socially marginalized groups located in the Global North, contributing to intersectional analyses of factors such as (dis)ability (Mogendorff, 2023) and age (Schuster & Cotten, 2023; van Leeuwen et al., 2023). The issue closes with a provocative piece focusing on how conspiracy theories associated with 5G mobile networks shape popular perceptions of the limits of digital inclusion (Sharp, 2023).

3. Overview of the Articles

The issue begins with a comparative study of 76 countries conducted by Füzér et al. (2023) that examines how macro-level patterns of digitalization and social capital articulate in clusters of digitized, digitalizing, and low-adopter societies. After building composite indicators for the social embeddedness of digitalization, the authors examine digitally-mediated aspects of social interaction as reflected in differences among trust, norms, ties, and connections. They conclude that digital inclusion initiatives must consider the intertwined goals of universal access and strengthening social capital, which are shaped through context-specific social and institutional conditions.

An analysis of social capital's impacts on digital inclusion is also presented by van Leeuwen et al. (2023), who adopt a Bourdieusian analytical framework to examine how diverse older adults in Belgium negotiate their aging experiences in digital contexts. Through qualitative interviews with 76 participants who range from 65 to 91 years old, the authors discuss the characteristics of avid users, users, and non-users of digital technologies. Their findings highlight the importance of personal context, the complexity of "age" as an explanatory indicator, and the role of digital support networks. Alongside evidence of heterogeneous use of digital technologies among this population, their conceptual framework helps explain the nuances of how older adults engage with digital inclusion.

Applying life course and aging theoretical perspectives, Schuster and Cotten (2023) similarly investigates how older adults interact with digital ICTs. Drawing on three national US datasets from 2017 to 2021, this quantitative study examines aspects of digital inclusion across different life course stages (e.g., 65–74 years; 75–84 years; 85+ years). While a constant connection may be normative for younger age groups, this is not necessarily the case for older adults. Older adults may reflect similar broad trends of ownership and use, but their frequency and purposes of use are nuanced across life course stages. As individuals age, they may retreat from constant connection and their reasons for using ICTs may change; however, they still desire support for digital inclusion such as affordable access to devices and Internet connectivity, training, and technical support. The article concludes with a discussion of how the social construction of digital inclusion shifts according to differing life course stages.

A life course analytical framework is also employed by Mogendorff (2023) in a commentary on the digital inclusion of disabled people in the Netherlands. Based on the author's personal and professional experiences with disability research and user-led empowerment projects (e.g., Aging With a Disability), Mogendorff

argues that digital inclusion initiatives should consider a life course intersectional approach, together with the early involvement of disabled people in technology and product development.

Alongside social capital and life course perspectives, Pavez et al. (2023) propose that researchers consider adopting the "ethics of care" to examine the role of emotions like frustration, powerlessness, and empathy in digital inclusion initiatives. Based on findings from 71 interviews with members of vulnerable communities located in 16 rural and urban communities across Chile, they suggest that emotions play an important role in driving the dynamics and interactions shaping technological appropriation. Marginalized groups located in tightly knit communities with differing levels of online access and digital literacy express strong examples of formal and informal leadership in organizing, helping, and teaching others. These activities contribute to forms of digital inclusion that decrease feelings of powerlessness and strengthen trusting relationships.

This observation is reflected in McMahon et al. (2023), who discuss how a Kānaka Maoli (Native Hawai'ian) political organization presents digital inclusion as a means to generate a "sovereignty mindset" for Indigenous peoples on Oahu. Members of the Nation of Hawai'i describe how the collective deployment of a local community network connecting their land base in Pu'uhonua o Waimānalo provides a means to practice values of independence, control, and autonomy that are tied to restoring *ea*, "the breath and sovereignty of the *lāhui* [assembly], *'āina* [land], and its people" (Aikau & Gonzalez, 2019, p. 2). Data drawn from surveys, interviews, and a focus group held in the community illustrate how the goals of practicing *ea* and *kuleana* (responsibility) intersect with broadband development work, despite ongoing challenges to the technical and economic sustainability of network infrastructure.

Another example of intersections between infrastructure, sovereignty, and settler colonialism is expressed by Toso and Foward's (2023) documentation of analogue and digital communications networks in the region of Eeyou Istchee in Canada. Presenting a series of dispatches about the James Bay Cree Communications Society and the Eeyou Communication Network, the authors "seek to represent the many complex layers of infrastructure, policy, social and political histories, and relationships, as well as the culture and ecologies in which these networks were conceived and developed" (p. 298). Anchoring their argument in the concept of spectrum sovereignty, they argue that Cree control of radio spectrum is both a resource for the "continuation of traditional lifeways" and a means to resist the "challenges posed by settler-colonial policies, extractive colonialism, climate change, and a threatened language and culture'' (p. 306).

Digital inclusion is also actively shaped and managed by individuals and groups based in unsettled and temporarily constructed environments. In their discussion of "Bidi Bidi creativity" among refugee students in Ugandan universities, Gallagher et al. (2023) advance the concept of liminality as a means to examine how practices of digital inclusion are intertwined with systems of control and marginalization. They suggest that "particularly for refugees, inclusion is further characterized by a persistent liminality with its attendant experiences of transition and tentativeness" (p. 309). More nuanced conceptualisations of digital inclusion rooted in liminal experiences are needed to anchor the adoption and use of digital technologies in refugee communities.

Social and economic inequities are also present in the rapidly expanding fintech industry in India, as discussed in Bhatia-Kalluri and Caraway's (2023) case study of the mobile e-commerce platform Paytm. On one hand, the platform enables reduced transaction costs and more accessible digital payment options for marginalized populations. Yet these benefits of inclusion must be weighed against the coercive effects of demonetization that benefit platform owners rather than everyday people. As India transitions to a digital payments ecosystem, the authors argue for stricter state policies to ensure that consumers' interests are served.

The issue concludes with Sharp's (2023) exploration of resistance to 5G mobile infrastructure. Applying an interpretative framework inspired by Cervantes' comic masterwork *Don Quixote*, Sharp draws on studies of mis- and disinformation, literary criticism, and media theory to demonstrate how hostility toward 5G is a transnational phenomenon with deep historical roots. Following social media rumours linking 5G to Covid-19, news media in Europe and North America reported multiple attempts by actors to damage infrastructure. By "tilting at 5G towers," these actions illustrate the symbolic role of infrastructure as a site of social confrontation. While stopping far short of legitimizing the mis- and disinformation that drove this interference with infrastructure, Sharp uses these examples to argue that corporate narratives of 5G as a means to expand the horizons of mobile connectivity can obscure the conflicting imperatives of exclusion and inclusion underscoring the privatized deployment of mobile infrastructure. He cautions that, when left unexamined, infrastructural transition may serve to exclude public participation and treat the novelty of a technical standard as a commodity unto itself.

4. Conclusion

Taken together, the 10 articles presented in this thematic issue provide insight into how experiences, values, and perspectives from network peripheries and non-adopters may guide digital initiatives in more socially-inclusive directions. As digital inclusion research and practice continues to evolve, these contributions offer ways to conceptualize the active, context-specific, and intangible factors and processes shaping emergent digital networks as mediating forces in relations of social inclusion.

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Conflict of Interests

The authors declare no conflict of interests.

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Rob McMahon is an associate professor in media and technology studies and political science at the University of Alberta, Canada. His research focuses on the development, adoption, and use of broadband and internet technologies by rural, Northern, and Indigenous communities. He and his partners are also involved in efforts to contribute to digital policy and regulation, and he co-founded the First Mile Connectivity Consortium (http://firstmile.ca), a national nonprofit association of Indigenous technology organizations.

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Article

Global Digital Peripheries: The Social Capital Profile of Low-Adopter Countries

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Abstract
As digital transformations have the potential to reinforce longstanding inequalities and create novel ones within and among societies, it is vital to understand how this process is socially embedded. This article contributes to the study of macro-level patterns of cross-country differences in digitalization by providing a global comparative analysis of 76 countries in three different clusters, with a focus on the almost 30 countries with the lowest rates of adoption. Going beyond the "access, use, outcome" perspective of the digital divide approach, this empirical analysis addresses the social embeddedness of digitalization in the framework of the three types of social capital. In contrast to the digitalized and the digitalizing country clusters, the findings on the social capital profile of low-adopter societies reveal their consistently low status on bridging and linking social capital, as well as their strengths in the trust and ties dimensions of bonding social capital. These results have alarming implications for digital inclusion in low-adopter societies.

Keywords
bonding social capital; bridging social capital; cross-country analysis; digital divide; digital transformation; linking social capital; low-adopter; social embeddedness; trust

Issue
This article is part of the issue "Expanding the Boundaries of Digital Inclusion: Perspectives From Network Peripheries and Non-Adopters" edited by Rob McMahon (University of Alberta), Nadezda Nazarova (Nord University Business School), and Laura Robinson (Santa Clara University).

1. Introduction

Digitalization is gradually transforming societies around the globe: The widespread diffusion of digital technologies has turned the digital transformation into a pressure point in a broad spectrum of everyday activities, from Industry 4.0 to public services, healthcare, schools, entertainment, and family life. Currently, all major international cooperation organizations and development agencies have priority actions in place to advise their stakeholders on how to reap the benefits and avoid the pitfalls of digitalization, including the United Nations (2020, 2023), the United Nations Development Programme (UNDP, 2021), the International Telecommunications Union (ITU, 2022a), the World Bank (2021), OECD (2020), the World Economic Forum (2023a), the European Commission (2021), and the BRICS (Brazil, Russia, India, China, and South Africa; see International Trade Centre, 2022). Their policy efforts extend to collecting and sharing global metrics on digital transformations: The ITU (2022b, 2023) has devised a digital development dashboard; OECD (2022) has published the *Going Digital Integrated Policy Framework*; the European Commission launched the Digital Economy and Society Index, followed by the International Digital Economy and Society Index (European Commission & Tech4i2, 2020); the World Bank (2016) set up the Digital Adoption Index; the UNDP (2023) offers its clients a digital readiness assessment tool; and the World Economic Forum (2023b) works with

its stakeholders in the framework of its digital transformation initiative.

Global-scale evidence made available by these organizations provides valuable macro-level insight into the technology-diffusion aspects of digitalization but largely falls short of grasping how digitalization transforms societies in more complex ways. Moreover, the focus of evidence-based policy-making has been chiefly on core economies, as they have experienced both digital disruption and digital dividends most powerfully. The ongoing digital transformation of societies on the peripheries, therefore, remains understudied. The same holds for conventional approaches in the academic literature on cross-country analyses of the digital divides. Most macro-level comparative research on the access to, use of, and benefits of digital affordances has sought to identify the economic, social, cultural, institutional, and regulatory predictors of technology diffusion. Focusing on core countries and policy implications, these studies have found that wealth, income, education, urbanization, trust, and the institutional environment are the main drivers of this process (Ayanso et al., 2010; Billon et al., 2009; Billon et al., 2010, 2016; Chinn & Fairlie, 2010; Corrocher & Ordanini, 2002; Cruz-Jesus et al., 2012, 2018; Cruz-Jesus, Oliveira, et al., 2016; Cryz-Jesus, Vicente, et al., 2016; Doong & Ho, 2012; Kraemer et al., 2005; Mardikyan et al., 2015; Skaletsky et al., 2016; Pick & Nishida, 2015; Serrano-Cinca et al., 2018; Zhang, 2013).

As a counterpart to analyses centered on technology and public policy, another segment of academic literature on the digital divide has offered a wealth of perspectives and empirical evidence on the social embeddedness of digitalization. For more than a quarter of a century (since Irving et al., 1995), scholars have studied the paradoxical potential of digital transformations to either reinforce or mitigate existing inequalities within and among societies. Besides investigating the aspect of access to transformative digital technologies, these studies have covered both the benefits and risks of various modalities of technology use (Chen & Wellman, 2004; Cotter & Reisdorf, 2020; Hargittai, 2002; Loh & Chib, 2021; Lutz, 2019; Ragnedda, 2017; van Deursen & Helsper, 2015; van Deursen & van Dijk, 2015, 2019; van Dijk, 2020), as well as the associated prospects for digital inclusion (Ragnedda, 2020; Robinson, Schulz, Blank, et al., 2020; Robinson, Schulz, Dodel, et al., 2020; Robinson, Schulz, Dunn, et al., 2020; van Dijk, 2020). A number of scholars in the digital divide literature who seek to capture digitalization as a complex process of social transformation do so by drawing on the theory of social capital. Some of these studies have focused on how the key dimensions in social capital research, i.e. networks, trust, and cooperative interactions (Dasgupta & Serageldin, 1999; Fukuyama, 1995, 1999; Portes, 2000; Putnam, 2000; Putnam et al., 1993) are related to the access, use, and benefits aspects of digital activities (Antoci et al., 2011; Chen, 2013; DiMaggio et al., 2004; Neves, 2013, 2015; Nguyen et al., 2021; Pénard & Poussing, 2010; Rainie & Wellman, 2012; Robinson et al., 2015; Sabatini & Sarracino, 2014). Others have investigated how these basic dimensions relate to digital capital, conceptualized as an additional form of capital, thereby broadening Pierre Bourdieu's scheme of economic, cultural and social capital (Calderon Gomez, 2021; Park, 2017; Ragnedda, 2018; Ragnedda & Ruiu, 2020; Ragnedda, Addeo, et al., 2022; Ragnedda et al., 2019; Ragnedda, Ruiu, et al., 2022; Ruiu & Ragnedda, 2020). Part of this scholarship has found not only an empirical but also a strong conceptual association between social capital and digital practices, resulting in a growing literature on how social capital has absorbed the digital dimension (DiMaggio et al., 2001; Hargittai & Hsieh, 2013; Nguyen et al., 2021; Ragnedda & Ruiu, 2017; Wellman & Haythornthwaite, 2002). Our study builds on these efforts by providing an analysis of the macro-level social embeddedness of digitalization in the framework of the three types of social capital, in order to highlight how various technological and digital affordances combine with bonding, bridging, and linking social ties and interactions.

The delineation of three distinct types of social capital was already introduced around the turn of the millennium (Field, 2003; Fukuyama, 1999; Halpern, 2005; Putnam, 2000; Woolcock, 1998, 2001, 2010, 2021) to overcome an excessively compact version of social capital (Portes, 2000), operationalized either by social networks alone, solely as a matter of trust patterns, or merely in terms of cooperative norms. The theory of the three types of social capital rests on the insight that the various types of trust, the diversity in norms of cooperation, and the many kinds of social networks are intertwined into analytically distinct social phenomena. Our analysis is based on the understanding that there is not only conceptual room but an increasing need as well for adding the dimension of technology use to all three types of social capital.

Bonding social capital rests on narrow-radius interpersonal trust among social actors who are in frequent face-to-face (potentially technology-mediated) contact, where cooperation is regulated by demanding norms of loyalty or altruism in social networks involving family, kin, or friends. Examples of bonding interactions would be family members supporting each other emotionally via voice/video calls, or elderly care provided by family members with the assistance of smartwatch communication and health apps. Bridging social capital is predicated upon less intensive, broad-radius, generalized interpersonal trust among actors who interact in formally or informally regulated social settings, such as schools, civil organizations, neighborhoods, or start-ups, where interactions occur ever more frequently online. Examples of bridging interactions would be social media-assisted crowdfunding for product innovation by a start-up, or practical support received on online self-help discussion forums. Linking social capital requires institutional trust

among actors in various highly regulated, large-scale institutional settings, such as public transportation, banking, the judicial system, representative political institutions, or multinational corporations, where actors differ greatly in terms of their power and level of expertise vis-à-vis institutional processes, but typically use the same digital platforms. An everyday example of linking interactions would be claiming a refund for a product purchased on an e-commerce platform.

The aim of this empirical investigation is to provide a global-scope analysis of macro-level bonding, bridging and linking social capital. Such a perspective allows us to focus on the global peripheries, which are often understudied in the literature on both digitalization and social capital. We are thus contributing to a distinct line of social capital scholarship that investigates macro-level social capital by using country- (or regional-) level data as proxies (Dulal et al., 2011; Halpern, 2005, pp. 13–19, 26–27, 65–71) for studying macro-level phenomena, such as national (or regional) democracy and public policy (Putnam, 2000; Putnam et al., 1993; Szreter & Woolcock, 2004), economic prosperity (Fukuyama, 1995; Füzér et al., 2020), development programs (Woolcock, 1998, 2001, 2010; Woolcock & Narayan, 2000), or innovation ecosystems (Doh & Acs, 2010). To account for the multidimensional character of social capital, several scholars have constructed comprehensive measures for cross-country analysis based on various techniques (Christoforou, 2011; Lee et al., 2017; Sarracino & Mikucka, 2017; van Oorschot et al., 2006). However, a metric that systematically recognizes the dimensions of trust, norms and networks and also incorporates the aspect of technology use in all three types of social capital is missing.

2. Research Questions and Methods

Three research questions follow from our exploratory research agenda:

> RQ1: What do the social capital-based digital profiles of countries around the world look like? To what extent can countries rely on bonding, bridging, and linking social capital?
>
> RQ2: Can we identify typical groups in terms of countries' social capital-based digital profiles?
>
> RQ3: In what ways is the social embeddedness of digitalization in the digital peripheries different from the digitalized core?

We apply the method of building composite indicators for the three types of social capital, following a standard procedure (OECD, 2008) and using a wide array of global datasets, all curated and made accessible online by international organizations as recognized data stewards. The pillars of our social capital indexes (SCIs) capture the three dimensions of trust and norms, ties, and connections, and the technology-mediated aspects of social interaction. Our three composite indicators reflect the intensity of bonding, bridging, and linking social capital available in all societies, while at the same time drawing their respective profiles. The guiding principles in selecting our proxy variables for each of the three dimensions of social capital were the following: The interpretation and categorization of the applied indicators should be as clear as possible and rest on precedents in the literature; the data should be as globally comprehensive as possible; the number of cases should be as high as possible; and the basic variables should correlate as much as possible within the subset of each pillar. The logic of index-building is summarized in Table 1, while a list of all variables used for the pillars of the three SCIs, their description, and the links to the data steward organizations are listed in Tables 1–3 of Supplementary File 1.

The variables for bonding social capital were selected to reflect the significance of strong ties, especially those of marriage and family. The average singulate age at marriage and the crude divorce rate indicate global differences in the significance of marriage, a prime vehicle of particular interpersonal trust, and the norm of loyalty (Brinig, 2011; Fukuyama, 1999, pp. 43–45, 108–110; Miladinov, 2022; Prandini, 2014). The capacity of family in providing immediate bonding social ties is assessed by the total fertility rate and household size (Fukuyama, 1999, pp. 45–46, 110–113; Halpern, 2005, p. 224). In addition, it is also measured by a negative indicator, namely the adolescent birth rate, which denotes the dysfunctional emergence of parent-child relations (Denner et al., 2001; Gold et al., 2002; Gyan et al., 2017). To approximate one aspect of financial responsibility within the family, we use data for personal remittances, as these denote strong bonding social connections among family and kin in a globalized context (Böröcz, 2014; Eckstein, 2006; Wu et al., 2023). One of the technologies that is of prime importance in managing bonding social ties is voice calling via telephone, which we measure by means of two variables indicating the type of device available to households (fixed lines, mobile phones), and one for the total population (cellphone subscription rate), both reflecting crucial elements in the access dimension of the digital divide in the context of bonding ties (Chan, 2015; Gubernskaya & Treas, 2016; Shema & Garcia-Murillo, 2020).

In the case of bridging social capital, the variables for the trust, norms, ties, and connections pillars were selected according to standard research practice. The measurement of generalized interpersonal trust, on the one hand, has its own history and associated inertia, making it indispensable for the trust and norms pillar of bridging social capital (Bauer & Freitag, 2018; Freitag & Traunmüller, 2009; Lundmark et al., 2015; Uslaner, 2012). Spontaneous sociability, on the other hand, manifests itself in active participation in various social settings, prominent among which are civil society (Dulal et al.,

Table 1. The logic of index-building.

Index	Pillar	Description
Bonding	Trust and norms	Narrow radius of interpersonal trust Bonding ties typically rest on mutual loyalty
	Ties and connections	The primary setting of social interaction are partnerships, family and kinship ties, and friendships (strong ties)
	Devices and technology	Information and communication technology (ICT) and devices assist in managing the needs and responsibilities arising from bonding social ties
Bridging	Trust and norms	Broad radius of interpersonal trust and spontaneous sociability Bridging ties typically rest on civility, honesty and trustworthiness
	Ties and connections	The primary setting of social interaction is the professional, educational and civil life (weak ties)
	Devices and technology	ICT and technological devices assist in managing the tasks and opportunities arising from bridging social ties
Linking	Trust and norms	Institutional trust and institutionalized interpersonal trust Linking ties rest on expertise, (self)-competence and integrity
	Ties and connections	Social interaction is framed by various highly institutionalized settings (institutional ties)
	Devices and technology	ICT and technological devices assist in managing the institutional interactions of lay actors and experts with varying degrees of power and types of expertise

2011; Putnam, 2000; Putnam et al., 1993), learning environments and social media, the latter reflecting the use dimension of the digital divide in the context of bridging ties (Nieminen et al., 2007; Saukani & Ismail, 2019; Stolle & Hooghe, 2003). While the general transportation and communications infrastructure continues to be highly relevant in facilitating social interaction (Bradbury, 2006; Gray et al., 2006; Wellman, 1999), the crucial technology in the domain of bridging social ties nowadays is the internet. We, therefore, selected variables that depict internet availability to households and individuals, capturing a vital element in the access dimension of the digital divide (Alessandrini, 2006; Wellman & Haythornthwaite, 2002).

The large-scale institutional settings that frame the interactions of linking social capital are also well-established in research practice, both in terms of confidence in institutions and participation in institutional processes (Dulal et al., 2011; Huff & Kelley, 2003; Tsai et al., 2011; Wang & Gordon, 2011). Besides variables of confidence and participation in comprehensive institutions, we also selected survey items covering the processes of linking social interactions. The perceptions of the effectiveness and fairness of institutional processes (e.g., corruption, rule of law, law enforcement) feed into confidence and participation, thereby creating positive or negative reinforcement mechanisms (Rothstein, 2003; Rothstein & Stolle, 2008). The primary technology supporting interaction among actors linked by large-scale institutional settings are internet platforms that create new opportunities to connect (as in e-commerce; see Doh & Acs, 2010; Sussan & Acs, 2017). These platforms can also boost conventional forms of transactions and interactions, such as e-public participation (Naranjo-Zolotov et al., 2019) or e-learning environments (Lu et al., 2013), and thus capture constitutive elements of the outcome dimension of the digital divide in the context of institutional ties.

Our datasets allowed us to calculate the pillar and index scores of 32 indicators for a total of 76 countries worldwide, using the standard composite indicator technique (OECD, 2008) and the calculation methodology advanced by Acs et al. (2014). The World Value Survey data proved to be the bottleneck in country selection: There are several countries where the rate of missing data is high—25% for Belarus and Qatar, 19% for Iran, Libya, and Uzbekistan, and 16% in the case of Iraq, Korea, and Kuwait. Consequently, the results should be viewed with caution for the eight countries in question.

First, the 32 selected indicators were normalized by means of the standard min-max methodology:

$$\mathrm{Ind(norm)}_{i,j} = \frac{\mathrm{Ind}_{i,j} - \min \mathrm{Ind}_{i,j}}{\max \mathrm{Ind}_{i,j} - \min \mathrm{Ind}_{i,j}} \quad (1)$$

where $\mathrm{Ind(norm)}_{i,j}$ is the normalized indicator score value for country i, indicator j, $\min \mathrm{Ind}_{i,j}$ is the minimum value of indicator j for country i, and $\max \mathrm{Ind}_{i,j}$ is the maximum.

Second, the three indexes of social capital are made up of three pillars: trust and norms (TN), ties and connections (TC), and devices (DE); thus we calculated the scores for all nine pillars by averaging (arithmetic mean) the previously normalized indicators j belonging to each

pillar for each country *i*:

$$\text{Social Capital Index (Pillar)}_i = \\ = \text{mean}\left(\text{Ind(norm)}_{i,j}, \ldots\ldots, \text{Ind(norm)}_{i,j}\right) \quad (2)$$

For each normalized indicator, any missing data were replaced by the averages of other normalized indicators belonging to the same pillar. The different averages of the normalized values of the indicators imply that reaching the same indicator value requires different efforts and resources. However, the additional resources needed to achieve the same marginal improvement of the pillar values should be the same for all pillars. The marginal effects could differ, depending on the level of the pillar values. Country variations in the marginal effects are also possible. As calculating all the marginal effects for all countries would be a cumbersome task, we propose a simpler solution, namely to equalize the marginal effects of the components only for the average pillar values of all countries. This technique reduces but does not eliminate the distortion in calculating the marginal effects. Equation 3 shows the calculation of the average value of pillar *j*:

$$\overline{\text{pillar}_j} = \frac{\sum_{i=1}^{n} \text{pillar}_{i,j}}{n} \text{ for all } j \quad (3)$$

We want to transform the $\text{pillar}_{i,j}$ values such that the potential values will be in the [0,1] range:

$$\text{meanpillar}_{i,j} = \text{pillar}_{i,j}^{k} \quad (4)$$

where *k* is the "strength of adjustment," and the *k*-th moment of pillar_j is exactly the required average, $\overline{\text{meanpillar}_j}$

For this, we have to determine the root of the following equation for *k*:

$$\sum_{i=1}^{n} \text{pillar}_{i,j}^{k} - n \times \overline{\text{meanpillar}_j} = 0 \quad (5)$$

It is easy to see, based on previous conditions and derivatives, that the function is decreasing and convex, which means it can be quickly solved using the well-known Newton-Raphson method, with an initial guess of 0. After obtaining *k*, the computations are straightforward.

As a result, is *k* to be thought of as the strength (and direction) of adjustment.

The average marginal rate of compensation (AMRC) for any two average pillars *i* and *j* is the same:

$$\text{AMRC}_{i,j} = \frac{d\bar{y}_i}{d\bar{y}_j} \quad (6)$$

More concretely, the nine pillars of the three indexes were calculated as follows:

$$\text{Bonding(TN)}_i = \text{mean}\left(\text{Ind (norm)}_{i,1}, \ldots\ldots, \text{Ind(norm)}_{i,3}\right) \quad (7a)$$

$$\text{Bonding(TC)}_i = \text{mean}\left(\text{Ind (norm)}_{i,4}, \ldots\ldots, \text{Ind(norm)}_{i,6}\right) \quad (7b)$$

$$\text{Bonding(DE)}_i = \text{mean}\left(\text{Ind (norm)}_{i,7}, \ldots\ldots, \text{Ind(norm)}_{i,9}\right) \quad (7c)$$

$$\text{Bridging(TN)}_i = \text{mean}\left(\text{Ind (norm)}_{i,10}, \text{Ind(norm)}_{i,11}\right) \quad (7d)$$

$$\text{Bridging(TC)}_i = \text{mean}\left(\text{Ind (norm)}_{i,12}, \text{Ind(norm)}_{i,13}\right) \quad (7e)$$

$$\text{Bridging(DE)}_i = \text{mean}\left(\text{Ind (norm)}_{i,14}, \ldots\ldots, \text{Ind(norm)}_{i,18}\right) \quad (7f)$$

$$\text{Linking(TN)}_i = \text{mean}\left(\text{Ind (norm)}_{i,19}, \ldots\ldots, \text{Ind(norm)}_{i,23}\right) \quad (7g)$$

$$\text{Linking(TC)}_i = \text{mean}\left(\text{Ind (norm)}_{i,24}, \ldots\ldots, \text{Ind(norm)}_{i,29}\right) \quad (7h)$$

$$\text{Linking(TN)}_i = \text{mean}\left(\text{Ind (norm)}_{i,30}, \ldots\ldots, \text{Ind(norm)}_{i,32}\right) \quad (7i)$$

where, for example, $\text{Ind(norm)}_{i,1}$ represents the first of the 32 normalized indicators for country *i*.

Third, we normalized the nine pillar scores (7b–7j) by the distance methodology, which is based on dividing the pillar scores by their maximum value:

$$x_{i,j} = \frac{z_{i,j}}{\max z_{i,j}} \quad (8)$$

where *j* denotes the pillar of country *i*, $\max z_{i,j}$ is the maximum value for pillar *j* for country *i*, and $x_{i,j}$ is the normalized score value for a given pillar and country.

Fourth, as the different averages of the normalized pillar values imply that achieving the same pillar values requires different efforts and resources, it also causes problems in calculating the marginal improvement effects. In order to equalize the marginal effects over the nine pillars, we applied the equalization of averages technique developed by Acs et al. (2014).

Finally, we calculated the three SCI scores by using a simple arithmetic average of the previously calculated three pillars: trust and norms, ties and connections, and devices. We also transferred the range [0,1] resulting from step four to the [0,100] scale by simply multiplying it by 100:

$$\text{BONDING}_i = 100 \sum_{j=1}^{3} \frac{y_j}{3} \quad (9a)$$

$$\text{BRIDGING}_i = 100 \sum_{j=4}^{6} \frac{y_j}{3} \quad (9b)$$

$$\text{LINKING}_i = 100 \sum_{j=7}^{9} \frac{y_j}{3} \quad (9c)$$

For analytical purposes, we also calculated a composite SCI score using the geometric average of the scores of

the three SCIs:

$$SCI_i = \Pi (BONDING_i, BRIDGING_i, LINKING_i) \quad (10)$$

where SCI_i is the composite SCI score for country *i*.

The three SCIs for bonding, bridging and linking social capital provide the social capital profile of the selected 76 countries. Profiling proved to be a better way to capture social capital endowments at country level than concentrating information into a composite SCI: Statistical robustness tests revealed that this overall SCI is very sensitive to different weighting scenarios (detailed calculations are available in Supplementary File 2). The geometric average provides a conservative estimate of the overall SCI score of a particular country. Since no available theory is able to account for the compensability effects of the different pillars, utilizing the nine-pillar social capital profile of the three SCIs is more reliable than using the composite SCI score.

In order to group countries according to typical social capital profiles, we applied two alternative methods while identifying statistically distinct categories based on index scores: k-means cluster analysis (Hennig & Meila, 2015; Kassambara, 2017; Mirkin, 2015) and latent profile analysis (Williams & Kibowski, 2016).

3. Results and Discussion

As regards our first research question, we introduce our basic research results, the raw scores for the three SCIs and the index pillars for all 76 countries in Tables 1–3 in Supplementary File 3. In the course of answering our second research question, the simple *k*-means cluster analysis of the SCIs revealed that there are three distinct groups of countries in terms of social capital profile. The three groups were chosen according to the elbow method, where we calculated the total within-cluster sum of squares for cluster solutions ranging from 1 to 10, and chose the cluster number after which an additional cluster did not improve the clustering solution (Kassambara, 2017; Mirkin, 2015). This finding was also corroborated by latent profile analysis (LPA; Spurk et al., 2020; Williams & Kibowski, 2016). Compared to k-means, LPA is a soft clustering method where individuals belong to each identified group (profile) with a certain probability. Comparing LPA solutions relies on the Akaike information criterion (AIC) and Bayesian information criterion (BIC), where the model with the lowest AIC and BIC values indicates the best model. A solution with three profiles (entropy = 0.85), which qualitatively matches the *k* = 3 solution of the *k*-means approach, was found to be the most appropriate.

The cluster score means of digitalized, digitalizing and low-adopter countries are presented in Table 2, and the clusters are visualized in Figures 1 and 2.

Our third research question probes the differences in the social embeddedness of digitalization across the groups of countries. We found that out of the 76 countries in our dataset, 16 belong to the digitalized cluster, meaning they rely on a wide array of device-mediated social interactions, have strong bridging and linking ties, reinforced by high levels of generalized interpersonal trust and confidence in a broad range of institutions, and exhibit intensive participation in institutional processes (see Table 3 in Supplementary File 3). Bonding social capital does not play a significant role in digitalized countries. In sharp contrast, the 28 low-adopter countries are characterized by strong, particularized interpersonal trust, which makes them predominantly dependent on bonding ties and hardly at all on device-mediated social interactions (see Table 1 in Supplementary File 3). Low-adopter societies are exceptionally weak in all aspects of bridging and linking social capital. The 32 digitalizing countries are similar to low-adopter societies in that bonding social capital is vital to them but, at the same time, they also rely on bridging and linking social capital, albeit to a lesser degree than digitalized societies (see Table 2 in Supplementary File 3). Device-mediated social interactions play an important role in digitalizing countries but are not as vital to their workings as in digitalized countries.

Our focus on low-adopter societies reveals that their social embedding of digitalization is marked by a combination of two factors. Their modest reliance on device-mediated social interactions in all walks of life is coupled with excessive family bonds and a narrow range of social or institutional ties beyond the family.

Looking at the visualization of our results in Figure 1, a narrow focus on the technology use profile of digitalized, digitalizing and low-adopter societies would reveal differences that are seemingly a matter of degree only: Low-adopter countries have the lowest technology use capacities (their bonding device, bridging device, and linking device data points form a very small triangle), while those of digitalized countries are the highest (their data points form a very large triangle), with digitalizing countries in between. The strength of our analysis is that

Table 2. K-mean cluster average index scores.

SCIs	Digitalized	Digitalizing	Low-adopter
Bonding SCI	41.0	50.6	51.2
Bridging SCI	74.4	49.6	33.4
Linking SCI	78.2	47.9	33.1
Number of cases	16	32	28

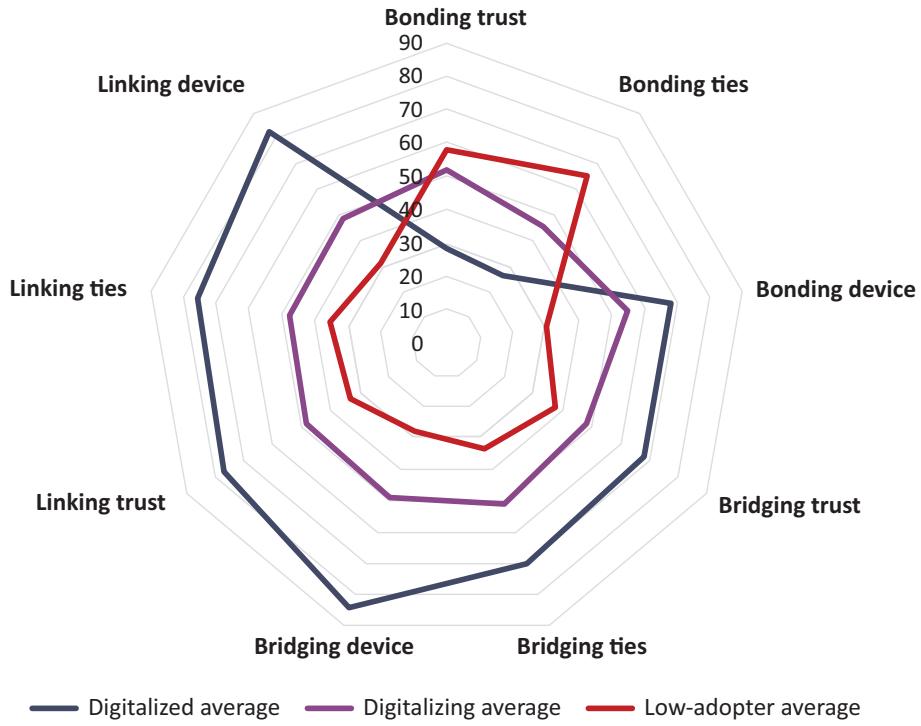

Figure 1. Profiling country clusters.

we can portray the social embeddedness of technology use by showing that the "shape" of the periphery (the low-adopter cluster) follows a very similar "matter of lesser degree" pattern concerning the social embeddedness dimensions of both bridging and linking trust and ties, but is markedly different in terms of bonding trust and ties. Low technology adoption on the digital periphery is coupled with excessively narrow social trust and

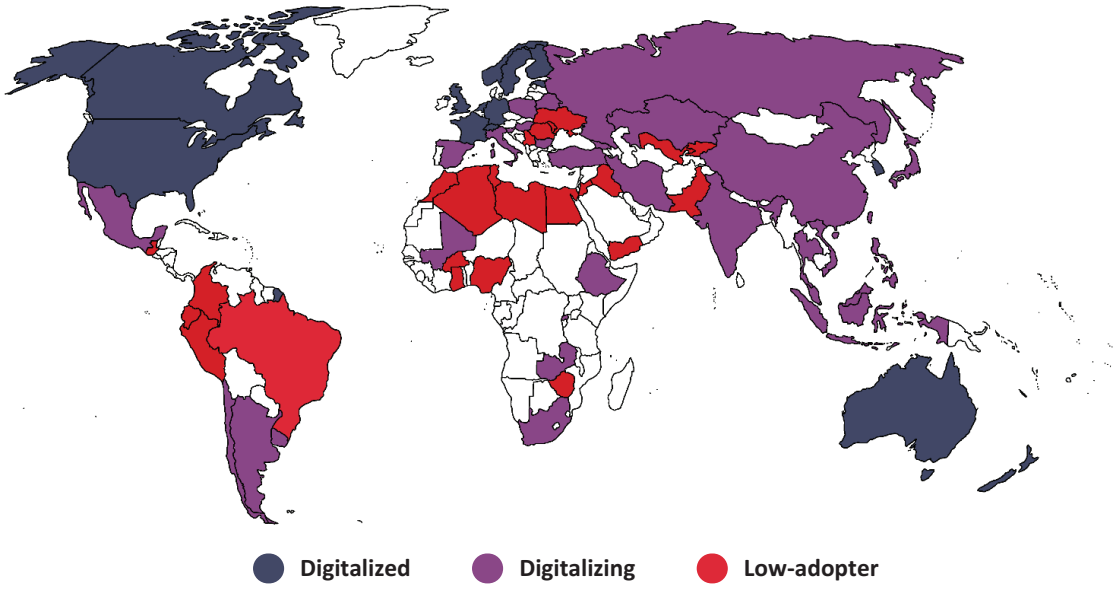

Figure 2. Country clusters on the map. Notes: DIGITALIZED countries: Australia, Canada, Estonia, Finland, France, Germany, Netherlands, New Zealand, Norway, Qatar, Singapore, South Korea, Sweden, Switzerland, United Kingdom, United States; DIGITALIZING countries: Argentina, Belarus, Bulgaria, Chile, China, Cyprus, Ethiopia, Georgia, Hungary, India, Indonesia, Iran, Italy, Japan, Kazakhstan, Kuwait, Malaysia, Mali, Mexico, Philippines, Poland, Russian Federation, Rwanda, Slovenia, South Africa, Spain, Thailand, Trinidad and Tobago, Turkey, Uruguay, Vietnam, Zambia; LOW-ADOPTER countries: Algeria, Armenia, Azerbaijan, Brazil, Burkina Faso, Colombia, Ecuador, Egypt, Ghana, Guatemala, Iraq, Jordan, Haiti, Kyrgyzstan, Lebanon, Libya, Moldova, Morocco, Nigeria, Pakistan, Peru, Romania, Serbia, Tunisia, Ukraine, Uzbekistan, Yemen, Zimbabwe.

tie patterns, a finding that, on the one hand, points to further research questions about the social conditions and consequences of technology use, and at the same time cautions against expectations rooted in technological determinism.

4. Conclusions

The three clusters of countries identified in our study, namely digitalized, digitalizing, and low-adopter, offer very different settings for bridging the digital divides and highlight the complexity of the social circumstances of technology use worldwide. This evidence-based argument on the social embeddedness of the digital transformation in the pre-Covid-19 world can enrich the reflections on policies, programs, and interventions aimed at managing the tide of digitalization triggered by the global pandemic. As such, it can act as a standard against which to measure the impact of the current, intensified phase of digitalization.

The social capital posture of low adopter societies calls into question any overly optimistic readings suggesting that the second or even the first digital divide has become obsolete worldwide. In fact, even the very access to those digital affordances that could invigorate social interactions with potential benefits is limited in vast parts of the world. At the same time, it is not simply access to technology and a fitting habitus in its use, but rather the development of a complex set of public and private institutions and practices that poses the greatest challenge to low adopter societies given their limited social and political activity and low institutional and generalized interpersonal trust. While this is something that policy interventions may be able to rectify to some extent, these countries still have to reckon with a social setting marked by overwhelmingly low levels of trust.

The social capital profile of digitalizing countries confirms that they are already in a position to reap the advantages of having access to and making use of a wide array of technologies. However, to improve their situation, they most likely have to reinforce their institutions in general, while at the same time enabling and promoting (and by no means hampering) cooperation among their citizens in settings normally not in the limelight of public policy, such as workplaces, civil society, and learning environments. As investments exclusively in technology might not suffice, these countries also need to pay attention to social embeddedness when designing digital inclusion interventions.

The social capital profiles of digitalized countries suggest that their intensive use of technologies is predicated upon a whole range of social and institutional conditions whose cultivation is not merely a matter of employing more technology but they have to sustain social and institutional processes with logics of their own, such as the reproduction of high levels of generalized interpersonal trust and institutional confidence. It is an entirely open question how the trust patterns in these countries have been affected by the Covid-19 pandemic (Delhey et al., 2021). The trust response can cut both ways: It can either reinforce or deplete confidence in expertise and the institutional processes most involved in creating measures to combat the pandemic, namely state capacities and scientific discovery feeding into technological innovation. Likewise, the pandemic has also put a strain on generalized interpersonal trust, as individual-level compliance and cooperation have been central to the success of anti-pandemic measures and continue to be vital to programs for recovery.

As opposed to academia, where attempts at blending the agendas of social capital and digital practices are already apparent, the policy world has only just begun to combine the goals of strengthening social capital and closing digital gaps in development and intervention programs (e.g., UNDP, 2023). Our study offers a framework for reflection on how closely intertwined these two aspects are and supplies empirical evidence of the structural conditions that have to be taken into account when devising targeted interventions. It is not simply technology rollout, but also the social and institutional embedding of technology use that is essential to achieving positive business, educational, health, and other outcomes (Chen, 2013; Stilinovic & Hutchinson, 2021).

As the world enters a new area of unprecedented, Covid-19-induced improvements in access to and use of digital technology worldwide, the social embedding of these processes, we argue, takes place in three very different types of social contexts. The structural factors captured by the social capital profiles of digitalized, digitalizing, and low-adopter societies are likely to shape the outcomes of digital practices performed by businesses, public and nonprofit organizations, as well as citizens more broadly. Low-adopter societies, in particular, are in a challenging situation, as the resources available to their social and institutional infrastructure have thus far not combined well with digitalization. Whether the strength of strong ties, manifest in low-adopter societies' bonding social capital assets, could invigorate a new variety of digital transformation remains to be seen. The social capital perspective promoted by this article can inform the design of inclusion policies aimed at tackling the vast digital inequality gaps exposed by the Covid-19 pandemic (Nguyen et al., 2021; Robinson, Schulz, Blank, et al., 2020; Robinson, Schulz, Dunn, et al., 2020; van Deursen, 2020).

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Conflict of Interests

The authors declare no conflict of interests.

Supplementary Material

Supplementary materials for this article are available online in the format provided by the author (unedited).

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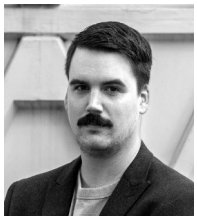

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Article

Catching the Digital Train on Time: Older Adults, Continuity, and Digital Inclusion

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Abstract
As society has become more reliant on digital technology, it has changed the perception of the ageing experience to now include a digital component. However, not every older adult perceives digital technology as essential to their way of ageing. In this article, we asked 76 older adults with different patterns of digital technology use how they experience and perceive the role of digital technology in the context of their ageing. The thematic analysis results point to a more nuanced understanding of the importance of familial support, the role of personal history or continuity in older adults' digital inclusion, and how they see the role of age in relation to digital technology. Furthermore, our findings show that ageism is both a barrier and a motivational factor for older adults. When ageism is based on the level of digital inclusion, it can cause a different ageing experience, one that is perceived as superior by those using digital technology. This leads to a precarious situation: It becomes essential to maintain digital skills to avoid the non-digital ageing experience even as it becomes more difficult to maintain their skills due to the evolution of technology. Prior to the study, we created a conceptual framework to understand ageing in a more digitalised world. We used the findings of this study to test the conceptual framework and we conclude that the framework can clarify the role (or lack) of digital technology in the ageing experience of older adults.

Keywords
ageism; continuity theory; digital inclusion; digital technology; older adults; social support; thematic analysis

Issue
This article is part of the issue "Expanding the Boundaries of Digital Inclusion: Perspectives From Network Peripheries and Non-Adopters" edited by Rob McMahon (University of Alberta), Nadezda Nazarova (Nord University Business School), and Laura Robinson (Santa Clara University).

1. Introduction

The growing reliance on digital technology means that the ability to use said technology is essential for full participation in society. However, the special expert for the UN has called for attention to the precarious position of many older adults in relation to digital technology (Mahler, 2020). Additionally, a recent study concluded that 46% of Belgians aged between 16 and 74 are at risk of digital exclusion due to a lack of progression in their digital skills (Koning Boudewijnstichting, 2022). The Koning Boudewijnstichting report designated the population aged 65 and older as especially vulnerable to digital exclusion (Faure et al., 2022). Research has theorised that digital exclusion works on four interacting levels: access, skills, usage, and outcomes (Helsper, 2021; van Dijk, 2020). Hunsaker and Hargittai (2018) found that older adult users employ unique strategies compared to those younger than them. For older non-users, research shows that they apply four strategies, which include substitution and minimal use (Dolničar et al., 2018; Gallistl et al., 2021). Although there has been significant research into the digital inclusion mechanisms surrounding older adults, there has not been a detailed examination providing a comprehensive perspective by older adults of their ageing experience within a more

digitalised society. Our research question, therefore, is: How do older adults negotiate their ageing experience in the digital context?

2. Ageing in a Digital World

Often ageing is framed as a problem for which technology can offer a solution (Peine et al., 2021; Peine & Neven, 2020). This view on both ageing and technology perceives these as two distinct areas of study, and disregards how they are entangled (Peine & Neven, 2019). Wanka and Gallistl (2018) argue the necessity of seeing age not as a biological attribute but as a process that is done via multiple agents and actors, one of which is technology. By viewing ageing as enmeshed with digital technology, older adults feel more empowered in their choice of (non-)use of digital technology. It changes the relationship from a binary dimension (use/non-use) into a more nuanced understanding of different types of use and non-use among older adults (Gallistl et al., 2021). Previous studies have shown that older users are more likely to have work experience or a prior interest in technology, and this motivates them in their continued use of various digital technologies such as the Internet (Hargittai & Dobransky, 2017; Olsson & Viscovi, 2020; Van Leeuwen et al., 2022, 2023). One theory from ageing studies that has been used to understand this phenomenon is continuity theory, which assumes that habits and views prior to retirement help determine the outlook and habits of the older adult (Atchley, 1999; Diggs, 2008). Manor and Herscovici (2021) argue that continuity should not be understood as a barrier to new habits but rather as a coping strategy that enables older people to engage with new technologies and situations in their later lives. This is confirmed by studies that have found older users as innovators of technology both in its intended form (Peine et al., 2017) and in adopting the technology for their needs and requirements (Bergschöld et al., 2020).

A non-binary approach to older adults' technology use also provides more room for understanding the role of the social network. Previous studies have shown that social support is important in the introduction of new technology to older adults (Outila & Kiuru, 2021; Peek et al., 2016). Furthermore, the children and grandchildren of (grand)parents who use(d) technology play a significant role in the continued use of digital technology (Barbosa Neves et al., 2019; Cheng et al., 2021; Courtois & Verdegem, 2016; Eynon & Helsper, 2015; Luijkx et al., 2015). However, research by Asmar et al. (2020) shows that there are different types of support needs. We assume that the support network becomes one of the actors within the ageing experience, which can have an impact on the use of digital technology. The support network's assistance can range from solving incidental issues to using the technology as a proxy-user for older adults (Asmar et al., 2020; Gallistl et al., 2021; Hunsaker et al., 2020).

Ageism has been found to be another important factor for the use of technology in later life. Neven (2010, pp. 10–11), for example, found that "even if technology could be beneficial to the health and wellbeing of elder users, elder users who feel that they are being positioned as old, lonely and frail may rightly refuse to be positioned as such and consequently refuse to use the technology." Ageism is here defined as discrimination based on age, which is externalised towards older adults in discriminatory assumptions and representations by society (Hargittai & Dobransky, 2017; Ivan & Cutler, 2021; Neven, 2010; Rosales & Fernández-Ardèvol, 2019; Schreurs et al., 2017) and internalised through a process in which older adults accept these ageist views and unintentionally replicate them in their own interactions and world view (Köttl et al., 2021; McDonough, 2016; Van Leeuwen et al., 2022). For example, during a longitudinal study of 86 Portuguese older adults, the internalising of ageist views had a detrimental effect on technology use. The study found that older adults were afraid to confirm a certain stereotype and hence decided to avoid the use of technology (Mariano et al., 2020). This avoidance of technology use due to internalised ageism was noted by Köttl et al. (2021, p. 5) "to constitute an invisible barrier to older adults' EICT engagement."

3. Methodology

This study used a qualitative research design with in-depth semi-structured interviews. The choice of qualitative methods was based on the understanding that it "attempts to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (Denzin & Lincoln, 2008, p. 4). Interviews are a traditional method of collecting qualitative data (Creswell, 2003). In this study, the interview method allows for the capture of experiences and perceptions of the ageing experience of older adults using their own words. The purpose of this study was to test a framework conceptualised by the first author as a result of previous studies (Van Leeuwen et al., 2022, 2023). This section is organised as follows: We will first discuss the conceptual framework and the various works that inspired its creation. Secondly, information about the participants is provided; finally, we will discuss the analysis process.

3.1. Conceptual Framework

The conceptual framework that guides this research is displayed in Figure 1. This framework combines theoretical concepts from the field of digital inclusion with previous studies conducted by the authors (Asmar et al., 2020, 2022; Van Leeuwen et al., 2022, 2023). We use the definition of Asmar et al. (2022) for digital exclusion, who see it as an interaction between social and digital mechanisms that lead to differences in usage and ultimately in the outcomes that might be enjoyed by an individual as the result of their (lack of) engagement with digital

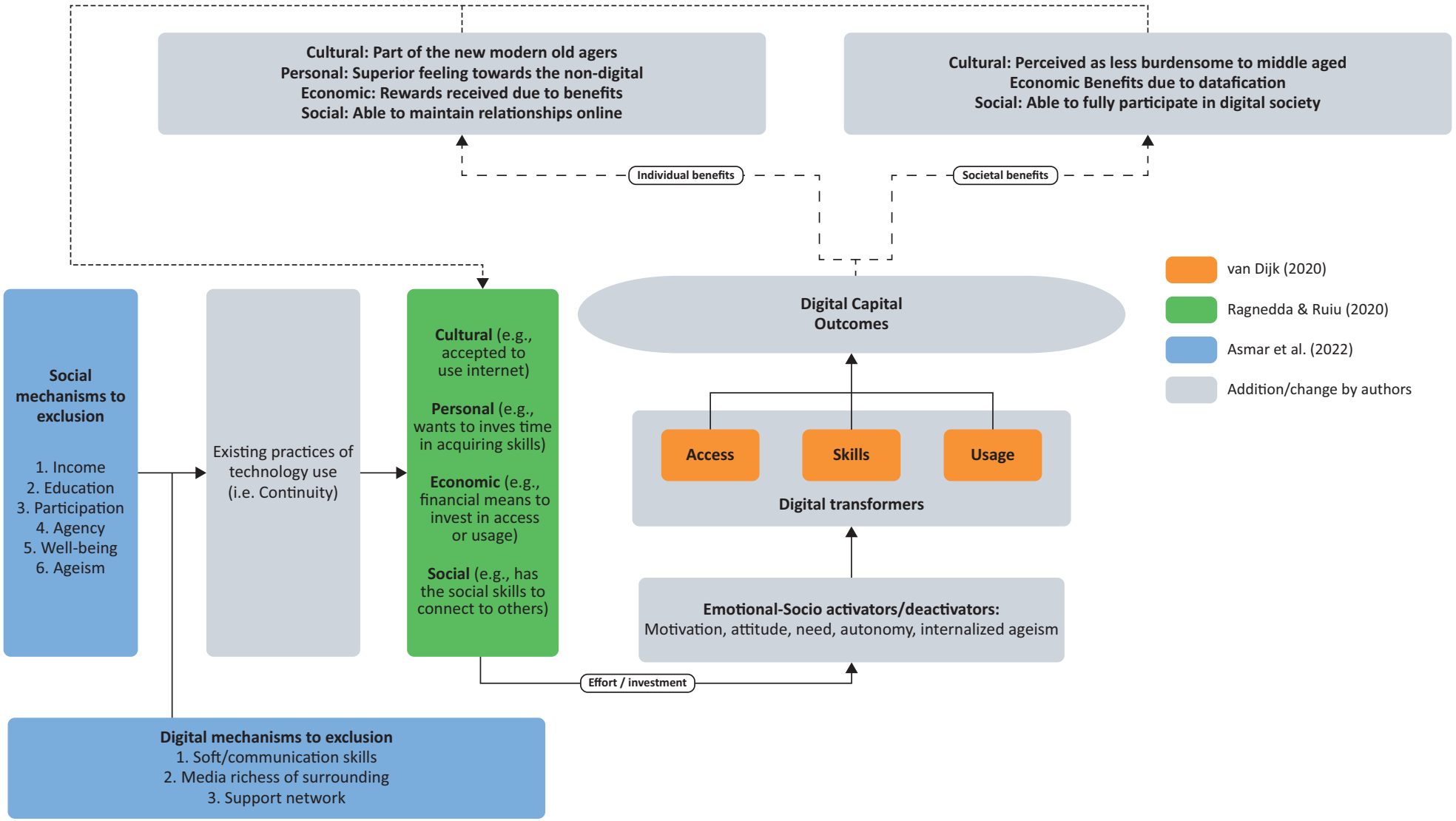

Figure 1. Conceptual framework to understand the role of technology in old age.

technology. For example, one of the social mechanisms is agency, as it impacts how much decision-making power a person has in terms of "how" and "if" they engage with digital technology. This social mechanism allows for the possibility that non-use is a conscious choice, even for those in a more socially precarious situation (Asmar et al., 2022; Gallistl et al., 2021; Townsend et al., 2020). Approaching digital exclusion in such a way helps to account for those that are unexpectedly included or excluded as it goes beyond the socio-demographic explanations and really looks at the individuals' situation and accounts for their agency in their own digital inclusion (Asmar et al., 2022). Furthermore, this specific placing of social and digital mechanisms enables us to understand that these influence and strengthen each other as proposed by Helsper (2012). In Figure 1, these mechanisms are indicated in blue. Ageism was added to the social mechanisms as we theorised that it influences the technology adoption of older adults. The mechanisms lead to practices that are informed by continuity theory and are therefore determined by one's level of interest or previous experience with technology. These practices are then altered by the Bourdieusian capitals, which consist of the accumulation of available resources in the field of digital technology use. The following list of examples for each capital is not exhaustive but serves to illustrate the resources that can be accumulated in these capitals. Personal capital includes the resources tied to one's capacity to learn, while social capital includes the support from one's social circle that can be relied on for digital technology issues. Economic capital is determined by the available financial resources to buy, for example, a new laptop. Finally, cultural capital deals with how acceptable the use of digital technology is perceived to be. The acceptability of technology use can be determined by age-norms, as they determine the appropriate behaviour according to age (Dannefer & Settersten, 2010). The discussed capitals influence the "emotional" socio-activators/deactivators. These are directly activated by the resources one has in various capitals. For example, one's perception of age-appropriate behaviour influences one's attitude towards technology.

The (de)activators lead to the "digital" transformers. These consist of two of the levels that are present in the digital divide—access and skills and usage—as argued by van Dijk (2020). The digital transformers are foreseen to determine the way older adults interact with digital technology. We have combined the last identified level, that of outcome, with a capital that was theorised by Ragnedda (2018) and Ragnedda and Ruiu (2020), namely, the "digital capital outcome." Ragnedda (2018, p. 2367) theorised that there should be a digital capital that consists of "the accumulation of digital competencies (information, communication, safety, content-creation and problem-solving), and digital technology." They perceive this capital as a bridge capital able to transform opportunities enjoyed online into offline opportunities, and vice versa. Ragnedda and Ruiu (2020) further explored this concept in connection to digital competencies and material access. They argued that both form part of the digital capital, which enables a transfer and/or accumulation into different Bourdieusian capitals. Furthermore, as it is a bi-dimensional relation, it results in a digitally enhanced outcome. Figure 2 shows an example of this transformative power.

The conceptual framework leads to two types of benefit, namely, individual benefit, which can be the increase of savings due to an online deal, and societal benefit,

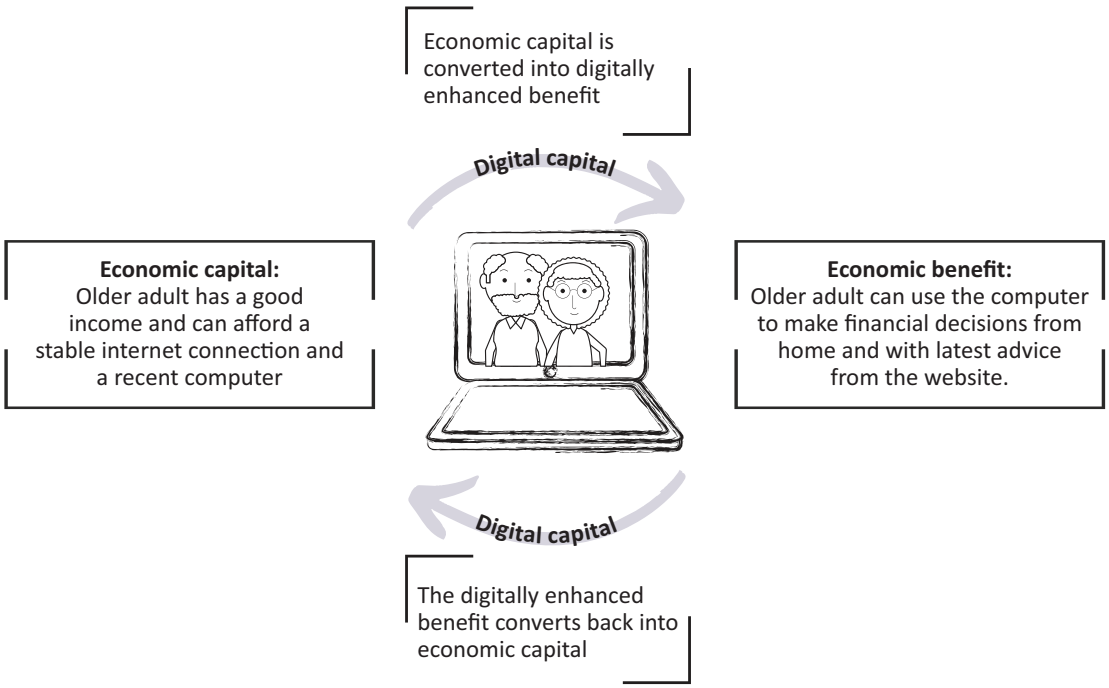

Figure 2. Example of how a digital capital can convert another Bourdieusian capital.

which is created through the process of data collection and data processing inherent to our use of digital technology. Sourbati and Behrendt (2020) describe this process as datafication, which encompasses the collection and processing of data that results in tracking and predictive analysis. Datafication can lead to societal bonuses as, for example, the city policymakers can create policies based on data collected in their municipality. Finally, although Ragnedda and Ruiu (2020) argue that by using the Bourdieusian capitals the existing inequalities are preserved, to obtain a more nuanced view we combined and added to the work of various authors to allow for both structural and institutional inequalities and to provide a more nuanced view on technology (non-)use in later life.

3.2. Participants

The data collection was organised in two waves. The first wave of 37 participants were interviewed from March to May 2021. The aim was to recruit self-identified digitally skilled older adults in Belgium. This was necessary as it involved online interviews due to the Covid-19 restrictions. Three PhD researchers were responsible for the data collection and received extensive training in online interview techniques, similarly to the methods described by Heiselberg and Stępińska (2022). The second wave of 39 interviews took place offline from October to November 2021. These interviews were in person and conducted by second-year communication studies students as part of the course "Introduction to Qualitative Studies." The first author performed a quality check that included reviewing the grade assigned by the assessors, conducting a thorough read-through, and verifying that the demographic requirements were met. Most of the participants were in their seventies (N = 41), with a median age of 71, ranging from 65 to 91 years old. Interviews were transcribed by either a professional transcription service or the students, and all the participants gave their consent following our ethical approval. Figures 3 and 4 provide information about the civil status and educational level of the participants respectively.

Participants were also divided into three user types: avid user, user, and non-user. These user types were determined by the first author and emerged during the analysis. The definitions for each user type are presented in Figure 5, and the process of their creation is explained in further detail in the next section. The distribution based on user type and age group is shown in Figure 6.

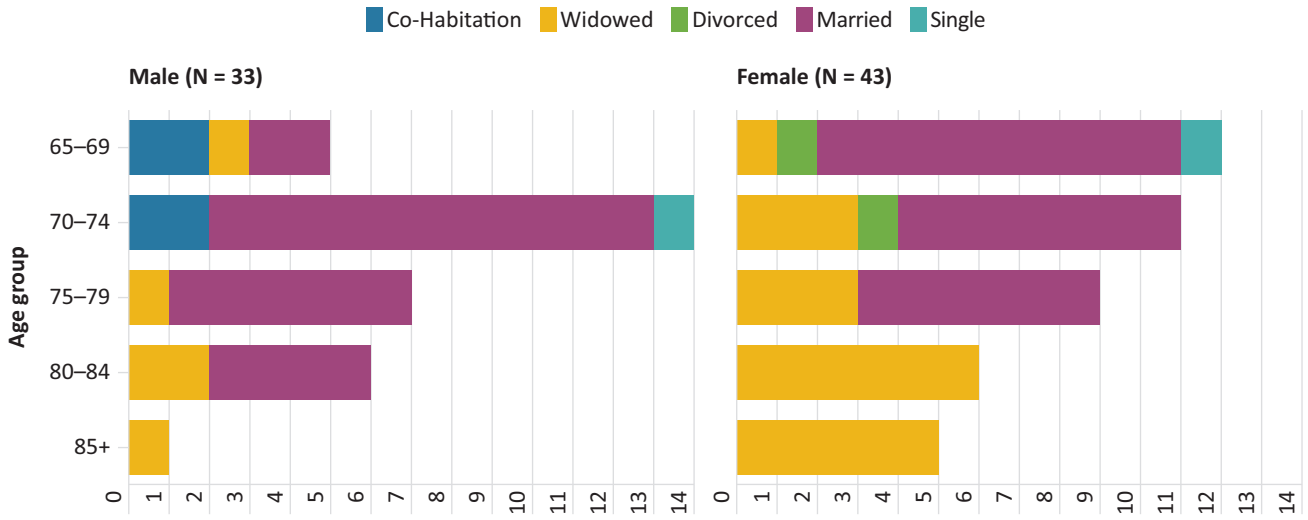

Figure 3. Civil status of participants: Participants are divided by age group and gender (overview).

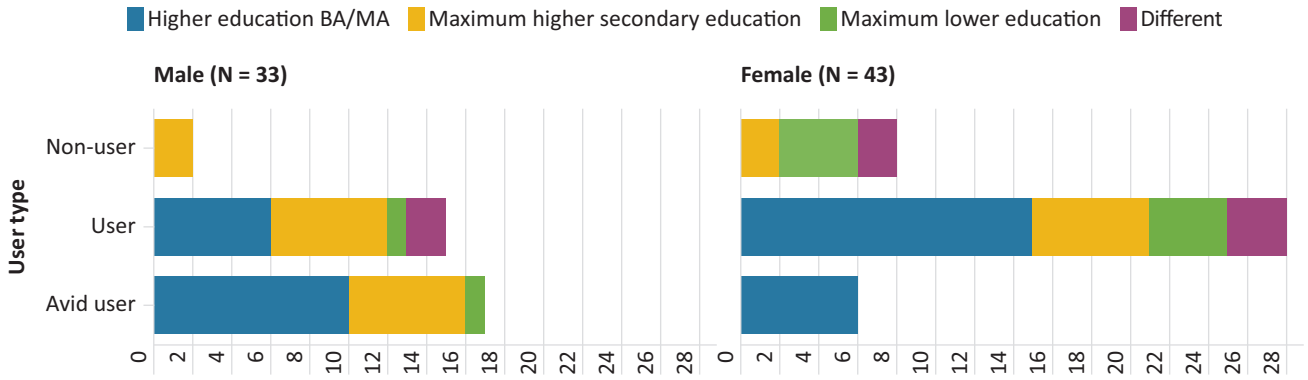

Figure 4. Educational level of participants: Participants are divided by user type and gender.

Avid user

Definition: Someone with a long history of use who experiences minimal barriers and is mostly self-sufficient in their use. Their interest in technology motivates them to maintain and expand their skills.

User

Definition: The user is willing and able to use technologu, however they are more hesitant in using new technologies and are content with what they know. They have little intrinsic interest in technology and are more utilitarian in acquiring their skills.

Non-user

Definition: Someone with no interest to use technology. Due to their ubiquitous nature they have not been able to avoid certain technologies but they will use the bare minimum and depend on other to make use of the more complicated features or to use e-services on their behalf.

Figure 5. Definition and criteria of each user group.

3.3. Thematic Analysis

The collected interviews were analysed following the thematic analysis procedure by Braun and Clarke (2006). The data was approached from the social constructionism paradigm as it places "the social practices people engage in as the focus of enquiry" (Andrews, 2012, p. 45). Furthermore, central to this paradigm is the "interaction, processes, and social practices" (Young & Collin, 2004, p. 377) of older adults in relation to ageing in a digital world. The first author initially coded 37 interviews using the inductive method, described by Charmaz (2014), for open coding. This included utilising the words of the participant and/or using verbs within the code to reconstruct the ageing experience in the participant's words. During the process of open coding the conceptual framework was not used. However, it was applied as a sensitising concept when themes were created because a sensitising concept provides the focus in an inductive research design (Bowen, 2006). Each theme emerged from the codes and was given a short definition by the first author. During the weekly meetings, the themes were presented to the other authors. They challenged the definition and if a consensus could not be reached about a theme, collaboration between the first and second authors would lead to the creation of a new definition, which was presented to the third author. This was an iterative process until all three of the authors agreed with the definitions. The result of these discussions was a code book to be used in the other interviews. However, the first author did use open codes where the code book insufficiently captured the perception of the participant, which allowed for emergent sub-themes during this stage of the analysis. These were then subjected to the above process. During this process, a definition of the various user types was created by the first author and discussed and re-defined together with the other authors. The result of this discussion can be found in Figures 5 and 6. The analysis was supported by the software MAXQDA 2020 and MAXQDA 2022.

4. Findings

In the following paragraphs, we will describe three themes that are used by older adults to position their ageing experience within a digital context. Each section

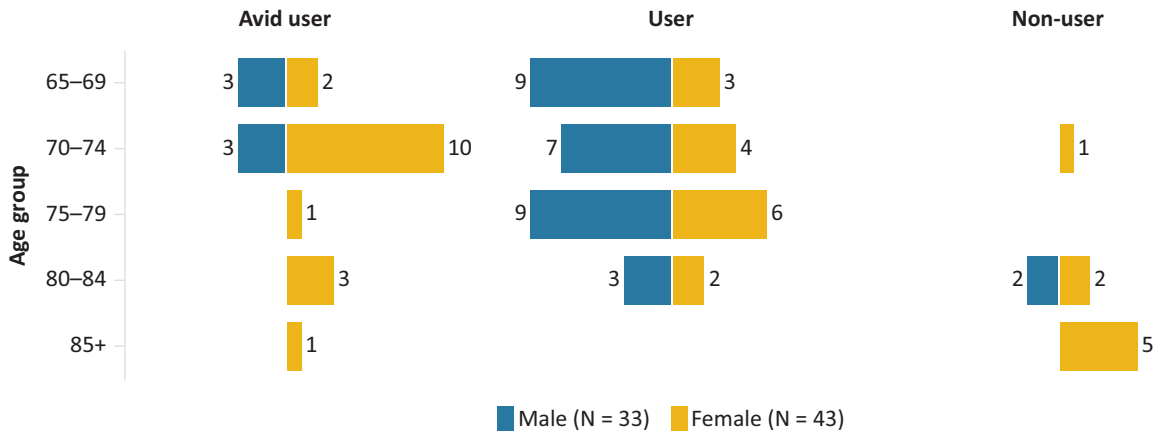

Figure 6. Distribution of user type: Participants are divided by age group and gender.

will provide perspectives of users and non-users. For each of the participants, we have indicated their user type: A for avid user, U for user, and N for non-users.

4.1. The Importance of Personal Context

Personal context consists of three sub-themes, namely, education, employment, and interest. This is closely related to the theory that habits and life choices of older adults are a result of their efforts to maintain a facsimile of their lives prior to retirement (Atchley, 1999), which means pre-retirement habits influence the level of interest and skill of older adults. Most of our users reported that their education and employment provided them with both material access and support for a significant period before digital technology became widely available. This early introduction means they were often able to follow the evolution of the devices, and the learning curve remained manageable. According to them, this contributed to existing skills and a basic awareness of technology that informs their current use, or as Dirk (M, 65, A) explained: "I think that if I hadn't had a job where it was necessary, that it would have taken a longer time [to use computers]." Another example is Kareltje (F, 72, U), who explained that her first introduction to the computer was in 1984 when her company was optimising the work floor. Others became interested by attending university, where they either studied technological studies (such as engineering) or were granted access to computers in the late sixties. However, this introduction was often combined with an interest in technology, as explained here by Gert (M, 82, A): "There arrived one computer at the school and I said: 'That one is mine.' And the computer was given to me." Another example is Laurent (M, 70, A) who said: "I have always been interested in everything related to electronics….And yes, the computer is a logical follow-up, that naturally follows up on it." The users often attributed this combination of interest and early access to their current level of technological comfort. Our dataset revealed that there were not many non-users in our sample who gained experience through their employment, and subsequently stopped using the technology. However, we had one participant, Koen (M, 85, A), who declared that the introduction of technology prompted his early retirement, as he retired at 60 to avoid having to follow additional courses although he later became proficient in using technology due to his own renewed interest therein.

On the other hand, non-users often cited a lack of interest in technology as a reason for their non-use. For example, Tim (M, 82, N) said he never had an interest, even if he had ample opportunity to learn, while Jopie (F, 87, N) said she has no interest, "because we have too little knowledge, and I think that we are not supported enough." In addition to the lack of interest, participants who did not use technology often mentioned other activities they engage in, such as gardening, walking, crafts, or watching television. This aligns with the perception that older users age without technology. An example is Dirk (M, 65, A), who explained: "As soon as people enjoy being outside, and are busy, is [sic] internet still not essential." However, we also found that their own disinterest does not exclude digital services used on their behalf, which we will explore in a later section.

4.2. Age as a Complicated Indicator

Our participants described an ageing experience in which the presence of digital technology is not based on chronological age, but rather on whether the digital technology is seen as appropriate for someone their age. Our participants limited to non-use often stated that they are too old to learn new things and they perceive this as a barrier. Learning new things appears to be judged as inappropriate or difficult for older people. For example, Janette (F, 89, N) said: "Because at this age you do not understand everything anymore!" They also used their age as an excuse to not learn anymore, such as Christina (F, N) who said: "And because I am now 85 years old…I think that I do not have to learn those things anymore." Some of the users expressed the belief that some people might be too old to learn, such as Maarten (M, 70, A) who said most people above 80 will not be interested as they did not grow up with it. Katinka (F, 72, U) said that even though her 102-year-old mother expresses interest in her smartphone, she deems her mother too old to learn how to use it. Furthermore, participants limited to non-use indicated that they feel as if older adults are ignored when it comes to digital technology. Francesca (F, 82, N) mentioned that "you are dependent on someone if you cannot use it," and Jopie (F, 87, N) stated that, "yes, they should have involved the elderly ten years ago, lessons for older people."

Another way in which perceptions of ageing are involved is when the older users clearly differentiate between their own experience and that of non-digital older adults. There are several ways in which this is achieved. The first is by associating themselves with younger cohorts. For example, Elena (F, 67, A) said she does not like to follow courses with people her own age because the younger people are more up to her speed. Secondly, older adults state that a problem is especially difficult for those older than them. For example, Miriam (F, 66, U) said: "But I think that for example for someone aged 85 or, or 89 or there abouts, that there is no interest anymore, but that is normal. I mean…the interest in everything lessens." When they are no longer able to make this distinction due to their advanced age, older adults provided evidence to the interviewer that they are an exception to the rule. Gert (M, 82, A) explained how he tried to introduce the smartphone to friends. They were categorically not interested, and he said that "it has become too big for [them] to take the leap." This tended to be a reaction of the avid users, while the users and non-users do tend to blame chronological age

for their lack of interest in using new technologies. For example, when a virtual birthday party was described, Jana (F, 74, U) laughingly said: "Oh boy….I am too old for that." When asked what she thought of the ubiquitous presence of digital technology, Christina (F, 85, N) said: "I am too old for that….And I do not have the inclination." However, we also found that older adults are open to new technology that they previously dismissed. Maurice (M, 72, A), for example, initially surprised his nephews and close friends with his reluctance to use a smartphone, which he described as follows: "How is it possible, that you, especially you do not have a smartphone! That is social pressure." However, since the pandemic, he is now very happy with his smartphone and the connection it provides within his neighbourhood:

> We have a [WhatsApp] group in the neighbourhood, because I have a lot of support [as a] single [man]—so I live alone, with a wheelchair. But if there's is a problem, my neighbours—I have fantastic neighbours—and we have such comity, and that is on WhatsApp, the Bootcomité. That is such fun.

4.3. Digital Support Network

This concept links to the previous statement of Maurice (M, 72, A) about connection to others and how this interacts in different ways for older adults. the connections in our findings can be both a motivation and a deterrent for older adults to use technology.

Firstly, there is the motivation that stems from having a partner interested in technology. We call this the "coupled bonus." It occurs when each member of a couple specialises in a different area of technology use. For example, in the case of Manon (F, 65, A), her husband "knows quite a bit about computers, course [sic] he had to learn that by experimenting. But sometimes he would already have the solution. Or I….Yes, we complement each other." Another example can be found in the social use of technology. Here our participants reported that women tend to manage the social aspects. Often the women were tasked with sharing the pictures and stories received via social media, such as WhatsApp and Facebook.

The second sub-theme is the role of the family in providing support for older adults in their use of digital technology, which appears to be essential for their continued engagement with it. This is evidenced by the many participants' accounts of the assistance provided by their children and/or grandchildren. It is possible to see a difference in the way users and non-users ask for help. First, users tend to ask for help from their children's generation for highly technical problems, and often after attempting to resolve the problem on their own without success. This younger generation has in common that they are recognised by the older user for having superior IT expertise. Maurice (M, 72), for example, indicated that he asks his adult nephews. Diederik (M, 67, A) said:

> You will look for it yourself. Afterwards, I have a son who works in computers. He designs apps. If I really encounter certain problems, then I will give him a call: "Phillip, my boy, you have to explain such and such to me or set that right for me."

The users ascribe this expertise to the younger generation because of their technical education or employment in the IT industry. This level of expertise is not required by older non-users from their proxy-users. This will be further examined later. However, for smaller, less technical issues they ask the younger generations to assist, especially as this generation is seen as natural users due to their age, or in the words of Kevin (M, 73, U): "That is already present in their genes probably." They also motivate the older adults to go or remain online as contact is easy and provides easy assistance as "they are the ones busy with it, the whole day and who have the time for it" (Fernand, M, 66, U). To summarise: older users use their own expertise at first, and the family helps occasionally and incidentally. However, their assistance is not structural or a substitute for their own usage.

For the non-users, the assistance of the younger generation is substantially different. Because they do not have an interest to obtain or maintain their own digital skills, they are required to have a proxy-user to assist them with the digital requirements of today's society. For example, obtaining prescription medication via their ID card or making transfers via e-banking services. One remarkable finding is that these proxy-users are often female, with daughters being most often tasked for proxy use regarding health, financial, or self-care tasks. Furthermore, proxy use requires a basis of trust; when the proxy-user is a close family member this is easier to achieve, as explained by Aaltje (F, 91, N) who said she is lucky that she can trust her daughter: "I don't think that our Ellen would ever abuse that [trust]. That is what I think." Tini (F, 81, N) is another non-user who, through her daughter, has access to Internet services. She feels ambiguous about it, as stated in her own words:

> It is good and not good. For the people who [are] aware of it, it is good, but I do not think that you must force everyone to use it. That it [should be able] to use the old way. I cannot imagine that every old person knows about it.

Most of the non-users conveyed a type of resignation to the loss of their autonomy and have accepted that they will burden their children with these tasks.

5. Discussion

In this section we will discuss the themes in connection to the conceptual framework and how both help with understanding how older adults negotiate ageing with digital technology. The first theme concerns the personal context, which corresponds broadly with the

principles of continuity theory (Atchley, 1999). It shows that, for our participants, the experience prior to retirement affects the integration of digital technology later in life. Additionally, this theme also provides insight into how the continuity theory can also apply to non-users, as most of our non-users indicated that they were never introduced to technology via work experience or never had an interest in using digital technology. However, there is a second link to the conceptual framework, namely how the personal context appears to influence the way participants view old age and what can be considered normal for their age. Both types of users perceive digital technology as interwoven with ageing. For the avid user, digital technology seems to be essential to part of their ageing process and identity. This seems to be aided by the fact that they experience the technological evolution over time. Users commented on the fact that they were able to jump on the technology "train" at the right time, while some non-users mentioned they missed the opportunity. The participants seemed to feel that it is difficult for non-users to begin using technology. In a form of internalised ageism, both users and non-users view age as the cause for a divide in usage or skills. This is evident in the comments of non-users who indicated that they are too old for learning, especially when they compare themselves unfavourably to younger generations. The younger generations, especially youngsters, are seen by our participants as naturally gifted and genetically predisposed to digital technology. Additionally, this perception of the younger generations as "natural users" implies that there is something missing in their own experiences with technology, which concurs with Gallistl et al. (2021) who found that older adults perceive their use as wrong or unskilled.

The older users seemed to perceive themself as an exception and are often aware that their use is not common in their generation or cohort. This translates into the confidence to look for their own solutions before approaching others for support. Indeed, the reliance on network support differs between users and non-users. While both would connect with their support network for assistance, the form of support requested is different. The non-users have a more dependent relationship with their support network compared to the users. Furthermore, our digitally active participants were able to determine when and who they approached for which type of assistance. They often expressed a preference for their grandchildren in the case of technology introduction or small issues, while engaging with tech-savvy children to provide technical support for more complex issues. This clear preference has not been found in previous research, and therefore adds to the existing literature on warm experts (Hänninen et al., 2020; Martínez & Olsson, 2022; Olsson & Viscovi, 2018), and aligns with the need for constant maintenance of ICT skills (Olsson & Viscovi, 2018). Additionally, there is an implied vulnerability in this situation as their own expertise and support network might not be sufficient in the future, which might result in the enlistment of proxy-users to take over their ICT tasks. However, a limitation to the current findings is that expectations on future use were not part of the interview, and more research focussed on this needs to be conducted as we expect that questions directed to this line of inquiry would provide an understanding of how older adults anticipate the (possible) loss of digital technology use. Our non-users tend to have one of their children as a dedicated proxy-user responsible for ensuring that their parents' ICT affairs are in order. The non-user seemingly selects this proxy-user based on their trust in them rather than their technological capability. This differs from how users seemingly select their children for support, which is based on perceived ICT capabilities. Furthermore, the interviews suggest that the proxy-user is involved in a variety of support activities beyond the technological (e.g., groceries). Further examination of the role of gender is needed as our data suggest a skewness towards daughters. The requirements and support needs for providing digital forms of informal care are a future avenue of research.

Finally, we would like to address the way users experience ageing differently from non-users. In our findings, it became evident that the older users prefer a digital ageing experience and have taken steps to avoid a non-user experience. They did this by expanding their own technological skills through engaging in various forms of support, such as formal support (e.g., lessons) or network support (e.g., spouse). In the conceptual framework, there are individual outcomes that can only be accessed by those that have digital skills and can transform their original Bourdieusian capitals into a digital enhanced outcome. We argue that our users use their digital capital outcome to avoid becoming unable to use digital technology. The current data set does not allow for further exploration of the implications of the precarity of losing the expertise needed to maintain their current engagement with digital technology. We found that the older user is in a vulnerable position as their current ageing experience is dependent on their technological expertise. Maintaining digital skills becomes more difficult over time (Olsson & Viscovi, 2018) and might therefore result in a loss of the preferred ageing experience. A further topic of research is therefore to determine what happens with the self-perception of older self-sufficient users if they become dependent on a proxy-user.

6. Conclusion

The empirical analysis has tested the conceptual framework and found that it is able to explain the nuances in the digital technology use and inclusion of older adults. The findings underscore that this population is heterogenous in their use and expectations in terms of support needs. These findings align with the conceptual framework. This study is strengthened by having used two data sets to obtain views from a wide variety of ages and distinct types of uses. Although the quality of

the second data set was checked, it was evident that opportunities for further in-depth questions were overlooked due to students' lack of experience. This means further research into non-users will enable a more in-depth study of their technology use to compare it to findings from other studies such as Gallistl et al. (2021). Although a line of inquiry in expected future use was not part of these interviews, it became evident during the analysis that such an inquiry would have been an interesting perspective. However, this might be best addressed by using different interactive methods to elicit future scenarios. Even without these expectations of future use, our research has shown that there is an inherent vulnerability in the self-perception of older adults in terms of digital technology. Educational efforts need to be catered to those already skilled to enable them to maintain their competence and therefore their self-image. The effect of internalised ageism on both the user and non-user needs to be addressed sensitively and an empowering balance needs to be found. For example, ensuring that older non-users are introduced to the benefits of technology by their peers might counter the internalised ageism of the non-user, while at the same time, it can help older users obtain a more nuanced view on ageing without technology.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

Examining Aspects of Digital Inclusion Among National Samples of US Older Adults

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Abstract
We live in a world where we are constantly connected to devices (e.g., smartphones, computers, tablets) and are encouraged to go online to find information about most things in society. This constant digital connection provides the means whereby many individuals communicate and exchange social support. For most demographic groups, this results in being online and connected to devices multiple times each day. Older adults have been slower to adopt and use emerging information and communication technologies (ICTs). Their digital divide in comparison to other age groups may not be an accurate representation of their technology use and the reasons for this use. This descriptive study examines this view of digital inclusion by focusing on older adults and their uses of technology. We provide an overview of technology usage by different older adult age groups in the United States using existing national-level data. We utilize life course and aging theoretical perspectives to help articulate how older adults use a wide variety of ICTs and whether they are constantly connected, and we note that while a constant connection to devices may be normative for younger age groups, this may not, and perhaps should not, be the case for older adults. The article concludes with a discussion of the social construction of digital inclusion and emphasizes the significant variation that exists in this construct, measurement of technology use in large-scale datasets, and variation in technology use across older adult life course groups.

Keywords
digital divide; digital inclusion; Internet; life course; older adults; technology use

Issue
This article is part of the issue “Expanding the Boundaries of Digital Inclusion: Perspectives From Network Peripheries and Non-Adopters” edited by Rob McMahon (University of Alberta), Nadezda Nazarova (Nord University Business School), and Laura Robinson (Santa Clara University).

1. Introduction

Digital inclusion is a complex construct that focuses on whether individuals and groups have equitable access to and use information and communication technologies (ICTs) such as smartphones, computers, tablets, and the Internet (Siefer, 2016). Most conceptualizations of digital inclusion include elements of access to, use of, and skills to use ICTs. Some also incorporate a type of connection as well as access to and quality of technical support (Reisdorf & Rhinesmith, 2020). ICT access, ownership, and use in the US has continued to rise. The majority of children (95%, 3–18 years; US Department of Education [US DOE], 2021) and adults (77%, aged 18 and older; Pew Research Center, 2021) have broadband Internet at home. Most community-dwelling adults (93%, 18 years and older) use the Internet (Faverio, 2022). ICT ownership has also increased. In 2021, most children (8–18 years) reported having a computer (87%), smartphone (94%), and tablet computer (74%) in their homes (Rideout et al., 2022). Similarly, the majority of adults (18 years and older) reported having a smartphone (87%) and tablet computer (53%; Faverio, 2022).

With the increase in ICT access and ownership, it is not surprising that ICT use has become ingrained in many areas of life. ICTs are used in education to facilitate

learning (Dore & Dynia, 2020; US DOE, 2019). For working adults, email and Internet use are vital to job success (Purcell & Rainie, 2014). ICTs are used to complete day-to-day tasks (Marist Poll, 2018) and for leisure activities (Editorial Unit, 2021; Rideout et al., 2022). We can find information about most things in society through ICT use. For example, most US adults (52%) prefer to get their news from a digital platform like a news website, online search, or social media sites (Shearer, 2021). Importantly, the spread of ICTs has changed how we communicate and exchange social support. Mobile phones, in particular, enhance communication between social ties, whether via voice, text messaging, or social media use (Anderson et al., 2022).

Both media and researchers have recently begun commenting on individuals being "constantly connected." Constant connection refers to the state of being always connected to a mobile or Internet-enabled device, which permits the user to be able to access online platforms, communicate with others in real time, and consume digital content on demand. It does not connote that individuals have to be using devices constantly; rather, it is the potential connection that they have given their mobile or Internet-enabled devices. Research on ICT use has evolved to understand the degree to which people are constantly connected to their ICTs; the frequency of daily ICT use is often used to assess whether individuals are constantly connected. For example, Internet use has increased to the extent that the majority of teenagers (89%, 13–17 years) and adults (84%, 18 years and older) go online at least several times per day or more (Anderson & Jiang, 2018; Faverio, 2022). In fact, 45% of US teenagers (13–17 years) and 33% of US adults (18 years and older) report being online almost constantly (Anderson & Jiang, 2018; Faverio, 2022).

Although ICT access, ownership, and usage have increased for children and adults, there are notable differences found between the adult age groups, with a smaller percentage of those aged 65 and older reporting ownership and use of ICTs (Cotten et al., 2017; Faverio, 2022; Kadylak & Cotten, 2021; Perrin, 2021). Though it may be becoming normative for some age groups to report being online constantly or to be "constantly connected," we examine whether this is the case for older adults across three US national samples of older adults, which few other researchers have done. We provide a more wide-ranging descriptive epidemiology of ICT access and use than previously found in research focused on older adults.

2. Older Adults and Their Use of ICTs

Older adults (65 years and older) have increased their types and frequency of ICT use, along with the range of online activities in which they engage over time. Most community-dwelling older adults own a smartphone (61%), have Internet at home (64%), and use the Internet (75%); almost half (45%) use social media (Faverio, 2022). Eight percent of community-dwelling older adults report being constantly connected to the Internet (Faverio, 2022). However, the digital divide still exists due to sociodemographic and technology-related factors. For example, higher Internet use has been found for older adults who are White (Anderson et al., 2019; Choi et al., 2022), male (e.g., Gell et al., 2015; Nayak et al., 2010; van Deursen & van Dijk, 2015), more affluent (Anderson et al., 2019), more educated (Anderson et al., 2019), those who reside in urban locations (Anderson et al., 2019; Choi et al., 2022), and those who are employed (Niesel & Nili, 2021; Schuster & Cotten, 2022). Most notably, the digital divide continues to prevail between the older adult age cohorts. "Younger" older adults (65–74 years) have more Internet and social media knowledge (Hargittai et al., 2019), Internet use (Anderson et al., 2019; Hargittai & Dobransky, 2017), and breadth of online use (DiMaggio et al., 2004; Leukel et al., 2023; Olsson et al., 2019; Seifert & Cotten, 2020) compared to "older" older adults (75 years and older).

3. Theoretical Perspective

We can further understand older adults' ICT use and preferences for connection from the socioemotional selectivity theory (SST) life course perspective, which suggests that social motivational priorities change based on how much time one has left to live (Carstensen, 1993, 1998, 2006). Older adults, in contrast to those younger, tend to be more cognizant of their time constraints and focus on present-oriented goals by avoiding negative emotions, finding meaning in life, and preserving significant relationships. Older adults' online social networks may become smaller to reflect age-related goal shifts (J. Chang et al., 2015; Pfeil et al., 2008); however, there may be an increase in the quality of individuals in online social networks (e.g., actual friends) and perhaps less quantity (P. F. Chang et al., 2015).

Another way to interpret older adults' ICT use and preferences for connection is through the uses and gratifications theory (UGT), which suggests that individuals intentionally choose and use technology to satisfy their five personal needs: cognitive, affective, personal integrative, social integrative, and mental escape (Katz et al., 1973). The UGT has been extended to newer uses like social media by older adults, and researchers have identified new gratifications. Older adults use social media to fulfill their social integrative needs for strengthening social relationships with family and friends (Jung et al., 2017; Sheldon et al., 2021). Older adults also use social media as a mental escape for diversion and entertainment purposes (Sheldon et al., 2021). Others satisfy their affective needs by using social media to alleviate feelings of loneliness (Aarts, 2018; Baecker et al., 2014; Sinclair & Grieve, 2017) or to meet their social integrative needs by creating content on Instagram (McGrath, 2018) and TikTok (Ng & Indran, 2022) that challenges negative stereotypes of aging.

Older adults' ICT ownership and use has substantially increased in the past decade compared to younger age cohorts (Faverio, 2022). There is also heterogeneity among older adults in these patterns as well as nuances in the specific types of use. Guided by SST and UGT, we descriptively examine older adults' ICT ownership, types, and frequency of use to assess whether rates of use in general and aspects of constant connection among different segments of older adults vary.

4. Methods

We descriptively compare ICT ownership and use by US community-dwelling older adults using data from three national studies that include measures of ICT use.

4.1. Qualtrics Survey of Older Adults

A cross-sectional online survey conducted by the second author was used to collect data on US older adults (aged 65 and older) in 2017 on their ICT use (*N* = 1,260). Participants were recruited through Qualtrics panels using quota sampling based on the demographic characteristics of the 2010 US Census characteristics for individuals aged 65 and older based on age, race, sex, and education. The online survey took approximately 15 minutes to complete. Prior to the start of the survey, participants provided informed consent. This study was reviewed and approved by the university's Institutional Review Board.

ICT use was measured by asking: *Do you use [a desktop computer, laptop or notebook computer, tablet computer, or cell/mobile phone]?* Responses could be *yes* or *no*. Participants who responded *yes* were then asked: *Is your cell/mobile phone a smartphone?* Responses could be *yes* or *no*. Frequency of weekly Internet use was measured by asking: *In a typical week, how often do you go online?* Response options ranged from *less than once a week* to *almost constantly*. Frequency of online activities was measured by asking: *On average, how often do you go online for activities such as health, financial, social, and leisure?* Response options ranged from *never* to *several times a week*.

4.2. National Health and Aging Trends Study

The National Health and Aging Trends Study (NHATS) examines late-in-life trends with a nationally representative sample of older adults (65 years and older) in the US. This study is supported by the National Institute on Aging and is led by the Johns Hopkins University Bloomberg School of Public Health and the University of Michigan's Institute for Social Research, with data collection by Westat. Data collection started in 2011 and is collected annually through in-person or phone interviews with older adults and/or proxy respondents on their mental and physical function. Information about the sample design, data collection procedures, and questionnaires can be found on the NHATS website (http://www.NHATS.org). For this study, we analyzed wave 11 data (2021) from community-dwelling older adults (*N* = 3,321).

ICT ownership was measured by asking: *Do you have a working cellphone? Do you have a working computer in your home? Do you have a tablet computer like an iPad that works by touching the screen?* Responses could be *yes* or *no*. For computer and tablet, there was the additional response of *yes, but I don't know how to use it*. The use of email or text messages was measured by asking: *In the last month, have you ever sent messages by email or texting?* Responses could be *yes* or *no*. This was followed by asking: *In the last month, how often did you send messages by email or texting?* Response options included *most days*, *some days*, and *rarely*. Internet use was measured by asking: *In the last month, besides email or texting, have you ever gone on the Internet or online for any [other] reason?* Responses were *yes* or *no*. Types of Internet use were measured by asking: *In the last month, have you gone on the Internet or online to [shop for groceries or personal items, pay bills or do banking, order or refill prescriptions, visit social network sites, and to visit with family or friends on video calls]? In the last year, have you gone on the Internet or online to [contact any of your medical providers, handle Medicare or other insurance matters, get information about your health conditions, and have a visit with medical providers]?* Response options for all types of Internet use were *yes* or *no*.

4.3. US Health and Retirement Study

The US Health and Retirement Study (HRS) is a panel survey of US adults aged 50 and older and their spouses. This study is supported by the National Institute on Aging and Social Security Administration and is led by the University of Michigan's Institute for Social Research. Data collection started in 1992 and has been repeated biannually. Interviews are conducted face-to-face, by telephone, or on the web. Participants are asked about issues pertinent to aging such as health, social relationships, and employment. We used the most recent wave of data (2020), collected between March 2020 and May 2021, with community-dwelling older adults aged 65 and older (*N* = 2,610). Information about the sampling strategy, panel design, and questionnaires can be found on the HRS website (http://hrsonline.isr.umich.edu).

ICT ownership was measured by asking: *Which of the following devices do you own or have access to?* Devices included desktop computer, iPad or other tablet, laptop computer, smartphone, regular cell phone, e-reader, wearable device, home assistant, smart home technology/security, and smart TV/streaming service. Responses were *yes* or *no* for each device. Internet use was measured by asking: *Yesterday did you use a computer or the Internet?* Responses were *yes* or *no*. Those who responded *yes* were then asked: *How much time did*

you spend doing this? Response options ranged from *less than 1 hour* to *7 or more hours*. Frequency of Internet use was also measured by one item: *How often do you use a computer for e-mail, Internet, or other tasks?* Response options ranged from daily to never/not relevant. Frequency of online activities was measured by asking, *how often do you use one or more of the devices to do any of the following activities?* Activities included health, financial, social, and leisure. Response options ranged from *daily* to *never/not relevant*. Activity use for each activity was measured by summing daily, several times a week, at least once a month, and at least once a year.

4.4. Data Analysis

Age in all three datasets was divided into three groups: young-old (65–74 years), old-old (75–84 years), and oldest-old (aged 85 and older). Data were analyzed descriptively and compared by age group and between datasets.

5. Results

5.1. Participant Characteristics

Most of the participants, across the three datasets, were female, White, and married or living with a partner. See Table 1 for participant characteristics.

5.2. ICT Access, Ownership, and Use

In the HRS 2020 sample, most device ownership decreased with age. Most young-old owned or had access to a smartphone (82%), desktop computer (59%), tablet (61%), laptop (59%), or smart TV/streaming device (59%), whereas, fewer old-old owned smartphones (60%) or desktop computers (52%). Cellphone ownership increased with age, with most of the oldest-old owning a cellphone (55%), compared to 28% of the young-old. Device use also largely decreased with age. Of the Qualtrics 2017 data, more young-old used laptops (69%), smartphones (64%), or tablets (46%), compared to the oldest-old who had less laptop (57%), smartphone (43%), or tablet (37%) use. However, desktop computer (69%) or cellphone (39%) use was higher among the oldest-old compared to young-old desktop computer (54%) or cellphone (24%) use. See Figures 1 and 2 for ICT ownership and use.

Across the age cohorts (and the three datasets), the majority of the young-old and old-old were Internet users. For the oldest-old, the Qualtrics sample (82%) had double the rate of Internet users compared to the other two datasets (NHATS: 41%, HRS: 39%). See Figure 3 for Internet users. Given the Qualtrics study was a sample of older adults who were Internet users, it is not surprising that the rates reported from the Qualtrics sample are higher than those from the NHATS and HRS samples. From the Qualtrics data, most young-old (59%), old-old (57%), and oldest-old (60%) are going online several times a day. The percentages were lower for reporting they go online "almost constantly" in the Qualtrics sample: 19% (young-old), 11% (old-old), and 10% (oldest-old). Neither the HRS nor the NHATS included measurement of constant use of the Internet. For both the Qualtrics and the HRS samples, most respondents reported 2–3 hours of Internet use per day. See Table 2 for Internet use results.

Table 1. Participant characteristics.

	Qualtrics 2017 (*N* = 1,260)			NHATS 2021 (*N* = 3,321)			HRS 2020 (*N* = 2,610)		
	65–74 years	75–84 years	85+ years	65–74 years	75–84 years	85+ years	65–74 years	75–84 years	85+ years
	n = 731	*n* = 365	*n* = 164	*n* = 440	*n* = 1,803	*n* = 1,078	*n* = 1,344	*n* = 959	*n* = 307
Gender									
Female	61%	55%	35%	52%	58%	61%	58%	59%	60%
Male	39%	45%	64%	48%	42%	39%	42%	41%	40%
Race/Ethnicity									
White	76%	93%	99%	69%	71%	73%			
African American	14%	3%	0%	21%	21%	19%			
Other	10%	4%	2%	10%	9%	8%			
Relationship Status									
Married/Partnered	54%	51%	55%	59%	50%	30%	63%	55%	35%
Divorced/Separated	21%	14%	8%	20%	17%	8%	17%	11%	11%
Widowed	15%	32%	37%	16%	30%	60%	14%	31%	51%
Single/Never Married	10%	4%	1%	5%	4%	3%	6%	3%	3%

Note: HRS race/ethnicity not publicly available.

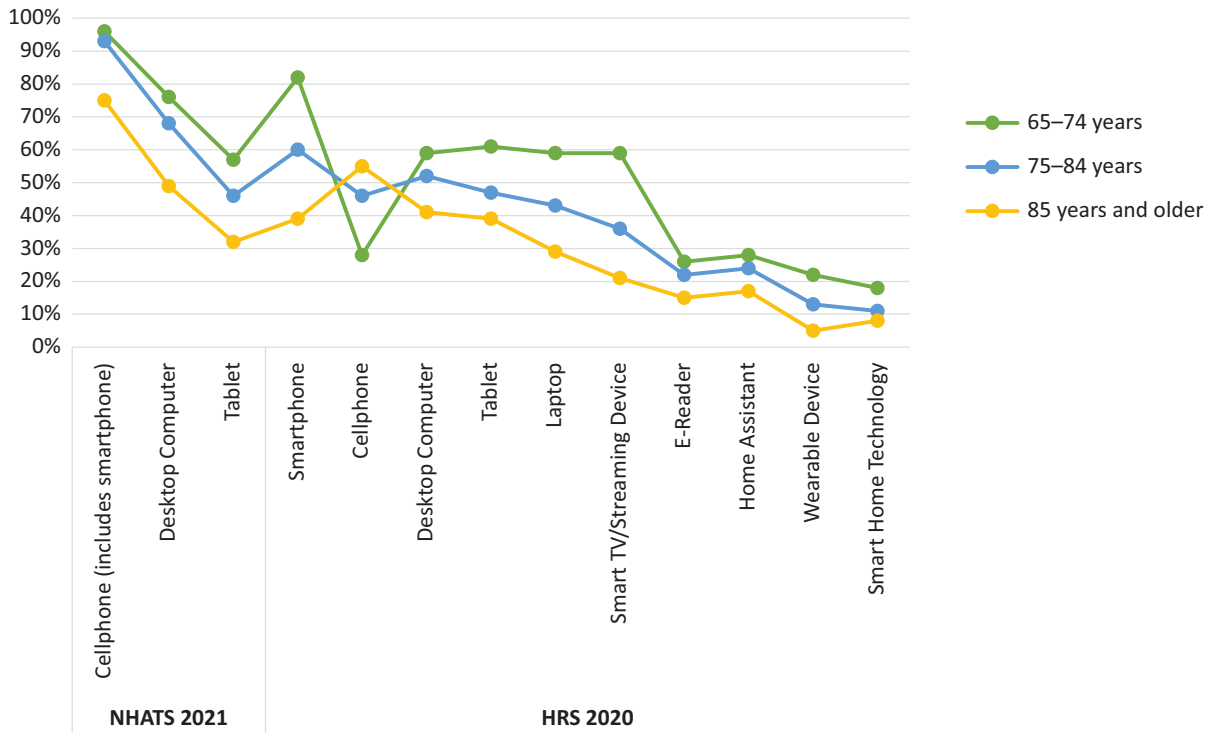

Figure 1. ICT ownership by older adult age groups.

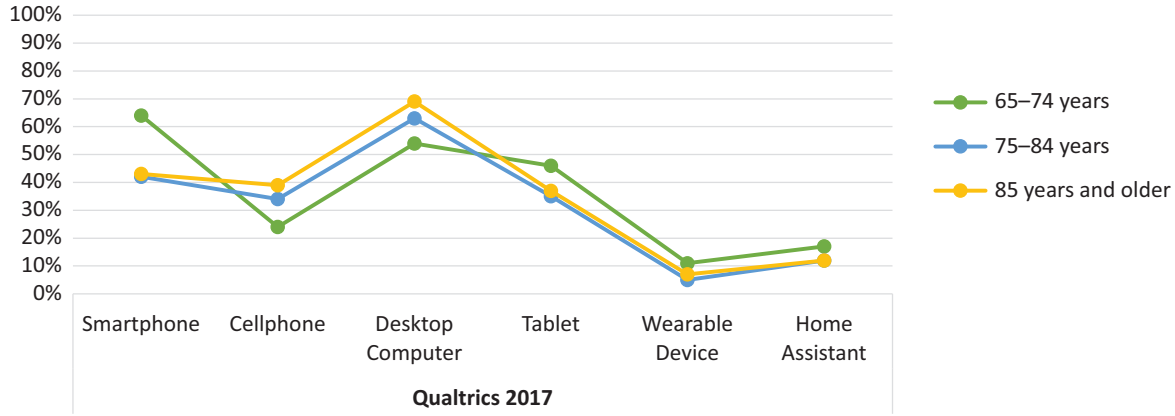

Figure 2. ICT use by older adult age groups.

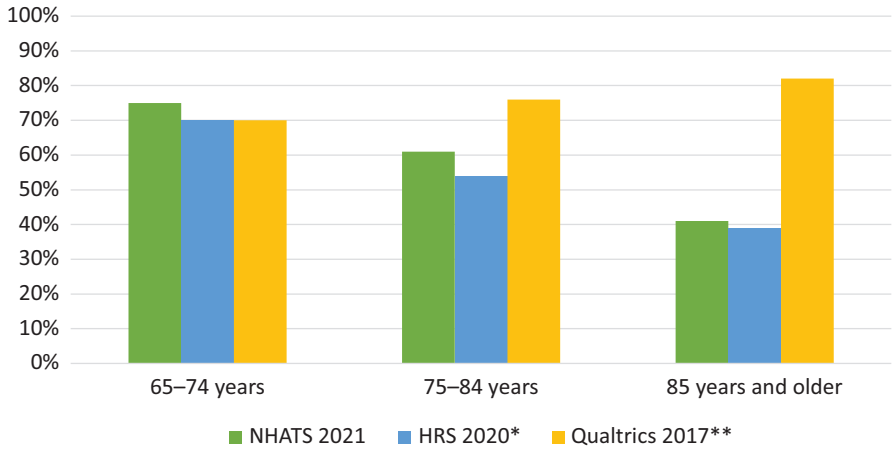

Figure 3. Internet users. Notes: * Internet use in the previous day; ** Internet use for 10 or more years.

Table 2. Internet use.

		65–74 years (Young-old)	75–84 years (Old-old)	85+ years (Oldest-old)
Frequency of Internet use	Qualtrics 2017			
	Daily	95%	94%	94%
	Almost constantly	19%	11%	10%
	Several times per day	59%	57%	60%
	About once per day	17%	26%	24%
	About 1 or 2 times a week	3%	3%	4%
	Less than once a week	2%	3%	2%
	HRS 2020			
	Daily	74%	70%	63%
	Several times a week	13%	14%	18%
	Once a week	3%	3%	5%
	Several times a month or less	10%	13%	14%
Average daily online use	Qualtrics 2017			
	Less than 1 hour	2%	2%	2%
	1 hour	10%	14%	19%
	2–3 hours	31%	32%	48%
	4–6 hours	31%	30%	21%
	7 or more hours	26%	22%	11%
	HRS 2020			
	Less than 1 hour	18%	20%	31%
	1 hour	32%	32%	23%
	2–3 hours	37%	37%	41%
	4–6 hours	9%	9%	5%
	7 or more hours	4%	2%	0%

Note: Qualtrics daily frequency is the sum of the three daily responses.

5.3. ICT Activities and Frequency of Activities Online

5.3.1. Shopping or Purchasing Services

Across the age cohorts, the majority of older adults do not order food or groceries (HRS: 65–74 years: 62%, 75–84 years: 75%, 85 years and older: 76%), buy tickets for events or reserve tables at restaurants (HRS: 65–74 years: 62%, 75–84 years: 78%, 85 years and older: 91%), or request ride-hailing services (HRS: 65–74 years: 82%, 75–84 years: 91%, 85 years and older: 94%) online (see Table 3). Young-old (HRS: 77%, NHATS: 61%) and old-old (HRS: 60%, NHATS: 53%) reported shopping online more than the oldest-old did (HRS: 40%, NHATS: 48%).

5.3.2. Day-to-Day Information

Regardless of the age cohort, most older adults are not going online to track their steps, exercise, or for personal fitness (HRS: 65–74 years: 57%, 75–84 years: 70%, 85 years and older: 69%), to apply for jobs (HRS: 65–74 years: 95%, 75–84 years: 99%, 85 years and older: 99%), or to use a home assistant such as Amazon Echo (Alexa) or Google Home (HRS: 65–74 years: 64%, 75–84 years: 70%, 85 years and older: 77%; see Table 3). Most older adults, regardless of age cohort, are going online to write notes, take surveys, or fill out forms; use an alarm clock, timer, or calendar reminder; search for information on things like recipes or hobbies; and for information about the news or weather. The majority of young-old and old-old go online to check the weather daily (HRS: 58%, 52%) and to get news and updates on other information several times a week or more (HRS: 73%, 60%).

5.3.3. Medical or Health

Most older adults are going online to get health information (HRS: 65–74 years: 84%, 75–84 years: 75%, 85 years and older: 67%) for themselves (Qualtrics: 65–74 years: 76%, 75–84 years: 76%, 85 years and older: 79%) and for others (Qualtrics: 65–74 years: 60%, 75–84 years: 51%, 85 years and older: 51%). The majority of older adults are going online at least once per month or more to search for health-related information (HRS: 65–74 years: 69%,

75–84 years: 58%, 85 years and older: 53%). However, most older adults do not go online to purchase or manage their health insurance or Medicare accounts (HRS: 65–74 years: 74%, 75–84 years: 82%, 85 years and older: 89%; NHATS: 65–74 years: 77%, 75–84 years: 80%, 85 years and older: 82%). When combining several medical activities online such as going online to talk to a doctor or other medical professional, make medical appointments, order prescriptions, or receive personal health care advice, most older adults do these activities (HRS: 65–74 years: 84%, 75–84 years: 73%, 85 years and older: 66%). However, when examining the activities as separate activities, the results vary. Most older adults do not go online to make doctors' appointments (Qualtrics: 65–74 years: 74%, 75–84 years: 75%, 85 years and older: 71%), to order or refill prescriptions (NHATS: 65–74 years: 57%, 75–84 years: 60%, 85 years and older: 60%), or to have telehealth visits (NHATS: 65–74 years: 53%, 75–84 years: 59%, 85 years and older: 68%).

5.3.4. Managing Finances

Going online to pay bills and do banking is common among most young-old and old-old respondents (NHATS: 70–74 years: 73%, 75–84 years: 57%). When "send or receive money" was added to the question, more young-old and old-old go online to do banking, pay bills, and/or send or receive money (HRS: 65–74 years: 75%, 75–84 years: 61%). Of the age cohorts, the oldest-old age group (Qualtrics: 55%) reported going online several times a month or more to check financial information compared to young-old (Qualtrics: 47%) and old-old (Qualtrics: 52%). Most older adults do not go online to manage their Social Security account (Qualtrics: 65–74 years: 70%, 75–84 years: 80%, 85 years and older: 80%).

5.3.5. Social

The majority of older adults go online for instant messaging, text messaging, or emailing (HRS: 65–74 years: 88%, 75–84 years: 70%, 85 years and older: 51%). Almost all older adults report going online to send or receive emails (Qualtrics: 65–74 years: 97%, 75–84 years: 96%, 85 years and older: 99%), with most reporting that they go online several times a week or more for emailing (Qualtrics: 65–74 years: 76%, 75–84 years: 72%, 85 years and older: 85%). The majority of older adults do not go online to use instant messaging or other chat programs (e.g., WhatsApp; Qualtrics: 65–74 years: 51%, 75–84 years: 63%, 85 years and older: 68%; HRS: 65–74 years: 75%, 75–84 years: 86%, 85 years and older: 94%). Most young-old go online to video chat with family or friends (HRS: 63%, NHATS: 51%) and to read or post on blogs (Qualtrics: 51%, HRS: 62%). Many young-old go online at least once a month or more to video chat (HRS: 48%) and blog (HRS: 55%), whereas the majority of old-old and oldest-old do not go online to video chat (75–84 years: HRS: 53%, NHATS: 52%; Qualtrics: 74%; 85 years and older: HRS: 66%, NHATS: 51%; Qualtrics: 68%) or to blog (75–84 years: HRS: 54%, Qualtrics: 53%; 85 years and older: HRS: 71%, Qualtrics: 56%). The majority of young-old (NHATS: 63%; Qualtrics: 74%) and old-old (NHATS: 55%; Qualtrics: 70%) go online to visit social network sites.

5.3.6. Leisure

The majority of young-old and old-old are going online to visit/"surf" websites (Qualtrics: 65–74 years: 91%, 75–84 years: 88%; HRS: 65–74 years: 82%, 75–84 years: 63%) and are doing this several times a week or more (Qualtrics: 65–74 years: 55%; HRS: 65–74 years: 70%, 75–84 years: 51%). Most young-old and old-old are playing games online (Qualtrics: 65–74 years: 58%, 75–84 years: 55%; HRS: 65–74 years: 67%, 75–84 years: 59%). See Table 3 for ICT activities results.

5.4. Internet Use Benefits

Across the age cohorts, most agreed that using the Internet made it easier to remain connected with others (e.g., reach people, stay in touch, feel connected to friends and family, feel less isolated, and increase the quantity and quality of communication with others). Most young-old and old-old agreed (Qualtrics: 51%, 52%) that using the Internet made it easier to meet new people; however, 68% (Qualtrics) of the oldest-old disagreed. See Table 4 for more information on the benefits of Internet use.

6. Discussion

Guided by SST and UGT, we examined ICT access and use (aspects of digital inclusion) for older adults and how they may vary across older adult age groups. We examined these topics across three US national samples of older adults—which few other researchers have done—providing a more extensive descriptive epidemiology of ICT access and use than exists in prior research. We found that older adults, as a cohort, own and use different types of ICTs, such as desktop computers, laptops, or cellphones (including smartphones). They use these ICTs for various purposes online, such as searching for information, banking, medical/health reasons, and for socializing. Many older adults go online daily, although there are variations depending on the dataset/sample and the type and frequency of activities they do online. However, for older adults, we don't see the same levels of access and use as have been previously reported for younger groups and adults in general (Faverio, 2022).

Most of the older adults in these studies reported spending an average of 2–3 hours online per day (Qualtrics, HRS), but few reported being constantly connected (Qualtrics: 65–74 years: 19%, 75–84 years: 11%,

Table 3. ICT activities.

Qualtrics 2017				HRS 2020				NHATS 2021			
	65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years
Shop or Purchase Services											
Shop or order products or services	**85%**	**82%**	**84%**	Make a purchase or shop	**77%**	**60%**	**40%**	Shop for groceries or personal items	**61%**	**53%**	**48%**
Several times a week or more	13%	9%	10%	Daily	3%	1%	1%				
About once a week	17%	11%	15%	Several times a week	18%	12%	5%				
Several times per month	18%	19%	13%	At least once a month	38%	30%	18%				
Once per month or less	36%	44%	46%	At least once a year	19%	16%	16%				
				Order food or groceries for pick up or delivery	**38%**	**25%**	**24%**				
				Daily	1%	1%	1%				
				Several times a week	7%	6%	6%				
				At least once a month	21%	13%	10%				
				At least once a year	10%	6%	6%				
				Buy event tickets or reserve a table at a restaurant	**38%**	**22%**	**9%**				
				Daily	0%	0%	0%				
				Several times a week	1%	0%	0%				
				At least once a month	9%	7%	2%				
				At least once a year	28%	14%	7%				
				Request a ride via an app (e.g., Uber, Lyft)	**18%**	**9%**	**6%**				
				Daily	0%	1%	0%				
				Several times a week	1%	0%	1%				
				At least once a month	3%	2%	1%				
				At least once a year	14%	7%	4%				

Table 3. (Cont.) ICT activities.

Qualtrics 2017				HRS 2020				NHATS 2021			
	65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years
Medical or Health											
Health-related information for self	**76%**	**76%**	**79%**	Get health information	**84%**	**75%**	**67%**	Personal health information	**54%**	**53%**	**45%**
Several times a week or more	4%	4%	5%	Daily	10%	6%	5%				
About once a week	6%	8%	7%	Several times a week	23%	17%	16%				
Several times per month	10%	14%	11%	At least once a month	36%	35%	32%				
Once per month or less	55%	50%	57%	At least once a year	17%	17%	14%				
Health-related information for others	**60%**	**51%**	**51%**								
Several times a week or more	1%	2%	2%								
About once a week	3%	4%	2%								
Several times per month	7%	7%	6%								
Once per month or less	48%	37%	39%								
Sign up for health insurance	**25%**	**21%**	**22%**	Buy or manage insurance online	**26%**	**18%**	**11%**	Medicare or other insurance	**23%**	**20%**	**18%**
Several times a week or more	1%	1%	0%	Daily	0%	0%	0%				
About once a week	1%	1%	1%	Several times a week	0%	0%	0%				
Several times per month	2%	2%	1%	At least once a month	7%	4%	2%				
Once per month or less	20%	17%	22%	At least once a year	19%	13%	8%				
Manage Medicare account	**30%**	**27%**	**31%**								
Several times a week or more	1%	1%	2%								
About once a week	2%	2%	1%								
Several times per month	3%	1%	3%								
Once per month or less	25%	24%	24%								

Table 3. (Cont.) ICT activities.

Qualtrics 2017				HRS 2020				NHATS 2021			
	65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years
Medical or Health											
Make a doctor's appointment	**26%**	**25%**	**29%**	Talk to doctor or other medical professional, make medical appointments, order prescriptions, or receive personal health care advice	**84%**	**73%**	**66%**	Contact medical providers	**52%**	**41%**	**37%**
Several times a week or more	1%	1%	0%	Daily	2%	2%	1%	Order or refill prescriptions	**43%**	**40%**	**40%**
About once a week	2%	1%	1%	Several times a week	7%	6%	8%	Telehealth	**47%**	**41%**	**32%**
Several times per month	3%	2%	3%	At least once a month	44%	41%	32%				
Once per month or less	21%	21%	25%	At least once a year	31%	24%	24%				
Managing Finances											
Check financial information (e.g., stock quotes, banking, retirement plan)	**69%**	**71%**	**75%**	Do banking, pay bills, send or receive money	**75%**	**61%**	**48%**	Pay bills or do banking	**73%**	**57%**	**47%**
Several times a week or more	23%	24%	33%	Daily	7%	7%	6%				
About once a week	13%	14%	13%	Several times a week	28%	18%	16%				
Several times per month	11%	14%	9%	At least once a month	37%	32%	23%				
Once per month or less	22%	19%	21%	At least once a year	3%	4%	3%				
Complete financial transactions	**65%**	**59%**	**66%**								
Several times a week or more	10%	9%	16%								
About once a week	13%	11%	9%								
Several times per month	16%	18%	14%								
Once per month or less	26%	22%	28%								
Manage Social Security account	**30%**	**20%**	**20%**								
Several times a week or more	2%	1%	1%								
About once a week	1%	1%	2%								
Several times per month	2%	2%	1%								
Once per month or less	25%	17%	16%								

Table 3. (Cont.) ICT activities.

Qualtrics 2017				HRS 2020				NHATS 2021			
	65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years
Social											
Use instant messaging or chat programs	**49%**	**37%**	**32%**	Send or receive instant or text messages or emails	**88%**	**70%**	**51%**	Send or receive emails or texts	**81%**	**68%**	**45%**
Several times a week or more	18%	12%	8%	Daily	56%	35%	19%	Most days	68%	61%	48%
About once a week	7%	5%	2%	Several times a week	23%	24%	18%	Some days	22%	24%	30%
Several times per month	9%	5%	9%	At least once a month	7%	9%	10%	Rarely	10%	15%	22%
Once per month or less	15%	15%	13%	At least once a year	2%	2%	4%				
Send or receive an e-mail	**97%**	**96%**	**99%**	Use chat apps (e.g., WhatsApp, Snapchat)	**25%**	**14%**	**6%**				
Several times a week or more	76%	72%	85%	Daily	6%	3%	1%				
About once a week	9%	10%	5%	Several times a week	6%	4%	2%				
Several times per month	6%	6%	7%	At least once a month	7%	3%	2%				
Once per month or less	6%	7%	2%	At least once a year	6%	5%	2%				
Make video phone calls (e.g., Skype, FaceTime)	**28%**	**26%**	**32%**	Connect face-to-face with family and friends using an app	**63%**	**47%**	**34%**	Visit with family or friends on video calls	**51%**	**48%**	**49%**
Several times a week or more	4%	4%	2%	Daily	6%	3%	4%				
About once a week	5%	2%	4%	Several times a week	15%	10%	5%				
Several times per month	5%	3%	4%	At least once a month	27%	20%	12%				
Once per month or less	14%	17%	22%	At least once a year	15%	14%	13%				
Participate in groups emails	**34%**	**29%**	**30%**								
Several times a week or more	8%	7%	7%								
About once a week	7%	5%	4%								
Several times per month	6%	4%	7%								
Once per month or less	14%	13%	13%								

Table 3. (Cont.) ICT activities.

Qualtrics 2017				HRS 2020				NHATS 2021			
	65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years
Social											
Read or post to a blog	**51%**	**47%**	**44%**	Write or read blogs, reviews, ratings, or comments	**62%**	**46%**	**29%**				
Several times a week or more	19%	16%	10%	Daily	19%	12%	5%				
About once a week	10%	10%	10%	Several times a week	20%	16%	11%				
Several times per month	8%	8%	7%	At least once a month	16%	13%	8%				
Once per month or less	14%	14%	17%	At least once a year	7%	5%	5%				
Use Facebook (at least occasionally)	**74%**	**70%**	**56%**	Access a social network site (e.g., Facebook, Twitter, Instagram)	**67%**	**46%**	**34%**	Visit social network sites	**63%**	**55%**	**47%**
				Daily	41%	23%	14%				
				Several times a week	17%	14%	10%				
				At least once a month	7%	7%	8%				
				At least once a year	3%	3%	2%				
				Use other social media (e.g., LinkedIn) to network with people	**21%**	**11%**	**7%**				
				Daily	3%	1%	1%				
				Several times a week	4%	2%	1%				
				At least once a month	7%	4%	3%				
				At least once a year	8%	4%	2%				
				Take or share photos and videos	**80%**	**60%**	**45%**				
				Daily	6%	3%	2%				
				Several times a week	25%	15%	9%				
				At least once a month	34%	28%	20%				
				At least once a year	14%	13%	14%				

Table 3. (Cont.) ICT activities.

Qualtrics 2017				HRS 2020				NHATS 2021			
	65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years
Leisure or Hobby											
Look around or surf the web	**91%**	**88%**	**87%**	Visit websites or surf the Internet	**82%**	**63%**	**43%**				
Several times a week or more	55%	46%	35%	Daily	46%	27%	17%				
About once a week	11%	13%	15%	Several times a week	24%	24%	12%				
Several times per month	12%	11%	15%	At least once a month	9%	9%	9%				
Once per month or less	13%	18%	22%	At least once a year	2%	4%	6%				
Play games	**58%**	**55%**	**47%**	Play games or do puzzles	**67%**	**59%**	**53%**				
Several times a week or more	37%	38%	32%	Daily	31%	27%	24%				
About once a week	6%	5%	5%	Several times a week	16%	13%	15%				
Several times per month	5%	5%	4%	At least once a month	11%	11%	7%				
Once per month or less	11%	8%	6%	At least once a year	9%	7%	7%				
Use streaming services (e.g., Netflix, Hulu, Amazon Prime Video, YouTube)	**49%**	**31%**	**30%**	Watch videos on sites like YouTube or Netflix	**78%**	**53%**	**34%**				
Several times a week or more	17%	9%	9%	Daily	23%	15%	7%				
About once a week	10%	6%	4%	Several times a week	30%	16%	12%				
Several times per month	8%	6%	4%	At least once a month	18%	16%	9%				
Once per month or less	14%	10%	13%	At least once a year	6%	5%	6%				
Listen to music using an app (e.g., Spotify, Pandora)	**36%**	**21%**	**21%**	Listen to music, radio, or podcasts	**83%**	**69%**	**58%**				
Several times a week or more	10%	4%	6%	Daily	38%	28%	26%				
About once a week	5%	2%	1%	Several times a week	29%	23%	19%				
Several times per month	6%	5%	2%	At least once a month	12%	13%	10%				
Once per month or less	14%	9%	11%	At least once a year	5%	5%	3%				
Listen to podcasts or radio	26%	17%	22%								
Several times a week or more	4%	3%	4%								
About once a week	5%	2%	3%								
Several times per month	4%	4%	3%								
Once per month or less	13%	8%	12%								

Table 3. (Cont.) ICT activities.

Qualtrics 2017				HRS 2020				NHATS 2021			
	65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years
Leisure or Hobby											
Family history and genealogy	**26%**	**27%**	**34%**	Read books	**66%**	**62%**	**54%**				
Several times a week or more	3%	3%	5%	Daily	22%	24%	25%				
About once a week	2%	2%	2%	Several times a week	15%	15%	16%				
Several times per month	4%	2%	1%	At least once a month	17%	14%	8%				
Once per month or less	18%	20%	25%	At least once a year	12%	8%	5%				
Visit websites created by family or friends	**54%**	**54%**	**64%**								
Several times a week or more	22%	21%	20%								
About once a week	10%	13%	10%								
Several times per month	8%	7%	11%								
Once per month or less	16%	15%	22%								
Day-to-Day Information											
News, sports, or weather	**56%**	**59%**	**53%**	News and other information updates	**84%**	**73%**	**73%**				
Several times a week or more	18%	22%	14%	Daily	49%	39%	39%				
About once a week	9%	9%	9%	Several times a week	24%	21%	21%				
Several times per month	6%	7%	6%	At least once a month	9%	10%	10%				
Once per month or less	22%	21%	24%	At least once a year	3%	3%	3%				
				Check the weather	**91%**	**81%**	**75%**				
				Daily	58%	52%	48%				
				Several times a week	24%	21%	15%				
				At least once a month	8%	7%	7%				
				At least once a year	2%	1%	5%				

Table 3. (Cont.) ICT activities.

Qualtrics 2017				HRS 2020				NHATS 2021			
	65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years
Day-to-Day Information											
				Get information about local neighborhood events	**76%**	**66%**	**58%**				
				Daily	21%	18%	19%				
				Several times a week	22%	22%	16%				
				At least once a month	24%	18%	15%				
				At least once a year	8%	7%	8%				
				Get directions or traffic information	**81%**	**63%**	**46%**				
				Daily	9%	6%	2%				
				Several times a week	24%	15%	10%				
				At least once a month	35%	28%	17%				
				At least once a year	13%	15%	17%				
Make travel arrangements	**49%**	**42%**	**62%**	Manage travel or hotel	**47%**	**30%**	**14%**				
Several times a week or more	2%	1%	2%	Daily	0%	0%	0%				
About once a week	2%	1%	1%	Several times a week	1%	0%	0%				
Several times per month	4%	4%	7%	At least once a month	6%	3%	1%				
Once per month or less	41%	36%	53%	At least once a year	41%	26%	13%				
Search for information (e.g., hobbies, movies, recipes)	**77%**	**73%**	**73%**	Search for ideas (e.g., recipes, patterns)	**83%**	**70%**	**54%**				
Several times a week or more	15%	12%	9%	Daily	18%	10%	6%				
About once a week	14%	14%	10%	Several times a week	29%	22%	14%				
Several times per month	16%	13%	18%	At least once a month	25%	24%	18%				
Once per month or less	32%	34%	37%	At least once a year	11%	14%	16%				

Table 3. (Cont.) ICT activities.

Qualtrics 2017				HRS 2020				NHATS 2021			
	65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years		65–74 years	75–84 years	85+ years
Day-to-Day Information											
				Use as an alarm clock, timer, or calendar	**81%**	**71%**	**61%**				
				Daily	42%	34%	33%				
				Several times a week	23%	19%	16%				
				At least once a month	12%	13%	9%				
				At least once a year	5%	4%	4%				
				Use a home assistant (e.g., Amazon Echo, Google Home)	**36%**	**30%**	**23%**				
				Daily	10%	10%	6%				
				Several times a week	9%	8%	6%				
				At least once a month	3%	3%	4%				
				At least once a year	64%	70%	77%				
				Write notes, take surveys, or fill out forms	**74%**	**64%**	**56%**				
				Daily	14%	11%	11%				
				Several times a week	17%	16%	14%				
				At least once a month	27%	24%	19%				
				At least once a year	17%	14%	12%				
				Apply for jobs online	**5%**	**1%**	**1%**				
				Daily	0%	0%	0%				
				Several times a week	1%	0%	0%				
				At least once a month	1%	0%	0%				
				At least once a year	2%	1%	0%				
				Track your steps, exercise, or personal fitness	**43%**	**30%**	**31%**				
				Daily	15%	8%	10%				
				Several times a week	13%	10%	11%				
				At least once a month	10%	7%	7%				
				At least once a year	6%	5%	3%				

Note: Activities bolded are the percent that do the activity.

Table 4. Benefits of Internet use.

Qualtrics 2017	65–74 years (Young-old)	75–84 years (Old-old)	85+ years (Oldest-old)
Makes it easier to get the information I need	96%	97%	96%
Contributes to my ability to stay in touch with people I know	84%	86%	92%
Makes it easier for me to reach people	82%	83%	88%
Makes it easier to get the health information I need	81%	80%	80%
Helps me feel more connected to friends and family	79%	82%	91%
Increases the quantity of my communication with others	75%	76%	82%
Makes me feel less isolated	71%	78%	76%
Helps me to manage my finances	69%	64%	71%
Makes it easier to meet new people	51%	52%	32%
Improves my health	46%	42%	42%

Note: Table 4 reports responses from participants who agreed or strongly agreed.

85 years and older: 10%). Though older adults are using ICTs at higher levels than in prior times, their use is likely to remain different than that of younger age groups due to their life stage, as would be predicted by SST (Carstensen, 1993, 1998, 2006). We suggest that these differences are to be expected and do not mean that older adults are not digitally included. Older adults possess and use ICTs for numerous purposes; however, there are online activities in which the majority of older adults are not engaging, such as ordering food, applying for jobs, or maintaining personal fitness. Importantly, older adults reported that their Internet access and use are beneficial in their daily lives. Internet use has contributed to their ability to find information, stay connected with family and friends, feel less isolated, and accomplish things that are important to them. This is consistent with the social integrative and affective integrative needs which are addressed through ICT use based on the UGT (Aarts, 2018; Baecker et al., 2014; Jung et al., 2017; Katz et al., 1973; Sheldon et al., 2021; Sinclair & Grieve, 2017).

While the types of ICTs owned and used and the main purposes of their use were similar across the age cohorts, there was variation in the rates of ownership and use across cohorts. Young-old had higher device ownership for a wide range of devices. As individuals age, their desire and reasons for using ICTs may likely diminish. For older adults to be digitally included, they need to have access to ICTs, affordable Internet access, devices that meet their needs and that they can use effectively, access to digital literacy training, support when technology fails, and support when they have problems using their devices.

7. Limitations

In this study, we examined various aspects of digital inclusion—ownership, use, and related aspects of ICTs—across three national US datasets. Data collection ranged from 2017 to 2021, with one study utilizing data collected via an online sample of Internet users and the other studies collecting data via telephone and/or in-person surveys. Rates of ownership and use varied across the three datasets, suggesting that the type of sample and the mode of data collection matter in relation to ICT measures. The Qualtrics online sample reported higher rates/scores on most indicators, compared to the other samples. Given that they were all Internet users in the Qualtrics sample, it is not surprising that they reported higher rates/scores. Unfortunately, the three datasets varied considerably in how they assessed ICT use and access; while we attempted to compare "apples to apples," the variability in measures makes this challenging. Unfortunately, national datasets that include nuanced measures of ICT use and purpose are rare (Cotten, 2021). Future studies should include measures that can better assess the type, amount, use, timing, and changes in the use of ICTs over time for older adults (Cotten et al., 2011). In addition, questions asked should include one ICT device or use, rather than multiple items combined into one question. For example, NHATS does not differentiate between a cellphone and a smartphone; however, as we see with the HRS and Qualtrics data, there are differences between smartphone and cellphone ownership and use across the age cohorts. While this study was descriptive in nature, it has provided insights into how access and usage vary across older age groups. Future studies are needed that examine factors that are associated with digital inclusion and use levels across various age groups of older adults.

8. Conclusions

Though reports of being constantly connected online may be increasing for younger age groups, few older adults report being constantly connected and may not desire this constant connection. As SST suggests, as individuals age their preferences for connection and how they spend their time often change. We suggest that many older adults are still digitally included even though their usage rates and levels may be lower than those of younger age groups. Digital inclusion is a social construct that has different, nuanced, meanings for different

groups. It behooves us to continue to examine how older adults are digitally included and how this may be changing over time.

Conflict of Interests

The authors declare no conflict of interests.

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Commentary

Managing Accessibility Conflicts: Importance of an Intersectional Approach and the Involvement of Experiential Experts

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Abstract
In this commentary, I reflect on how digital communication technology and products are both an opportunity and a threat to the inclusion of disabled people. Drawing on my personal and professional experiences with research and user-led empowerment projects, I argue that a life course intersectional approach, together with early involvement of disabled people in technology and product development, may prevent accessibility conflicts and further participation and inclusion.

Keywords
accessibility conflicts; age; de-ableism; disability; life course intersectional approach

Issue
This commentary is part of the issue "Expanding the Boundaries of Digital Inclusion: Perspectives From Network Peripheries and Non-Adopters" edited by Rob McMahon (University of Alberta), Nadezda Nazarova (Nord University Business School), and Laura Robinson (Santa Clara University).

1. Introduction

Digital technology and media offer both opportunities and threats to disabled citizens. New media and technology may enable disabled people to conduct activities more efficiently and effectively, but they may also exclude them; disabled users can either not reap the benefits of new media technology altogether or do so with more difficulty than other citizen groups (Scholz et al., 2017). Opportunities and threats are informed by societal views on—and treatment of—disabled people in general and by how disability is treated in media technology development in particular. Disability is still largely viewed in society as an individual problem that is best overcome. Disabled citizens are expected to try their best to participate "normally" in society alongside their able-bodied peers. Accommodations tend to be made *after* the occurrence of participation problems.

Digital products and services tend to be developed for everyone, that is, the "reference man"—the able-bodied, able-minded, heterosexual, right-handed, middle-class White male in his prime who serves as the standard in product and service development (Mogendorff, 2022). Although disability is not considered in technology development as a matter of course, disabled people may, depending on their specific impairments, skills, characteristics, and circumstances, be able to use ableist (digital) technology "normally," use the technology with difficulty, or not be able to use the technology altogether. If disabled people encounter problems, software and devices may be adapted and informed by accessibility guidelines; alternatively, disabled citizens may apply for adaptations tailored to their individual circumstances.

In the last decades, inclusion is increasingly viewed as a two-way process. Instead of disabled people having to adapt to able-bodied society one-sidedly, the UN Disability Rights Convention obligates governments to ensure that disabled citizens may participate in online and offline society on equal terms with able-bodied citizens, e.g., by adapting existing ableist legislation, ensuring that (semi)-governmental institutions are truly accessible to disabled citizens, and providing subsidies for inclusion initiatives of organizations and businesses (United Nations, 2006).

Problems with digital inclusion are important to address particularly because public administration–citizen, business–consumer, and social interaction is

nowadays largely digital in nature. For instance, a problem with digital inclusion is the conditions for access to one's digital identity (commonly referred to as DigiD). Dutch citizens need their unique DigiD to exercise their citizens' rights and duties. It is increasingly difficult to pay taxes and access public education and healthcare services without a DigiD. This is a problem for citizens who are judged legally incompetent due to illness or disability; they and their guardians cannot (easily) obtain and access DigiD and it takes time to adequately address these problems (Netherlands Court of Audit, 2023).

An instrument deployed to promote (digital) inclusion is specific funding schemes that focus on (online) societal participation of disabled citizens. For example, in 2019, I acquired, together with others, funding to co-develop with media and experiential experts a digital Dutch free-learning multimodal module about aging with lifelong or longtime disabilities. This module is called Aging Well With a Longtime Disability (Goed Ouder worden met een langdurige beperking in Dutch). A condition for funding was that experiential experts were involved and had a say in the project from design to implementation. This user-led empowerment project by and for aging disabled people was conducted in 2020 during the Covid-19 pandemic. Disabled people as experiential experts were digitally involved in all project phases and on all levels from co-designer to project leader. The involvement in all phases and on all levels of experiential experts ensured that experiential knowledge of aging with a disability was incorporated in the resulting free digital learning module; this module is in Dutch only and may be accessed at https://www.ouderwordenmeteenbeperking.nl.

It is useful to address problems at the intersection of disability and age because the problems aging disabled citizens encounter differ significantly from the problems disabled citizens in general face and the problems of aging able-bodied citizens. For one, disabled people who age with a disability generally have more impairments at an earlier age than their peers who acquire impairments only with age. Co-morbidity tends to complicate (digital) participation (Kemp & Mosqueda, 2004). It also matters when during the life course one becomes disabled, if you become disabled while of working age you need to be digitally included in work life, if one acquires a disability after retirement digital participation needs and problems are different (see also Scholz et al., 2017).

Despite good initiatives, such as the aforementioned Aging Well With a Longtime Disability project, there is still much work to be done before society is adequately inclusive. An underlying barrier to offline and online participation and inclusion is ableism. Ableism is deeply ingrained in culture and society; the omnipresence of buildings, hardware, and online and offline services that are not adequately inclusive shows how much able-bodiness and able-mindedness are taken for granted. Moreover, ableism is often quite explicitly expressed. For instance, as a visibly disabled postdoctoral researcher, I questioned in-person Dutch public servants about public commissioning and accessibility before ratification by Dutch parliament of the UN Disability Rights Convention in 2016: "It [the building] is already accessible [current legal accessibility requirements have been followed]"; and: "It is too expensive to make everything accessible in keeping with the Convention"; "Not everything [buildings or services] needs to be accessible"; "It does not make sense to make a building accessible when disabled people cannot reach the building anyway."

Underlying public servants' ableist stances is the consensus that (digital) services and buildings that are primarily designed for disabled citizens need to be accessible, but opinions differ on the matter when disabled citizens are not the imagined primary users of the service or building. Moreover, some public servants seem to imply that independent access—disabled citizens can enter public buildings and use (digital) services housed in the building without needing to ask for assistance—is not necessary by saying that disabled people may ask for help or bring help with them (see also Mogendorff, 2021). Poorly accessible buildings are problematic concerning digital participation and inclusion particularly when they house hardware and services disabled citizens need to be able to participate digitally in society, e.g., libraries and (semi)public service organizations that provide on-location (free) access to Internet, specialized software or services, or in-person support for citizens who find it difficult to access online services and social benefits.

Another problem is that disability tends to be treated in mainstream societal discourse, policies, and practices as a master identity that overshadows everything else (Mogendorff, 2021, 2022). While nature and severity of impairment may affect (digital) participation and inclusion in an ableist society, two persons with the exact same impairments may be limited in their participation in digital society in different ways. Disabled people's life history and other social characteristics such as gender, socioeconomic position, age, and educational level may have a greater impact on access to and use of digital technology and media than disability (Gopaldas & DeRoy, 2015).

I will elucidate the latter with an example of how the life history and different social characteristics of a disabled participant intersect in a digital project I was involved in as a project lead in 2006–2007. This project focused on the empowerment and digital inclusion of resident councils of nursing homes. The elderly members of the councils generally had age-related impairments. I found that a higher educated project participant and former manager in her 70s had more to learn about Internet use than her practical educated non-manager peers. When she was employed as a manager, she had a secretary who took care of her communication and correspondence. She was pensioned in the 1990s when Internet use and digital technology were not as omnipresent as

they are today. Consequently, she hadn't felt the need to learn how to use the Internet but was motivated to learn to do so in her 70s to become a more effective council member. Thus, in this case, digital literacy and, with that, digital participation partly depends on the participant's specific life course, which is marked in part by privilege; relatively few Dutch women born in the 1930s were managers. It is also relevant that this participant mostly lived and worked in the pre-Internet era. Her impairments did not significantly affect her use of the Internet during the project other than that she had to enlarge everything on the screen and that everything had to be translated from English to Dutch, including English terms that are adopted in the Dutch language such as "downloading." Like other participants in their 70s or older, she had not been taught English in school. This example highlights that life course and the times in which one is educated and socialized may affect digital participation alongside disability and other social characteristics such as educational level.

Given that disabled people have very diverse backgrounds, impairments, and characteristics, there are significant ingroup differences in digital participation and inclusion of disabled citizens (Gopaldas & DeRoy, 2015; Tsatsou, 2020). Given the many characteristics and circumstances that may influence disabled citizens' access and use of digital technology, an intersectional approach and life course approach is warranted. An intersectional approach means that one does not single out one social characteristic of digital media users such as disability, but considers how different characteristics of actual people—such as disability and age—may intersect and subsequently affect digital media use. An intersectional approach may provide insight into how participation and inclusion may best be promoted for different subgroups, e.g., for higher-educated young disabled women, practical educated middle-aged disabled men, etc.

A life course approach is helpful in addition to an intersectional approach for two reasons. Firstly, deprivation and privilege tend to be cumulative in nature across the life course. People's educational and social deprivation and privilege throughout one's life span may affect the knowledge, skills, and motivation necessary for digital participation in the present and in the future. Secondly, as the provided example shows, it matters in what media and technology era people have been socialized. The digital literacy of disabled citizens in their 70s in 2023 is likely to differ from the digital literacy of disabled citizens who were in their 70s back in 2006. Over time there are changes in school curricula, legislation, norms, and technology that may affect (digital) participation and inclusion.

Additionally, providing an opportunity to use digital technology for different subgroups in the present is not enough to ensure durable equal participation and inclusion. People, concepts, and media tend to evolve. Access to and usage of media can be lost, e.g., when media develop in ways that are no longer compatible with users' abilities and impairments. For instance, the shift from text-based online communication to multimodal communication poses both opportunities and challenges for deaf/Deaf digital media users: opportunities because multimodal video-based communication enables Deaf people to communicate in sign language with other Deaf people while text-based digital communication does not; it is also a challenge because video-based communication with hearing people is not subtitled as a matter of course, whereas text-based online participation does not require subtitling.

Moreover, voluntary or involuntary non-use of technology may become more problematic over time. When usage of a new medium becomes normalized, as is the case with the aforementioned DigiD, non-use becomes increasingly difficult particularly when older media infrastructure gets removed from the public sphere, e.g., the institutional processing of paper forms is increasingly discontinued and the once omnipresent public phone booth in the Netherlands is now a museum piece. The continuous evolvement of media and its infrastructure implies that facilitating digital participation and inclusion is an ongoing effort that requires the involvement of disabled people.

2. The Importance of Early Involvement of Experiential Experts: Avoidance of Conflicts

An intersectional life course approach is most effective when experiential experts are involved from design to implementation, if they are involved later in the process—e.g., in the implementation phase, most decisions are already made. Although it is an established insight that stakeholders and users should be asked for their input from the start, their voices are not typically included (Oudshoorn & Pinch, 2005). In part, this may be due to power imbalances. The ableist attitude or "blind spot" of many design professionals may also play a part in that professionals may see themselves as adequately equipped to represent disabled citizens' perspectives in the design process (Oudshoorn & Pinch, 2005; Tsatsou, 2020).

The added value of involving disabled citizens with diverse impairments and backgrounds from design to implementation is that it makes it more likely that (potential) accessibility conflicts are prevented (Tsatsou, 2020). Accessibility conflicts arise when digital technology supports the participation of one disabled user group but hinders (the interests of) other disabled or non-disabled user groups. An example is the differences in preferences and stakes concerning working online or offline.

People like me who have visible neuromotor impairments may prefer everyday online meetings for routine work-related purposes because online one does not experience locomotion problems or stigma associated with impairment visibility. The dependence on online communication during the Covid-19 lockdowns felt like levelling the playing field for me; I did not have to spend

more energy on mobility than able-bodied peers and, consequently, could attend more conferences and activities. More importantly, our interaction was less affected by the visibility of impairments—or not affected at all. However, other able-bodied or disabled people may prefer offline meetings for various reasons, e.g., because one misses basic stimuli online such as seeing one's audience. These differences in preferences, stakes, and needs when it comes to online working together may, if left unaddressed, cumulate in conflicts—conflicts that may, at least in part, be prevented if one does not treat disability as a monolithic whole, but as the diverse category it actually is.

Diversity may be managed by committing to giving disabled and non-disabled user groups a real say in technology and service development from design to implementation. This requires more than dialogue or listening to non-dominant voices; it requires clear ex-ante agreement between involved stakeholders on how experiential knowledge is evaluated and incorporated into technology development (Romsland et al., 2019).

To conclude, every change in media technology in ableist society creates new opportunities *and* new potential problems for everyday (digital) participation and inclusion of disabled citizens. The ongoing involvement of experiential experts from different impairment groups and backgrounds in all development phases of new digital technologies, products, and services informed by a life-course intersectional approach may contribute to less accessibility conflicts and, with that, greater participation and inclusion.

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Conflict of Interests

The author declares no conflict of interests.

About the Author

Karen Mogendorff (PhD) is a Dutch disability scholar with a background in anthropology, communication science, and STS. Her work focuses on understanding and increasing societal participation of disabled people through the use of experiential knowledge alongside professional and scientific knowledge in research and product development.

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Article

The Power of Emotions: The Ethics of Care in the Digital Inclusion Processes of Marginalized Communities

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Abstract
Digital inclusion research has focused on the conditions, practices, and activities necessary to ensure that all individuals and communities, including the most marginalized populations, can access and use digital technologies. The complexities of Internet appropriation that enable digital inclusion have traditionally been approached from a macro-level perspective that focuses on access infrastructure policies. Although motivations and social, economic, and cultural capital have been part of the analysis at the individual level, there are still questions about how this process unfolds at the community level. Specifically, little is known about how dynamics and interactions among marginalized groups with weaker online skills and limited Internet access influence technological appropriation. The ethics of care offers complementary insights into this phenomenon, allowing scholars to look at how emotions can trigger actions that lead to the technological involvement of those on the digital periphery. Drawing on 71 in-depth interviews conducted in person with Internet users in 16 rural and urban communities in Chile, we discuss how care sets the stage for organizing, helping, and teaching others. Our results show that emotions such as empathy, powerlessness, and frustration were vital to giving and receiving forms of care that facilitate digital activities. The findings also suggest that digital assistance is more prevalent in tightly-knit marginalized communities with more trusting communication patterns.

Keywords
digital inclusion; emotions; ethics of care; Internet; rural communities; urban communities

Issue
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1. Introduction

Digital inclusion research has focused on the conditions, practices, and activities necessary to ensure that all individuals and communities, including marginalized populations, have access to and use digital technologies (National Digital Inclusion Alliance, 2017). A strong line of earlier research has focused on how people’s social relationships and networks are key factors in the distribution of digital resources that can be used to meet their needs (Mesch, 2012; Straubhaar, 2012). However, the complexities of the process mainly impact groups with weaker online skills or limited technological access, such as dated devices or unreliable Internet signals that lead to fraught online experiences (Donner, 2015). These relational theoretical perspectives could be strengthened by considering how emotions, values, and moral practices shared by community members could trigger actions that increase the digital involvement of those left behind. Members of communities that have been deprived of economic, social, or cultural opportunities develop emotions such as frustration or a sense of empathetic

responsibility and care for one another (Nemer, 2018). Research has shown the importance of people who act as intermediaries—also called digital brokers (Katz, 2010)—in developing online skills and confidence. For example, formal and informal leaders in communities, neighborhoods, and families often provide key help and assistance (Francis et al., 2018). However, there is still a need to deepen our understanding of the role of emotions in giving and receiving digital help within communities.

The ethics of care, a concept rooted in moral philosophy and feminism, and characterized by a concern for building and sustaining individual welfare and good relationships, offers theoretical insights into the role of digital inclusion in marginalized communities (Slote, 2007). This framework sheds light on how situations or contexts can elicit emotions and empathy among community members that contribute to the development of relationships by connecting with others and providing and receiving care (Ciulla, 2009). Given that care "begins with an assumption of human connectedness" (Tong, 1998, p. 131), the emotions experienced by community members form the basis for triggering the ethics of care and the creation-maintenance of networks in communities where digital technologies are facilitators. This perspective focuses on how and why people help, listen to, and connect with others (Gilligan et al., 1994). The theoretical underpinnings of this study combine the ethics of care and digital inclusion to contribute to the understanding of how care sets the stage in the digital arena for connecting, organizing, helping, and teaching others. In this article, we explore the role of emotions in digital inclusion processes through the lens of the ethics of care based on 71 in-depth interviews conducted in person with Internet users in 16 rural and urban communities in Chile.

This study contributes to the existing literature on digital inclusion by examining the intersection of the ethics of care and digital adoption within marginalized communities. Unlike the conventional one-to-one approach employed in the ethics of care, it extends to a meso level. As such, it considers the social and economic context, perspectives, and experiences of communities, recognizing them as crucial factors in understanding their approaches to technology. This study is situated in the aftermath of the Covid-19 pandemic, which also informs how these communities are impacted in terms of seclusion and emerging digital needs. By considering such experiences, this article expands the current understanding of digital inclusion by examining the role of emotions, care, and the community's socio-economic capital in a vulnerable community context, offering valuable perspectives and contributing to the literature in this field.

2. Theoretical Framework

2.1. Social and Digital Inclusion

Given that digital inequalities mirror structural social inequalities, much of the literature on digital inclusion has relied on relational or network approaches to explain the distribution of different types of resources, including digital technology appropriation and its outcomes (Helsper, 2021). For instance, van Dijk (2012) proposed the resources and appropriation theory, a relational or resource-based approach to understanding digital inclusion. Van Dijk's main argument is that social inequalities are related to people's social ties and relative position to one another in a given society (see also Wellman & Berkowitz, 1988). This relational framework proposes that people's personal and positional categories in society and the distribution of resources explain digital media access and use. Personal categories are related to individual properties, which are in turn linked to social or identity constructions (e.g., gender, generation). Positional categories refer to people's positions in a community and are based on elements such as their occupation or education. These positions are linked to differences in the distribution of resources or capital, which are defined as the means to reach particular goals. Material and social resources such as social network positions and relationships shape digital media access and use. An earlier study conducted in isolated rural villages in Chile that was based on this same theoretical perspective found that social resources—that is, the presence of children in the household and larger social networks—were the main predictors of digital connection (Correa et al., 2019).

Similarly, based on Bourdieu's (1986) idea that different forms of capital are key to understanding social mobility and inequality, scholars have proposed that economic, cultural, and social capital such as assets, education, and networks are key to understanding the formation of technological capital, that is, technological capabilities and know-how (Straubhaar, 2012). Following similar theoretical inspirations such as network theories and social capital, the social diversification hypothesis (Mesch, 2012) proposes that the geographic and social segregation observed in multicultural societies precludes minority or disadvantaged groups from forging and developing interactions. Computer-mediated or mobile communication provides a platform for overcoming this barrier. This means that the Internet allows members of disadvantaged groups to expand their social circles, activating the bridging function of social capital. This theory also suggests that the Internet helps members of the majority or more powerful groups to maintain their social ties, activating the bonding function of social capital. If we apply this theoretical argument to this study on isolated rural villages that are socially and geographically segregated, we could argue that online connection is key for overcoming isolation, as it is fundamental to understanding the social processes that further digital inclusion.

These frameworks describe and analyze digital inclusion as a complex process that involves more elements than access to infrastructure (see Helsper, 2021). They also acknowledge the fact that users (individuals) are

part of a context compounded by specific social, cultural, and economic elements. In this situated access and use of technologies, social ties are critical to understanding how the digital process unfolds. For example, Francis et al. (2018), who explored how older people cope with technical difficulties, found that older adults reported that they enjoyed asking for help to strengthen their social ties with their families. The emotional support provided by their family members motivated them to incorporate technological devices into their lives. Similarly, Katz (2010) studied how a sense of empathetic responsibility shapes how immigrant children behave as technological brokers in their homes, connecting their families with local and learning resources. These results suggest that the ethics of care provides a useful and underutilized theoretical avenue by considering the role played by emotions, values, and moral practices in analyzing the role of digital inclusion in marginalized communities.

2.2. The Ethics of Care

Four decades ago, feminist theorist Carol Gilligan suggested in the monograph *A Different Voice* that many moral decisions and practices are based on both principles of rights and/or justice and responsibilities and care (Gilligan, 1982). This was the beginning of the development of the ethics of care, an approach that emphasizes the relational and interdependent aspects of human beings and communities (Slote, 2007). Furthermore, it recognizes that individuals are dependent on others during many periods of their lives and that developing caring relationships allows people to live and progress (Held, 2006). The literature shows that in this kind of process, people develop emotions such as frustration or a sense of empathetic responsibility and care for one another (Williams, 2001; Zembylas, 2010). Although the approach focuses on how individuals meet the needs of others who might be more vulnerable by helping, listening, and connecting with them (Gilligan et al., 1994), we are now extending this rationale to the analysis of the process of digital inclusion and the role of technologies as goals or as means to achieving goals.

Although the ethics of care continues to be used as a theoretical framework, it has faced persistent criticism. For example, some scholars have pointed to issues such as the theory's perceived ambiguity and narrow scope of application (e.g., Crigger, 1997; Paley, 2002). However, this approach provides another layer of analysis to look at marginalized and tight-knit communities that have been deprived of economic, social, or cultural opportunities. It also allows scholars to recognize the new opportunities provided by access to and use of digital technologies.

Our work in this field began by looking at how members of communities develop trust, which is a key component of building social capital and forging strong and healthy ties in a community (Purdue, 2001). The ethics of care relies on it, as this perspective values the ties we develop with other individuals as constitutive of part of our identity (Williams, 2001). As such, trust and mutual consideration are basic elements of a caring relationship (Held, 2006).

Similarly, empathy is a precondition of care (Slote, 2007), as feelings play a key role in this process (Pulcini, 2017). Most of the research that has been conducted on the ethics of care has centered on empathy as a crucial factor in the provision and receiving of care (Held, 2006). Following Stein's (1917/1989) seminal work, empathy is defined as involving how we perceive and understand another person. It inspires an arousing feeling in us as we become aware of and acknowledge others' feelings while recognizing the difference between ourselves and other individuals (Gurmin, 2007). While Pulcini's (2017) work relies on empathetic emotions as drivers of care, Held (2006, p. 10) asserts that "even anger may be a component of the moral indignation that should be felt when people are treated unjustly or inhumanely, and it may contribute to (rather than interfere with) an appropriate interpretation of the moral wrong." This negative feeling might eventually trigger care as well. However, Pulcini (2017) tries to move the discussion forward by proposing that different emotions motivate different forms of care, noting that relationships are key to understanding how we care for someone with whom we have a personal connection (e.g., family, friends, neighbors), which is different than caring for unknown people who are vulnerable through, for example, paid, unpaid, or volunteer work. An example of this in the context of technology is Nemer's (2018) work on how community technology centers (CTCs) were used by disadvantaged communities in Brazil. The study showed how CTCs, which were defined as social gathering spaces, promote care among users, workers/owners, and the community. CTC users visit these spaces to access the Internet and develop social ties characterized by empathy, compassion, and solidarity. Students help each other with their homework, workers help users to pay their utility bills, and community members socialize. In other words, the research showed that people did not only use the CTC to access the Internet. Their main purpose in visiting these spaces was to feel that they are part of the community and to give and receive help when necessary. Following this line of research, but on a different scale and context, in this study, we look at the influence of care in the development of digital engagement based on ties among marginalized community members in urban and rural settings. We pose the following research questions related to our exploration of digital inclusion processes in marginalized communities:

> RQ1: How do digital technologies facilitate the process of caring through connecting, organizing, and teaching others?
>
> RQ2: How do people provide-receive care through digital technologies in marginalized communities?

3. Methodology

3.1. Marginalized Communities in Chile

Chile is the longest and narrowest country in the world. It has a population of 19 million and Internet penetration of over 85% (SUBTEL, 2021), one of the highest rates in Latin America (ITU, 2021). This is mostly due to public policies that have promoted geographic coverage and mobile connections. For example, the Telecommunication Development Fund subsidizes mobile connections in lower-income and isolated geographic areas (Digital Regulation Platform, 2020). However, this country's geography presents a challenge for internet access infrastructure and signal quality because its unusual shape does not allow for alternative connection paths (NIC Chile & Universidad de Chile, 2018). Furthermore, the Andes Mountains run alongside the entire country, which makes it difficult to build redundant telecommunications infrastructure. The current design of Chile's infrastructure serves major urban centers rather than rural localities (Galdames, 2021). Despite widespread connectivity, the prolonged periods of confinement experienced during the recent pandemic revealed various challenges related to access and signal quality.

Approaching digital inclusion from a community perspective requires understanding aspects of that community (Geertz, 1973), such as how residents organize, which resources they can access—e.g., public services, transportation, schools, and work—and the advantages and challenges posed by the local geography, which is inevitably linked to the quality of their Internet signal. Although these situations can be measured or reported, experiencing them as a researcher provides a deeper understanding of how participants live their lives. For example, one can truly understand what it means to live in a remote community after spending two and a half hours driving on an unpaved road in the middle of a desert with no internet signal, no other cars in sight, and a complete lack of road signs. Some villages are separated by lakes and connected only by hilly, winding roads. Local residents are forced to pay up to US$10 to ride in a neighbor's car for three kilometers because there is no public transportation for traveling short distances. In the case of urban communities, researchers experienced what it is like to walk through a neighborhood with no street names, fences encircling all of the houses, no children playing outside, and very few people in the streets. This is consistent with how other reports have described what a marginalized urban community looks like in Chile (Rasse et al., 2021; UNDP, 2017). Despite the prevalence of these increasingly lonely marginalized urban neighborhoods in Chile, it is important to acknowledge that this study does not aim to represent all rural isolated or urban vulnerable communities across the country due to its qualitative nature. Instead, its primary purpose is to capture specific and context-bound experiences that can offer valuable insights for addressing the research questions. We chose this perspective in part because social situations and digital decisions are informed by contextual and individual elements that are more easily grasped in the natural environment where they are enacted (Rosenblum, 1987). We conducted face-to-face interviews in an effort to give participants a voice (Kvale & Brinkmann, 2009) and to interact without the mediation of technology—which is important in this case given that the level of sub-par Internet connections and taxing online experiences is one of the topics covered.

3.2. Community Selection and Participant Recruitment

The goal of this study is to address the perceptions and experiences of members of marginalized communities. As such, we selected rural and urban low-income villages with limited access to resources such as the Internet, as the literature suggests that this impacts their broader social and economic spheres (Bagga-Gupta, 2018; Donner, 2015). We traveled to 11 rural isolated communities and five urban neighborhoods throughout northern, central, and southern Chile over nine months in 2022. The selected rural communities gained access to the Internet ten years ago through a private-public policy that subsidized 3G mobile connections in secluded areas with limited or no connectivity.

The five urban centers were chosen in the same regions as the rural villages. These serve as the main urban centers for those communities and play an important role in residents' everyday lives. We relied on socioeconomic information provided by city councils to identify vulnerable neighborhoods in each location (see Table 1).

We used a three-stage ethnographic approach (Bernard, 2006) to recruit participants. First, we scheduled interviews with local leaders such as the presidents of neighborhood and seniors' associations, members of informal youth groups, and teachers who play the role of gatekeepers in these communities. All of them were interviewed in their homes, workplaces, or gathering places. Once in the community, we approached people who worked in local businesses (e.g., grocery stores, restaurants, beauty salons) or in an official capacity as extensions of municipal offices. We then used snowball sampling, asking interviewees to help us access hard-to-reach participants. The goal was to cover demographic-relevant areas that are consistent with the objectives of the study and to ensure that it reflects a diversity of experiences and voices. Thus, participants' characteristics vary in terms of gender, age, and occupation, and they have different levels of Internet access and use. Despite this diversity, we were able to map out their connections to the community, identify patterns, and understand how they interact at the social and technological levels.

3.3. Procedures

This project followed an ethical protocol developed by the institution of the principal researcher (N.015-2021)

Table 1. Communities visited for this project.

	Zone	Geographic area	Economic activity	No. of women	No. of men	No. of children
Locality No. 1	Northern	Rural	Fishing	3	4	2
Locality No. 2	Northern	Rural	Mining	4	1	0
Locality No. 3	Northern	Urban	Mining and agriculture	4	1	0
Locality No. 4	Northern	Rural	Agriculture	6	5	0
Locality No. 5	Northern	Urban	Mining, fishing, and tourism	1	2	0
Locality No. 6	Northern	Urban	Commerce, construction, and mining	2	0	0
Locality No. 7	Central	Rural	Agriculture	3	2	1
Locality No. 8	Central	Rural	Agriculture	4	3	0
Locality No. 9	Central	Rural	Agriculture	0	1	1
Locality No. 10	Central	Rural	Agriculture	1	0	0
Locality No. 11	Central	Urban	Agriculture	1	1	0
Locality No. 12	Southern	Rural	Fishing and tourism	3	1	0
Locality No. 13	Southern	Rural	Silviculture and tourism	2	2	0
Locality No. 14	Southern	Mixed	Silviculture and agriculture	2	3	0
Locality No. 15	Southern	Rural	Silviculture and agriculture	1	1	0
Locality No. 16	Southern	Urban	Silviculture and commerce	1	2	0

which included a signed informed consent form. In the case of minors, the protocol included an informed consent form signed by the participant's parent or guardian and an assent form for the children. The three authors conducted 71 unstructured and semi-structured interviews lasting between 35 and 120 minutes. All of the material was audio-recorded and transcribed. The participants' names and specific locations were omitted to protect their privacy.

Using a hybrid thematic analysis that combined deductive and inductive approaches (Fereday & Muir-Cochrane, 2006), the researchers developed a coding scheme that incorporated the main concepts from the literature and emerging themes from the fieldwork. All transcripts were assigned specific codes based on the main themes and subthemes, which included community and personal access to the Internet, digital routines and struggles, discourses, process, identification of digital helpers or enablers, and emotions related to the process.

4. Results and Analysis

4.1. The Role of Emotions in the Process of Digital Inclusion

Communities can play a key role in addressing conditions such as limited Internet access and related experiences. This is particularly true in rural areas, where villages are recognized for their main productive activity, such as tourism, fishing, forestry, agriculture, and mining. Each community's main productive activity conditions the level of digital access and skills needed by residents. This is also informed by the social context, such as a pandemic, where there is a greater need for information and an increase in physical isolation, which affected normal economic and educational activities on different levels. Furthermore, the experiences of tightly knit rural communities exemplify how emotions such as frustration, rage, compassion, and empathy inspire leaders and neighbors to connect and organize to provide and receive care.

For example, one of the communities included in our study is a fishing village with a year-round population of less than 300. During the summer, people from nearby cities who have built informal cabins and camps on the hill flock to the village. The number of seasonal residents has exploded over the past few years due to the pandemic and lockdowns. At one point, its population tripled in just one year, mainly because people who had left the village returned to spend lockdown periods near the sea. Furthermore, it was common knowledge that regulations were not monitored as carefully there as they were in large cities, so people believed that they would be able to walk around town freely despite the quarantine rules.

The community had limited electricity infrastructure and Internet access as recently as ten years ago. Over time, people have gotten used to the advantages of online activities, especially social media and streaming services. The pandemic changed everything. The population grew from 300 inhabitants to over 2,000, and this had consequences on the connectivity front. In addition to seasonal residents, young people who usually lived elsewhere to attend university and children who

attended school outside of the village returned, as they were forced to continue their education online. This population surge and increased need for digital access impacted the quality and strength of the Internet signal because the town shares a single 3G antenna and has access to only one provider.

This situation affected the majority of the urban and rural locations visited in the context of this study. Participants expressed frustration, claiming that the digital service, which was insufficient most of the time, had become impossible to use. The situation was particularly dire for residents who needed to use the Internet connection to work remotely. For example, Jorge (27) was forced to return to his rural village during his final year of school. He reports that he "gave up" on the engineering program he had enrolled in because he could not connect to Zoom for his classes or download course materials. He even tried to do so late at night when fewer people were online, but it didn't work, so he took a leave of absence. This kind of situation was common among participants, as university students were forced to return to their rural homes due to Covid restrictions and school closures. They expressed how difficult it was to study online because of signal limitations. However, the reasons varied. Urban dwellers tended to hold the government and Internet companies responsible. Others claimed that newcomers were the cause of problem. Jorge's mother shared his frustration: "This is the newcomers' fault….The village doesn't function well with so many people.''

Other participants from rural and agricultural communities, which also received new residents during the pandemic, also reported signal quality issues. The principal of one of the local schools even received requests from residents to share the WIFI password for a signal that was exclusively for the use of local students. In some urban neighborhoods, particularly in the north of the country where the mountains are more prominent, some participants are unable to communicate even by phone, and it could take hours to download WhatsApp and social media messages, forcing people to restart their phones several times a day. The signal problem is even worse when the device is a computer, as in Jorge's case. Although these problems are widespread, only one community organized to take action against the Internet service provider as complaints started to pile up and a shared sense of helplessness and neglect grew. The literature suggests that anger is also a trigger for care because people feel that they have been treated unjustly, interpreting this as morally wrong and seeking to change the situation through care (Held, 2006). In this case, the unbearable connectivity situation was one of the reasons Sebastián (49), a former electricity company worker, decided to run for president of the neighborhood association:

> People feel rage. We have filed class action suits against the company and the telecommunication office over this poor connectivity. We joined forces a year ago, and we have received over 90 refunds. The whole community came together. They weren't paying attention, so we knew we had to do it together.

The evidence shows that empathetic responsibility and care for one another (Williams, 2001; Zembylas, 2010) can trigger this kind of action. Sebastián spends his time going door-to-door to meet with his neighbors, taking note of the issues that they are facing, and helping when needed. Despite the signal problems, he created a WhatsApp group to provide a communal space for sharing messages:

> We have 132 members, almost half of our population. You can list anything you want that could be used to help others, such as fresh bread for sale, good night wishes, a note saying that a puppy is lost…anything.

This group also helped them to organize other actions that can be considered acts of care despite their nature (Gilligan, 1982). For instance, when people started complaining that foreigners were responsible for an increase in Covid cases, the community voted to stop people from entering the village. They built a barrier at the entrance to the town and organized the work required to keep others out through the WhatsApp group. Entire families took day-long turns to stop visitors from coming in.

4.2. Providing and Receiving Care Through Digital Technologies

In the ethics of care literature, empathy serves as a driver to start actions that help others, and through them, acknowledge their experiences, differences, and needs (Gurmin, 2007; Held, 2006; Stein, 1917/1989). In the case of community leaders, identifying digital or technology needs can be a useful tool for organizing previous care work. We observed this dynamic in the case of Elvira (72), a well-known elderly resident of one of a lower-income neighborhoods in southern Chile. As a former president of the neighborhood association, she introduced the street light system and, more recently, led efforts to pave two main streets. She is also part of a WhatsApp group called "Friends With Food." The group is comprised of seven women from the neighborhood between the ages of 66 and 75 who engage in volunteer work in the community. Since the beginning of the pandemic, they have organized meals for neighbors in need, many of them undocumented immigrants living in a camp who are not welcomed by the rest of the community. These women used the WhatsApp group to organize help for them during the public health emergency. This kind of communication and organization was common among neighborhood associations and volunteer groups during the pandemic, particularly in urban communities where tighter restrictions were in place. However, this did not come easy to many of the communal leaders. Susana (53), the president of a union, explains:

> Before the pandemic, people were resistant to using technology like WhatsApp. Most of the leaders are older….We started using Zoom when we were unable to meet face-to-face. I think less than half [of them participated]. I had to call them because to this day not all areas have [Internet] access. All of the work done by social organizations is voluntary, so paying for a connection is a big deal.

Our research found that local leaders' commitment to help others in their urban and rural communities was based on social ties and solidarity (Zembylas, 2010). They reported that it was mostly this kind of connection that fueled their need to adapt to these new challenging circumstances and, when possible, to learn new digital means of communication. Elderly participants with younger family members living close by were more confident than those without digital help when it came to using mobile phones and embracing new platforms like Zoom and Google Meet. As other scholars have pointed out, community actions are fueled by trust and empathy (Held, 2006; Williams, 2001). In this case, considering the needs of others during an uncertain and challenging time like the pandemic has paved the way for the adoption of technology, particularly smartphones. Antonia (68) was drawn to the idea of helping her neighbors but was very much isolated because she was not comfortable using a mobile device: "I don't really know how to use this," says Antonia, showing her smartphone, "my son bought it for me. I didn't find it very useful except for phone calls." This changed when she was invited to join the group "Friends With Food.''

Access to these devices has been fundamental for both rural and urban populations. Many participants reported that most of them did not like being online and preferred face-to-face contact before the pandemic. However, when restrictions were introduced, particularly in urban settings, their desire to care for others in their communities led them to acquire, use, and teach others how to use digital devices. It is clear that their efforts to organize would not have been as effective without this technological assistance.

WhatsApp groups proved very useful to community members. City dwellers tended to use it to sell goods, help older people with their shopping, and share the newest information about restrictions, among other things. Given that most of the community's older residents have trouble using smartphones, some neighbors volunteered to contact them directly. They called them regularly to find out if they needed help with tasks such as buying groceries and applying for government subsidies online. Nearly two years later, most of the WhatsApp groups created because of the pandemic continue to operate, but their scope has expanded to include announcements about a neighbor's small business, church schedules, and local government meetings. The motivation for these group chats—besides maintaining communication with neighbors and disseminating useful information—is clear from the ethics of care perspective, as the participants rely on their own sense of community and empathy (Gurmin, 2007).

Studies have also shown that people ask their families or peers how to use digital devices or go online (Courtois & Verdegem, 2016; Katz, 2010; Katz & Gonzalez, 2016). Laura (48), a rural homemaker who sells breakfast foods, fish, and pies, has two school-aged children and claims to have no digital abilities whatsoever: "I am more of a face-to-face person; I don't get the [smart]phone." At the time of the interview, she and her family had spent almost eight months in seclusion for fear of the coronavirus. She lives with Camilo (10) and Simón (12), who, like other children in the village, were forced to attend school online. Her house is located almost immediately behind another. It has no sewage service and a dirt floor. The main room contains a table with a red plastic tablecloth that brightens up the dark space. The two children share a single chair and computer in one corner:

> They are supposed to go to school in the city. School lasted all day and included free meals. [Points to the computer] My eldest daughter got this from a governmental program.

Laura's eldest daughter, Renata, now lives in a different part of the country and has her own family and life. However, she sends WhatsApp audio messages to her mother to let her know that she needs to apply for financial help from the government digitally and how to use the computer to help her younger siblings: "Renata is the technology-savvy one. She knows how to use all this and how to apply for subsidies. She helped several other people who live here, too." She also uses the phone and WhatsApp audio messages to help her younger brothers, Camilo and Simón. Even with this help, the children fell behind, as the boys did not know what Zoom was or how to find links to connect to their classes without assistance. Furthermore, the screen would routinely freeze due to the poor quality of the signal.

Similarly, when Sebastián set up the WhatsApp group to coordinate care for the community, the group included older people who did not know how to use it: "The kids taught them....Their children, grandchildren, nieces, and nephews all started helping older adults with their cell phones."

Macarena (27) lives 1,200 kilometers away from this village in a farming town in the middle of the Atacama Desert. Like Laura, she is the mother of two school-aged children who live at home. Both reported a similar sense of despair and frustration due to continued fraught experiences with online classes. However, Macarena took the initiative and set up a satellite Internet connection to remedy her children's signal problems. She decided to share the costly service with her neighbors (about 15 families) when they needed it:

> People asked me if they could use it to apply for financial assistance from the government. One family with small children needed it to do their online classes, and I immediately said yes. I gave them the password to get online.

Macarena acknowledges that having people outside her house using her Internet is comforting. Pulcini (2017) identifies this kind of assistance as "care out of love." The emotion that motivates her actions involves caring for someone we are related to, such as her kids and community members. Her neighbors' attitude is also interesting, as Held (2006) points out that the party on the receiving end must be perceived as having reliable intentions and as someone who would not try to take advantage of the help offered. To foster this kind of connection within the community, Macarena's neighbors would ask her permission before using the Internet and would only use it for pressing reasons and not just to stream a movie. In the words of Purdue (2001), this is the crucial component.

Asking for and receiving help is not always an explicit act. As Gilligan et al. (1994) point out, indirect acts such as listening and helping others to connect to the Internet, particularly the most vulnerable members of a community, are also forms of assistance. Reported care is usually expressed as helping by teaching or doing something online for others in the digital arena, as seen in the case of the neighbors' WhatsApp groups. However, facilitating Internet access can lead to other empathetic actions (e.g., Francis et al., 2018). For example, in one central Chilean city, we found an empty shop that still has the cybercafé sign outside. Its owner, Rodrigo (49), a former owner of one of the city's first cybercafés, continues to run his office from there even though the desks that used to hold at least 20 desktop computers and three printers have been empty for almost five years. Rodrigo now sells antennas that double the power of Internet signals in geographically challenging places. His customers include the owner of a factory in the middle of nowhere and a school located between several hills. When he started his cybercafé venture, his focus was the same—to provide Internet access to those who needed it so that people could take advantage of technology:

> I did not see it as a computer business at the time. I knew that people did not have access to computers…so I expected them to acquire digital skills so that our young people would be better prepared when it was time for them to go to university.

This kind of caring and connecting by providing digital opportunities was experienced at the community and extended family levels as well.

5. Discussion and Conclusion

Digital inclusion is a complex process with no linear path from Internet access to online skill development. The circumstances and needs related to these resources are highly dynamic and contextual, and other people are usually involved in the process. We use the ethics of care to analyze this phenomenon in an effort to enrich the academic discussion of the phenomenon. Specifically, we consider the role of emotions in influencing values and moral practices, which in turn may enhance digital development among members of a marginalized community. The questions guiding this article are: (a) How do digital technologies facilitate caring by connecting, organizing, and teaching others? (b) How do people provide-receive care through digital technologies in marginalized communities? We addressed them by combining the ethics of care with the digital inclusion framework in the analysis of 71 face-to-face interviews in 16 communities. We intentionally looked at vulnerable social groups in both urban and rural communities and how they have overcome challenges such as seclusion due to the pandemic, school closings, and economic hardships through empathy and caring. Given that technology can be identified as part of the solution—as it is a key element of responses such as teaching others, creating WhatsApp groups to organize help, or helping with signal access and strength—we consider the role played by emotions as triggers for seeking and providing care through digital means.

The participants' accounts show that Internet access and experiences are highly contextual, as communities imprint some of their main characteristics onto their members' social and technological interactions. These characteristics include living in remote areas, being part of a community that relies heavily on a single economic activity, and facing circumstances such as prolonged confinement due to the pandemic. These situations require individuals to navigate and address emergent digital issues, leading community members to offer and seek out assistance.

Our exploration of access to and use of technology in these communities consistently pointed towards emotions and caring practices. Therefore, we argue that the ethics of care framework allows us to explain some of the technological paths followed by community members. Moreover, it helps us to address the emotions associated with the situation and the instinct to help that characterized some of our subjects' interactions and digital choices. For instance, we found that community members tended to experience feelings of powerlessness, frustration, and empathy. These emotions enhanced their empowerment and led them to seek out digital help, mainly through communication and organization. Thus, both elements were enabled by technologies regardless of challenges such as weak digital skills or low-quality Internet access.

Our findings point to a social situation that triggers an emotion which in turn leads to action—connecting, organizing, helping, or teaching. In the process, which is enabled by technologies, each member involved is strengthened by giving and receiving. For instance, due

to the pandemic, Internet access became essential for rural and urban communities; thus, the ethic of care among its members encouraged technology adoption and digital inclusion (e.g., Francis et al., 2018; Nemer, 2018). Digitally challenged communities provided fertile ground for helping and teaching others through a process that also renewed formal and informal leadership among its members. In some cases, participants offered help even before someone asked for it, which strengthened the communities' social ties (Sweeney & Rhinesmith, 2017).

The data show how various layers and approaches can be explored to disentangle the complexities of technological appropriation, in this case with a focus on emotions. For instance, empathy, compassion, powerlessness, and frustration were critical elements of enacting ethics of care among communities. Furthermore, some applications were adopted across the board despite digital and material inequalities, as is the case of WhatsApp. Their adoption level is related to the characteristics of the communities—i.e., the presence of younger generations. Our findings also support the argument that the role of organizing, helping, and teaching others how to use digital technologies is prevalent in tightly-knit marginalized communities with more trusting communication patterns. Finally, formal and informal leadership was renewed among community members through asking for help and assisting others, strengthening trusting relationships and decreasing the sense of powerlessness. Although these findings cannot be extrapolated to other marginalized communities, the results suggest that the intersection between digital inclusion and the ethics of care can shed new light on the Internet adoption process in vulnerable groups. The combination of approaches facilitated by focusing on more intangible elements such as emotions and caring about others brings the structural and emergent struggles faced by the communities due to changing dynamic contexts into the analysis.

The results also raise questions regarding the development of digital skills among community members. In our study, participants did not exhibit a high level of digital skills, but they had enough knowledge to help others. As a result, future studies should incorporate this aspect. Future research should also consider the exceptional digital needs that arose due to the pandemic and the disruption of participants' daily lives. It may be productive to conduct a study that covers a more extended period or incorporates a quantitative perspective, thus allowing researchers to analyze elements of the interaction such as how learning to trust in others influences individuals' inclination to seek help. A more comprehensive understanding of these dynamics can be achieved by employing a quantitative approach.

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Conflict of Interests

The authors declare no conflict of interest.

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Article

Indigenous Community Networking in Hawai'i: A Case Study

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Abstract
Shaping digital inclusion policy and practice to meet community-defined goals requires more than access to digital devices and connectivity; it must also enable their effective design and use in local settings. For the Nation of Hawai'i, a *Kānaka Maoli* (Native Hawaiian) organization with a land base on the island of Oahu, these activities are closely associated with broader goals of nation-building and sovereignty. In this article, we document how the Nation of Hawai'i is conceptualizing its community networking project as an example of an Indigenous organization's efforts to frame community networks as a means to generate a "sovereignty mindset" among its members, as well as share resources and experience among community members and with other communities in Hawai'i and beyond.

Keywords
community networks; digital divide; digital inclusion; digital inequalities; Indigenous media; Indigenous peoples; Indigenous sovereignty; Native Hawaiians; rural broadband

Issue
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1. Introduction

For hundreds of years, the islands of Hawai'i have served as vibrant communication hubs: Long before European settlers arrived, *Kānaka Maoli* (Native Hawaiians) exchanged information between islands by canoe (Shay, 2018). King Kalākaua had telephones installed in 'Iolani Palace several years before the White House. Today, these activities continue as Hawaiian communities are deploying telecommunications as a component of nation-building, and addressing access and affordability divides that persist in the islands (Maka'awa'awa, 2019; Winter et al., 2014). The Indigenous organization Nation of Hawai'i frames these communications networking initiatives as expressions of Native Hawaiian sovereignty, including in the context of digital connectivity (Morgenstern, 2021). Echoing the spirit of building housing, water, and electrical infrastructure on their land, sovereignty activists are establishing their own Internet systems, answering calls for Indigenous self-determination in the information age in Hawai'i that have been in existence as early as 1995 (Crawford & Bray-Crawford, 1995).

In this context, we contend that the networking activity in the community of Pu'uhonua o Waimānalo contributes to efforts to theorize how "sovereignty" relates to digital data, platforms, and infrastructures, particularly in diverse Indigenous contexts. As Couture and Toupin (2019) discuss, Indigenous scholars and activists relate sovereignty to their larger struggles to reclaim control over lands, bodies, and cultures. They also identify another stream of digital sovereignty linked to social

movements, pointing to examples of free and open-access hardware and software—including decentralized community networks—as efforts to build alternatives to commercial technologies (Antoine, 2020; Beaton & Campbell, 2013; Wemigwans, 2018). A third reading of digital sovereignty relates to values of independence, control, and autonomy, as reflected in the capacities of groups to engage in innovation and technological development and in their attempts to secure ownership and control of digital data and infrastructure (see First Nations Information Governance Centre, 2014; Kukutai & Taylor, 2016; McMahon, 2014; Roth & Audette-Longo, 2018). We build on these observations to demonstrate how sovereignty activists in the Nation of Hawai'i are addressing these issues.

We note that some Indigenous organizations in Canada and the US have built and operated their own digital infrastructure for several decades to serve the development needs of their communities and citizens (see, for example, Carpenter, 2010; Duarte, 2017; First Mile Connectivity Consortium, 2018; McMahon et al., 2014; Roth, 2014; Sandvig, 2012). In rural, remote, and Indigenous contexts, these projects demonstrate infrastructure deployment in areas with a limited case for private sector investment, while retaining community ownership and control of infrastructure and services.

Our focus here is on how the Nation of Hawai'i conceptualized, planned, and implemented a community network. While we include interviews on adoption and use, it is too early in the development process to fully evaluate the network's impacts. Therefore, our analysis focuses on how the Nation of Hawai'i utilized a framework of digital sovereignty in their development of a community-owned and operated network.

1.1. The Native Hawaiian Context

Despite their reputation as a paradise of abundance, the islands of Hawai'i contain deep social, economic, and political inequities (Silva, 2004; Trask, 1999). As Aikau and Gonzalez (2019, pp. 1–2) write:

> While this place is indeed beautiful, it is not an exotic postcard or a tropical playground with happy hosts. People here struggle with the problems brought about by colonialism, military occupation, tourism, food insecurity, high costs of living, and the effects of a changing climate.

These inequities are expressed in digital contexts; for example, in 2021, 34% of Native Hawaiians and 35% of non-Hawaiians reported insufficient access to digital devices and Internet connectivity (Imi Pono Foundation, 2021). For those households struggling economically, almost one in three have no Internet service. As in other regions and communities around the world, Covid-19 made these differences even more significant.

At the same time, *Kānaka Maoli* and other residents of Hawai'i are engaged in resurgence and revitalization initiatives toward restoring *ea*, that is, "the breath and sovereignty of the *lāhui* [assembly], *'āina* [land], and its people" (Aikau & Gonzalez, 2019, p. 2). Goodyear-Ka'ōpua (2016) describes *ea* as an emergent concept encompassing diverse practices. While the term originally referred to political independence and state-based forms of sovereignty in the 1840s, the meaning has since expanded to encompass the environment and relations among humans and non-humans, "the mutual interdependence of all life forms and forces" (Goodyear-Ka'ōpua, 2016, p. 5). *Kānaka Maoli* practice different paths to *ea*. Goodyear-Ka'ōpua (2016, p. 12) writes:

> Hawaiian social movements have been, at their core, about protecting and energizing *'Ōiwi* ways of life: growing and eating ancestral foods, speaking the native language, renewing relationships through ceremonies, making collective decisions, and simply remaining on the land.

In the late 1970s and early 1980s, some Hawaiian movement leaders began "articulating an explicitly nationalist agenda and calling for sovereign control of a national land base" (Goodyear-Ka'ōpua, 2016, p. 14; see also Goodyear-Ka'ōpua et al., 2014). While the Nation of Hawai'i is not the only group seeking autonomy and control over their lands, or involved in ongoing independence efforts (McGregor, 2010), we focus on their activities here as context for their establishment of a community network. In 1993, some 20,000 *Kānaka Maoli* and supporters converged on 'Iolani Palace, the Hawaiian Kingdom's seat of government, to listen to a series of speeches on Hawaiian history and self-determination. At the same time, the People's International Tribunal, Ka Ho'okolokolonui Kānaka Maoli, brought the US to trial for its armed invasion of Hawai'i in 1893. A tribunal of distinguished international human rights experts and advocates found the US guilty of its violations against *Kānaka Maoli* and the nation (Blaisdell et al., 2014; Boyle, 2015). Professor Haunani-Kay Trask and colleagues at the University of Hawai'i at Mānoa's Kamakakuokalani Center for Hawaiian Studies produced critical media works that served to make the findings of Hawaiian historians and political scholars available to a broad audience (see Puhipau & Lander, 1993; Trask, 1999).

During these events, one of the Hawaiian independence leaders Pu'uhonua Dennis "Bumpy" Kanahele organized a 15-month occupation of Kaupō Beach in Waimānalo, O'ahu. According to the Nation of Hawai'i, participants with genealogical ties to the land's original owners sought to establish a permanent encampment and made land claims as heirs to the rightful ownership of the land base (Nation of Hawai'i, 2018). In June 1994, "Bumpy" Kanahele ended the occupation of Kaupō Beach to form the Nation of Hawai'i on the state-owned *mauka* (mountainside) agricultural lands in the valley adjacent

to the Ko'olau Mountains in the *Ahupua'a* (communal land tenure system) of Waimānalo. Members of the organization cleared the densely forested lands to build infrastructure and houses without assistance from the state or federal governments (Nation of Hawai'i, 2018).

With a population of approximately 80 people living in 15 houses, this land is now known as Pu'uhonua o Waimānalo and remains the headquarters of the Nation of Hawai'i (which claims "citizens" throughout the state of Hawai'i, as well as Indigenous people elsewhere in the world). Pu'uhonua o Waimānalo is a project of Aloha First (a non-profit organization), while the land base is provided through a 55-year lease from the state of Hawai'i. As "Bumpy" Kanahele describes it: "We're kind of like the refuge for everybody, the Pu'uhonua for everybody." In Pu'uhonua o Waimānalo, the Nation of Hawai'i continues its *ea* work through activities ranging from growing *kalo* (taro) to ecommerce:

> Pu'uhonua o Waimānalo is both a hope and a promise for a better future for Hawaiians—one where we can get back to the land and *mālama* [take care of] it in the way that only Hawaiians can—with the proper cultural and spiritual foundations and with a focus on bringing our people home. (Nation of Hawai'i, 2018, p. 5)

1.2. The Telecommunications Context

It should be noted that, despite its distance from the continental US and other population centers, Hawai'i is a key node in global telecommunications networks (Starosielski, 2015, p. ix). Both the state government and the University of Hawai'i have a long history of ICT4D initiatives and programs dating to the 1970s, including PEACESAT, ALOHANET, and other projects to link Hawaiians to each other and the island states of the South Pacific (Hudson, 1990; Omandam, 1996). In addition, the Pacific Telecommunications Council, a non-profit organization founded to "meet a growing need for the development, understanding, and beneficial use of telecommunications in the Pacific area" is headquartered in Hawai'i where its annual conference is held (Wedemeyer, 1983, p. 12). However, these telecommunication initiatives did not involve Indigenous ownership or control of the networks.

The advent of the Covid-19 pandemic further highlighted the importance of reliable and affordable broadband to access essential services and resulted in increased attention to broadband by state and federal departments and agencies. For example, the federal Consolidated Appropriations Act of 2021 included several provisions that address broadband deployment and digital inclusion. Its Emergency Broadband Benefit program to reimburse internet service providers (ISPs) for providing broadband service and devices to low-income households was succeeded by the Affordable Connectivity Program of the Federal Communications Commission (FCC), which implemented additional subsidies for broadband services to low-income and Tribal households in 2021. The Act includes USD 1 billion in funding to expand access to and adoption of connectivity on Tribal lands, including those of Native Hawaiians.

This policy and funding environment has catalyzed a nascent community networking movement supported through the Broadband Hui, a community of practice dedicated to digital equity activities in Hawai'i (see https://broadband.Hawaii.gov/broadband-hui). The Broadband Hui's activities are reflected in the Hui's Digital Equity Declaration (at https://www.broadbandhui.org). This enabling environment of state and federal policy and funding has increased awareness of the potential of broadband connectivity across the Hawaiian islands—including through community networks.

2. Case Study: Purpose and Methodology

The purpose of the case study was to document the process of planning and implementing the community network, to collect preliminary data on the usage of the network, and to understand how the project relates to the values of *Kānaka Maoli*. Our research questions are:

- How do leaders and citizens of the Nation of Hawai'i conceptualize local Internet infrastructure?
- How does this understanding shape the ways they are building, operating, and sustaining a local Internet system?

The authors consist of a team of non-Indigenous community-engaged researchers and leadership from the Nation of Hawai'i collaborating on a participatory action research project. This approach builds on past work employing participatory and Indigenous methodologies to co-design and implement research activities with Indigenous communities and organizational partners (see, e.g., O'Donnell et al., 2016). Team members from Pu'uhonua o Waimānalo are involved as co-developers of research design, project administration, and community engagement, as well as sharing their expertise about the Nation of Hawai'i and their development and application of *ea* (sovereignty) to their work. They are also co-authors of this article. With respect to research processes, we utilize a mixed-method approach that draws on primary data, including household surveys, interviews, an in-person focus group, and document analysis. We employed a case study method (Yin, 2018) to investigate the perspectives of members of the Nation of Hawai'i (and the organization's leadership in particular) by compiling data from these multiple data sources. Household surveys, interviews, and focus group questions elicit data about perceptions, adoption, and use of the community network. For example, survey questions asked participants to identify how they used the network as well as any technical challenges that they faced, while

the focus group expanded upon specific factors influencing use, such as perceptions of access and affordability, thoughts about usage and impact, and impressions of technical support. Interviews with Nation of Hawai'i leaders and network managers provided important information about the vision and goals of the network, relationships between the network and broader sovereignty and nation-building goals, and reflections on challenges and solutions. Interview data was supplemented by information drawn from written documentation collected between 2019–2021 by network managers. See Table 1 for a chronology of project research activities. This study was reviewed and approved by the Research Ethics Board at the University of Alberta.

Because of Covid-19 restrictions during the study, we hired and trained a local researcher remotely to conduct 10 *hale* (household) surveys. Surveys consisted of 40 questions modified from the 2020 ITU Household Internet Access Questionnaire (International Telecommunication Union, 2020). Responses were collected using a tablet pre-loaded with a survey data collection app and shared with university-based researchers through the app for analysis. The local surveyor signed a confidentiality agreement to protect the privacy of respondents. Following ethical standards, respondents were not required to answer every question. Respondents received a USD 10 gift card as an incentive to participate. Survey data were analyzed using basic descriptive statistical analysis.

Data were also collected from 90-minute semi-structured interviews with network managers and Nation of Hawai'i leaders and a 90-minute in-person focus group held with eight community residents. Both the interviews and the focus group were recorded and transcribed. Finally, we conducted a thorough review of documents associated with the community network; these included mission and vision documents, technical manuals, troubleshooting logs, and presentations. We sorted and categorized the data thematically and prepared a chronological narrative of the early phases of the community network. We present highlights from this analysis here, with a specific focus on issues related to *ea*. Our observations are further supplemented by participant observation during several field trips to Pu'uhonua o Waimānalo.

We note several limitations to our study, including the small sample size of our household survey data (although there are only 15 households in the community), the difficulties of collecting data through remote methods, and the personal engagement and relationships of our team members (which may have biased responses from community participants and leaders). Covid-19 significantly affected the timing and scope of our project, which may have impacted the ability of participants to recall certain details. The three university-based researchers are not *Kānaka Maoli* and have a limited understanding of *Kānaka Maoli* research methodologies or notions of *ea* (Goodyear-Ka'ōpua, 2016; Oliveira & Wright, 2016). However, they worked closely with community team members to mitigate these limitations. Direct quotes from these co-authors ("Bumpy" Kanahele, Brandon Maka'awa'awa, and John Kealoha Garcia) are presented throughout the text and come from transcribed interviews.

3. Findings

3.1. Documenting the Evolution of the Pu'uhonua o Waimānalo Community Network

Prior to the launch of the community network, residents of Pu'uhonua o Waimānalo had limited connectivity available through 4G cellular hotspots—an option described as convenient but slow, limited, and expensive, with restrictive data caps. Residents also accessed the Internet in places outside the community including fast food restaurants, coffee shops, at the houses of friends and family members, at work, and at school.

This situation began to change in November 2019, when participants, staff from the Internet Society (ISOC), and some residents of Pu'uhonua o Waimānalo participated in a community network training and deployment initiative as part of the third annual Indigenous Connectivity Summit (ICS; Buell, 2019). Funded and organized by the ISOC, the initiative involved a series of pre-conference online training webinars, followed by two days of discussion and presentations on the island of Hawai'i and hands-on technical training and the launch of the network at Pu'uhonua o Waimānalo on Oahu.

"Bumpy" Kanahele and Maka'awa'awa, respectively the head of state and deputy head of state of the Nation of Hawai'i, participated in this project. Reflecting on their experience, they noted ISOC's sharing of technical expertise and described how the event catalyzed further

Table 1. Chronology of Pu'uhonua o Waimānalo community networking project research.

Date	Project research
November 2019	Indigenous Connectivity Summit held in Hilo and Pu'uhonua o Waimānalo
2019–2020	Project agreements were established, as well as ethics and Covid protocols
2020–2021	First round of data collection (surveys, interviews)
November 2021	Second round of data collection (focus group)
2022	Data analysis and write-up

engagement with the state of Hawai'i and businesses such as Hawaiian Telcom (the incumbent provider). According to Maka'awa'awa: "This is probably one of the first and best relationships we've ever built with the state of Hawai'i." They described the event as important not only to connect the community but also to improve their relationships with other groups and organizations.

They also highlighted how the project was facilitated by the Nation's independent political status. Maka'awa'awa noted: "The state [of Hawai'i]…pretty much let us manage what we manage on our land, so the state has no involvement [beyond supporting negotiations for backhaul] with any of the things we're doing on our Nation". The network development was facilitated by the state of Hawai'i and involved negotiating access to Hawaiian Telcom's fiber backhaul and preparing a fiber connection to the community network infrastructure. Within the community, the system utilizes a fixed wireless network (5.8 Ghz unlicensed spectrum) that redistributes bandwidth from Hawaiian Telcom's two backhaul fiber links (2 x 1GB circuits). Figure 1 provides an overview of the community network coverage.

During the build, Nation of Hawai'i residents and ICS participants connected 10 *hales* (houses) out of 15 and several community buildings using fixed wireless transmitters (see Figure 2). Residents appreciated that it was hands-on and not too technical, and enjoyed working in groups alongside people from other communities. As one resident commented during the focus group: "They lived in the same kinds of communities as us. They dealt with the same kinds of problems as us. And that's why it was easier to do the training like that."

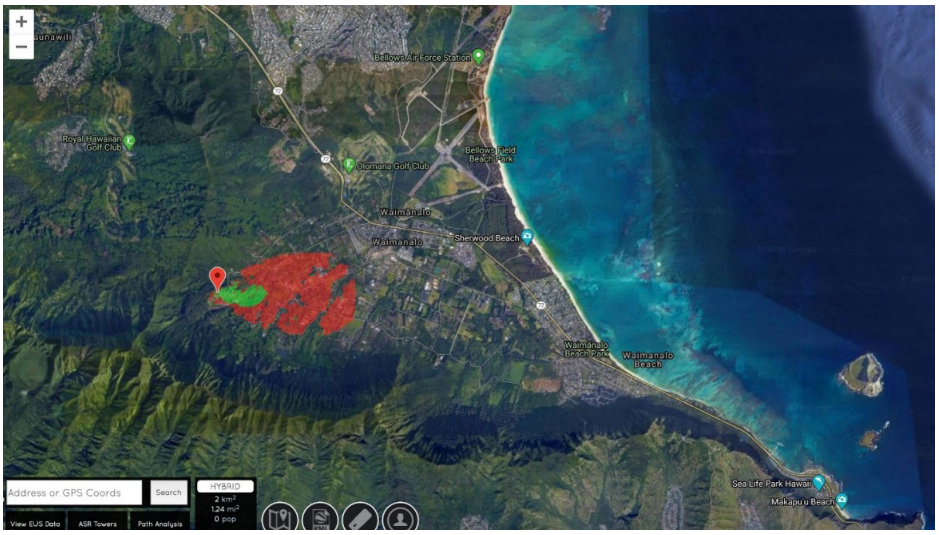

Figure 1. Google Maps satellite image showing the connectivity footprint of Pu'uhonua o Waimānalo community network.

Figure 2. Pu'uhonua o Waimānalo community network installation during the 2018 Indigenous Connectivity Summit.

After the network installation, the Nation of Hawai'i developed a vision and mission statement to guide the ongoing operations and maintenance of the community network that covered access, applications, innovation, and the focus on nation-building and *ea*. Conceptually, these goals are framed as connected phases of network maturation. Access comes first and refers to building and maintaining physical connections to the Internet. As the project gains maturity, access expands to applications and uses. Innovation involves engaging community members in activities such as communications, research data collection, training, and policy. Since 2019, the network management team has been documenting network operations, including speed test and usage data, as well as reports from residents and site observations. Network manager Garcia noted the importance of documentation through this process: "We have the technical expertise. We have the ability to figure it out….Formalizing a lot of that process is going to be what I think allows us to continue to learn from it."

3.2. Applications and Uses of the Community Network

In the focus group, residents reported that they use digital services for a variety of purposes, namely for entertainment or education, to connect socially, conduct business, shop for products and services, and create music and art.

In household surveys, residents said that access to the Internet was very important for these and other purposes and that their usage increased during Covid-19, especially during the lockdown. Community members also noted several uses specific to their goals of language and cultural revitalization, such as taking online language classes and sharing information about the Nation and its sovereignty efforts with people around the world.

While a follow-up survey and additional data collection will be necessary to determine the social, cultural, and/or economic impacts of this usage, we can consider these findings part of the "chain of inference" of ICTD impacts. For example, e-commerce may result in increased revenue for community members; online education may lead to opportunities for further education or employment, and music, art, and social connections may strengthen Indigenous culture (Hudson, 2006).

Residents also noted that digital connectivity also brings challenges, including online safety, security and privacy breaches, and misinformation. Many expressed concerns related to negative impacts on children and increased exposure to spam.

4. Discussion: Digital *Ea* in the Context of the Nation of Hawai'i

Throughout this research, leaders and network managers—and, to a lesser degree, some community members—noted how the Nation of Hawai'i's goals of practicing *ea* intersects with their broadband development work. This section documents the different ways in which people in Pu'uhonua o Waimānalo are framing the community network project in relation to *ea*.

First, the community network project is perceived as a means and expression of cultural revitalization tied to the legal basis of the Nation of Hawai'i's claims to sovereignty, for example by connecting the community network project to broader efforts to restore the *Ahupua'a* communal land tenure system. In its documentation the Nation of Hawai'i (2018) stresses the importance of this system in relation to the occupation of stewardship of their land base, describing it as serving as "a living testament to the power of *'āina* (land), place and space to Hawaiian identity" (p. 5). They state these lands serve as "a safe space for our people and a physical reminder of the power of *'āina* and the peace, joy and contentment that comes with caring for it in a *pono* (just) way" (p. 5).

Garcia further connects their community networking efforts to this system, stating: "We have the ongoing journey of reconciling and restoring the *Ahupua'a* system...an ancient land division system that was fractured when the overthrow happened….We were self-sustaining for many generations." These and other links demonstrate how the Nation of Hawai'i is conceptually linking the practices of *ea* with their deployment and ongoing operations, maintenance, and use of the community network.

Second, sovereignty work is framed as building and operating communications infrastructures as autonomous, but also recognized by government agencies like the FCC or the state of Hawai'i. Maka'awa'awa explained that "sovereignty and control over your lands allow you to move a lot quicker. It's not like we're reckless. We're more careful than anybody else would be because it's our land and it's our people that we're trying to give better access to." This approach recognizes the Nation of Hawai'i's sovereignty while also requiring collaboration and negotiation with the state of Hawai'i and the US government. For example, the Nation is working to secure formal licensing as an eligible telecommunications carrier, which in many cases is a requirement for government funding or subsidies. The Nation was also involved in negotiations with the FCC to secure access to the Tribal priority spectrum (FCC, 2020). As Garcia put it:

> It is like a dance: We are co-existing with the state [of Hawai'i], but also building our Nation and network with our own people, without asking permission. This enables us all to live in harmony. We are working at addressing the lack of access facing our people, the continuing inequity. We are not against the FCC; if anything, we want their help to get further access, and to advance the [community network] project.

The route to connect to the existing fiber was trenched by the community prior to the 2019 ICS event, using their own equipment. As Maka'awa'awa put it:

> We had to trench our own fiber optic, which could be a problem for other communities. For us, it wasn't—because we have machines. We have operators. We have people that dig plumbing lines and stuff. That's a normal thing for us. It wasn't any issue trenching for our people. We just had to make the time and schedule it.

He further described how these activities demonstrated sovereignty to the Nation's citizens:

> The kind of stuff we do over here, not everybody is able to see and touch and feel and do, and they just get one little taste of it. That's why we're doing what we're doing….We've got to just keep building…because it's not just hopes and dreams. This is physical lines being drawn in the sand, infrastructure, all of that kind of stuff.

Third, the community network provides a means for the Nation of Hawai'i to interact with other governments, for example through policy engagement. The Nation is already active in international fora, including the United Nations. During Covid-19, they reported to the UN their activities using a connection established through their community network. On Oahu, the network management team is engaged in a community of practice through the Broadband Hui (see Section 1.2), and one of its sub-committees is focused on Hawai'i community networks. As a result of this involvement, the network management team is more engaged in and aware of policy issues such as the FCC's Tribal priority spectrum and funding availability.

The Nation of Hawai'i is also engaged in policy through its ongoing work with ISOC. They have given testimony to support proposals to fund broadband at the State level and have participated with ISOC on national-level policy development and at subsequent ICS events. Maka'awa'awa highlighted how their work includes a focus on sharing stories of their efforts with policymakers:

> These people that create these policies, they're not actually living through these experiences of how you can take a community that has no Internet access and all of a sudden give them Internet access and see how the community changes. Then, also, me, as a person, understanding how important Internet access is now and seeing how people are getting funded by doing a lot of this work. It just makes you more aware that we need to be more engaged and sharing those stories and making sure that our policymakers and our politicians realize that we're watching.

Fourth, the Nation of Hawai'i representatives suggest that the community network allows their citizens to connect with one another, and with the Nation's government, in a virtual space free of physical borders and political jurisdictions. For example, Maka'awa'awa pointed out that the Internet enables the Nation's citizens to connect with one another and participate in political activities such as elections:

> Right now, sovereignty for us as Hawaiians and a lot of Indigenous people is limited to physical boundaries and limited to political jurisdictions and political obstacles, whereas the Internet is free. The Internet goes through borders. To have a presence on the Internet and to have our people be able to have access to that presence is a form of sovereignty that we need to not only foster but expand upon.

Fifth, and finally, the project can inspire residents to actively engage in the deployment and operations of projects such as the community network, including as volunteers. The network management team frames this call to action to both address digital inequities and generate energy for local innovation and entrepreneurship, including through shared ownership and stewardship of the community network as a utility managed by the Nation's citizens.

During the focus group discussion, one community member stated: "I guess, 'cause our dynamics here are different, 'cause if you grumble about it, chances are you are going to have to go and help to fix it." As Garcia put it:

> The integrity of the connection is important for the residents who are in the Nation….It's almost like the duty of keeping the connection up and running. It's like my *kuleana*. *Kuleana* in Hawaiian is responsibility, but it's more than just "I've got to do this." It's more like it's my ancestral calling….It is because we're all *ohana*, we're all family. We're not coworkers. And it's the difference between going to a place of work—it's more of "hey, I want to teach my entire family how this thing works," because there's not very much separation between what we do for a living and day-to-day stuff. That's the cornerstone of self-determination.

While they support and encourage these ideas, the Nation of Hawai'i team recognizes that a gap remains between the rhetoric of increased communication and community engagement and the challenges of enacting those practices. In the next section, we summarize the technical, operational, and sustainability challenges that they faceat this stage of the community network's evolution.

5. Technical, Operational, and Sustainability Challenges

As in many community networking initiatives, the startup phase of the Pu'uhonua o Waimānalo network has experienced numerous challenges. Community networking initiatives around the world experience issues related to technical, operational, and sustainability considerations

(Lithgow et al., 2022; Song et al., 2018). This section provides examples of these challenges, including how the team is utilizing the *Kānaka Maoli* concepts of *ea* and *kuleana* to frame responses and solutions led by community members.

5.1. Technical Challenges

From 2019 through 2021, the network management team identified three key technical challenges: network design issues, power/energy issues, and equipment damage (including weather and human tampering).

Network managers identified several design limitations in early iterations of the network, for example in signal coverage, speed, and latency. To address these challenges, network managers engaged in ongoing network improvements and upgrades, including adjusting the antennas for the wireless system and installing updated equipment. They also expanded the network in 2021 to add four additional *hale* (households).

The second challenge relates to the reliability of electricity in the community, specifically the impacts of unpredictable power outages and surges. These issues affected network reliability and damaged equipment such as routers that had to be replaced with more resilient equipment. Diagnosing and addressing these challenges involves close connections with community members. Some problems are caused by old wiring and an unstable electrical supply, while others relate to the conditions in the houses such as the limited number of power outlets in homes. The team is exploring alternative energy solutions not only for the network but for the residents and community activities.

The third challenge is damage to equipment by factors outside of the community's control (such as weather) and by people tampering with the network—for example, by splitting connections, installing different routers, and unplugging devices. As Garcia explained:

> We started noticing a lot of our [equipment] just [wasn't] connected. And so, we went into those homes and noticed that the nearest electrical outlet in the house is behind the dresser in the kids' room, half hanging out. And so, when the GameBoy needs to be plugged in, Internet gets unplugged….These houses started as tents and then evolved into cement pads. And we're hopefully in the process of rebuilding some of these homes with proper equipment.

While physical security is important to protect sensitive (and expensive) networking equipment, solutions are often framed with reference to a partnership with the community, including suggestions for training to support engagement among community members in ongoing operations and maintenance; rather than impose penalties on residents for damaging or unplugging equipment, the team communicates the importance of shared network stewardship.

5.2. Operational Challenges

Over the past two years, the network management team has determined that many challenges may be due to limited communication with and among community members, as well as a general lack of knowledge about the operations and maintenance of the network. For example, in several instances of network outages, users did not reach out to network managers. Maka'awa'awa explained further:

> After you create your network, [you need to focus on] staying engaged with [community residents], making them a part of it, making them feel like they can come up to you with any issue. What we found is that, when some of their systems went down, people just—they didn't reach out. They didn't call. They didn't let us know. I think sometimes we have to do the checking in.

These lessons sparked increasing focus among the Nation of Hawai'i and network managers to involve community members in reporting issues and outages. They now frame the community network as a project that encompasses social as well as technical activities closely tied to the participation and engagement of the Nation's citizens. As Maka'awa'awa put it: "Ultimately, it's the people that manage [the community network], and then it's the end users that keep the network going. So, this is different from you being a customer to Hawaiian Tel[com]." He went on to connect this to the broader goals of the Nation; that the way to keep the network going is through partnerships and involvement with community members. In short: "We're holding up the network together….That's part of the sovereignty that we're trying to exercise, because we understand sovereignty on a different level, because we're on the ground building our nation, not just talking about it in the schools and all that. We're doing it in real time."

These issues are reflected in responses from community members in surveys and focus group discussions. Residents noted their interest in getting involved and suggested that more young people be trained to operate the network. They connected these activities to broader goals and values of autonomy and self-determination. As one focus group participant put it: "I think…that's what this community network provides. It provides a lot more independence. It can be as wide as you want it to be. If you're willing to do the work, to learn, to come to meetings.''

Looking ahead, the Nation of Hawai'i and community members plan to continue meeting to discuss how to work through these challenges together. Ideas expressed have included increased community involvement in data collection, hosting regular meeting updates, and group discussions about solutions.

5.3. Sustainability Challenges

As of the end of 2022, the community network continued to be managed on a volunteer basis. Garcia and Maka'awa'awa, who live outside of the community, act as virtual network operators and are often on-site in the community. They have been joined by two volunteers who live in the village and act as the ground crew, monitoring community outages, addressing minor outages, and communicating with the network managers as needed.

ISOC currently provides funds that cover operating costs, primarily to pay Hawaiian Telcom for two 1 GB circuits. Costs beyond this backhaul are minimal—for example, cell tower management fees and email and web-hosting services. Vendors and ISOC paid for or donated any replacement equipment. Electricity bills are covered by individual households, while the network itself does not require substantial energy costs.

The network management team is considering options if ISOC stops providing funding support, and is exploring means for the network to be self-sustaining while remaining affordable to residents.

Ideas include charging households a nominal fee for services, selling services to out-of-community residents, and generating income from providing training and support services to other community networks in Hawai'i. Other ideas include recruiting a sponsor for the community's monthly agriculture and crafts market that would pledge to cover Internet costs for the month, or including expenses for the network in the monthly housing rental fees paid by residents. The household subscription model seeks to balance network sustainability with affordability, taking into consideration the ability of households to pay. The network management team has also looked into external funding support for the community network including applying for a federal grant as part of a broader USD 3 million application from several groups in Hawai'i for digital equity and infrastructure funding. If awarded, this federal funding would support network infrastructure improvements, including solar generators, as well as a broadband training facility and funds for ongoing training for network administrators. The funds would also enable the team to hire network management staff and to consider expanding the project to include networks in four other communities.

6. Preliminary Conclusions and Future Initiatives

Dennis "Bumpy" Kanahele said:

> Our mission was always sovereignty of our people and our identity, our politics, our economics, our social culture.

Community networking practices are closely tied to the contexts from which they emerge. Research on such work enhances our theoretical understanding of how digital ICTs support the resilience and sustainability of communities, while highlighting their assets and strengths, as well as potential areas of improvement. Many Indigenous nations, including the Nation of Hawai'i, are examining ways to substantively engage their citizens and members in decisions regarding the development, adoption, and use of digital ICTs. As understood and conceptualized by the leaders of the Nation of Hawai'i, these digital inclusion issues of participation and control are intricately tied to broader questions of sovereignty in political, economic, cultural, and social contexts. As described in this article, these goals are reflected in the group's plans for network planning, deployment, and usage. Moving forward, and pending grant support, the network management team plans to replicate their development process with other Native Hawaiian communities. With the support of organizations like ISOC, Connecting Humanity, and the State of Hawai'i Broadband Office, they plan to continue documenting their process and deepening engagement with the community members who ultimately will be in charge of managing the community network—as well as many other aspects of the Nation.

In the four years since the network was first deployed in Pu'uhonua o Waimānalo, the network management team and the Nation of Hawai'i have learned not only about the structure and operations of the physical network but also about how ongoing operations and maintenance activities are closely tied to engagement with their citizens. By framing these connections in reference to *ea*, i.e., sovereignty in the specific context of the efforts of the Nation of Hawai'i, this project helps continue efforts to understand how community-led connectivity initiatives contribute to community cultural, political, and social development.

Acknowledgments

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Conflict of Interests

Authors Rob McMahon, Heather E. Hudson, Brandon Maka'awa'awa, John Kealoha Garcia, and Dennis "Bumpy" Kanahele have volunteered for the ISOC's annual ICS, which is a policy advocacy forum focused on Indigenous connectivity. Garcia serves as a member of the Advisory Committee for the Indigenous Connectivity Institute, which plans the ICS. Authors McMahon and Hudson have also worked on other projects for the ISOC as paid research and evaluation consultants and contributed to policy and regulatory consultations in Canada related to Indigenous connectivity as paid consultants and unpaid volunteers. Maka'awa'awa, Garcia,

and “Bumpy” Kanahele are involved in the Nation of Hawai‘i and Pu’uhonua o Waimānalo, which are projects of Aloha First (a formal 501(c3) non-profit organization). The community networking project described in this article received funding from the ISOC to compensate for their time on this and other community networking projects in Hawai‘i.

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Brandon Maka'awa'awa is the vice president of the Nation of Hawaii, the oldest Hawaiian independence organization in Hawaii. He assists President Dennis "Bumpy" Kanahele in the day-to-day operations of the village of Pu'uhonua o Waimānalo, the Nation's sovereign land base, home to 90 Hawaiian Nationals. Brandon also leads the Nation of Hawaii's delegation to the United Nations Permanent Forum on Indigenous Issues, where he has given interventions on Hawaiian national sovereignty, peaceful coexistence, reconciliation, economic development, and innovation. Brandon is also the president of Na Po'e Kokua, a non-profit organization that advocates for the development of more affordable housing options for Hawaiians. Brandon advocates on behalf of the Nation of Hawai'i at all levels of government on different issues impacting Hawaiians and their rights.

John Kealoha Garcia is a Native Hawaiian entrepreneur, humanitarian, and award-winning creative director based in Honolulu, Hawai'i. As Minister of Foreign Affairs, 2nd vice president for the Nation of Hawai'i, John Kealoha's work encompasses international relations, economic development, and government logistics. He was voted one of Hawaii's top new media influencers, with design accolades from the Society of Professional Journalism and the American Advertising Federation. His latest venture, Exchange Ave, is an Ahupua'a inspired digital economy with a mission to pioneer an Indigenous-led economic framework centered around shared abundance and peer-to-peer social exchange. John Kealoha sits on the board of Aloha First and is a founding board member of the Connect Humanity Institute, an indigenous owned non-profit organization with a focus on connecting rural and tribal communities to clean and safe Internet access.

Dennis "Bumpy" Kanahele is president and head of state of the Nation of Hawai'i, and CEO of Aloha First. A respected Hawaiian leader and advocate for the restoration of the independent nation-state of Hawai'I, he gained national attention in the 1980s for his involvement in the Makapu'u Lighthouse land occupation and the prayer vigil on the steps of Iolani Palace, where he was among those arrested. Kanahele was appointed to the Sovereignty Advisory Commission and worked to find solutions beyond state and federal mandates. Kanahele has been a key figure in advocating for self-determination and self-governance for Native Hawaiians. Kanahele serves on the Board of Directors of the International Indian Treaty Council (IITC) and is actively involved in its mission to restore political, economic, social, educational advancement, and just treatment for all Indigenous, Aboriginal, and Native peoples worldwide.

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Article

Dispatches From Eeyou Istchee: Cree Networks, Digital, and Social Inclusion

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Abstract
This article offers a fragmentary, partial history of the successes and challenges the Cree of Eeyou Istchee have encountered as they've developed the capacity to offer their region and communities a range of traditional, analogue, and digital services through the development and maintenance of different yet interconnected networks. Using social construction of technology (SCOT) and social shaping of technology (SST) theories as a framework, these dispatches offer a glimpse of the complexity and layeredness of two Cree networks as they come into contact and/or overlap with those of extractive colonialism, Canadian settler policies, and traditional Cree law and policy.

Keywords
digital inclusion; digital inequity; Indigenous networks; settler-colonial communications policy

Issue
This article is part of the issue "Expanding the Boundaries of Digital Inclusion: Perspectives From Network Peripheries and Non-Adopters" edited by Rob McMahon (University of Alberta), Nadezda Nazarova (Nord University Business School), and Laura Robinson (Santa Clara University).

1. Introduction

The following article offers a partial and fragmentary narrative of the successes and challenges the Cree of Eeyou Istchee have experienced as they've developed the capacity to offer their region and communities a range of traditional, analogue, and digital services through the development and maintenance of a number of different yet interconnected networks. We trace the development of two networks that have become important in the everyday lives of the Cree, which are enmeshed in complex ways with the networks of Canadian settler-colonial policies, infrastructural intrusions, and large-scale terraformations, as well as traditional Cree policies and laws.

The James Bay Cree Communications Society (JBCCS) began as a network of loosely connected radio stations in the Cree communities of Eeyou Istchee in the early 1980s. Today, as a non-profit radio network operator with nine licensed radio stations through the James Bay Eeyou Istchee territory, it delivers daily news and information programming in the Cree language. It also offers a range of digital, cultural, and social services including live-streaming Chief and Council meetings, local and regional elections, and children's Christmas concerts. This digital capacity is due to the development of an Eeyou Communications Network (ECN), a not-for-profit, Cree majority-owned fibre optic network. Conceived in the early 2000s, the network today offers broadband services to 14 communities including nine Cree communities and five Jamesian (Québec francophone) communities, as well as to anchor institutions such as health boards, hospitals and clinics, schools and school boards, and band and municipal offices. The following offers a series of dispatches that seek to represent the many complex layers of infrastructure, policy, social and political histories, and relationships, as well as the culture and ecologies in which these networks were conceived and developed. Using social construction

of technology (SCOT) and social shaping of technology (SST) approaches as a framework, we consider the adoption of digital technologies in Eeyou Istchee and what digital inclusion might mean and might not mean for the Cree communities.

2. Networks in Eeyou Istchee: A Case Study

This article is co-authored by Scott Forward and Tricia Toso. Scott lives in Mistissini, Eeyou Istchee, and is of Cree and European descent. Scott is the executive director of JBCCS and sits on the ECN board of directors. Tricia is a settler of European descent and a PhD candidate and policy researcher living in the traditional unceded territories of Haudenosaunee peoples. She has worked with ECN and JBCCS on a volunteer basis since 2018 on policy proceedings with the Canadian Radio-Television and Telecommunications Commission (CRTC) and Innovation, Science and Economic Development (ISED). Both authors have worked with and interviewed the founders of JBCCS and ECN, including Luke MacLeod, Edward Georgekish, Ted Moses, Hyman Glustein, and Alfred Loon, over a period of many years. This has informed our account of communications history and present in Eeyou Istchee.

To develop this case study we've used a range of methods, including interviews, archival research at the CRTC and the Aanischaaukamikw Cree Cultural Institute, the production of video and audio translations of Cree elders' narratives and histories, and our own experiences participating in government agency policy proceedings. Committed to anti-colonial and Indigenous methodologies, we understand that research isn't something that happens outside of the political and social conditions of which it is a part (Smith, 2012); rather, it emerges in relation to a range of institutions, infrastructures, and actors. Many of the following stories have been recounted, documented, and shared in the context of developing policy recommendations for CRTC and ISED proceedings by the authors, as well as the work Scott does at JBCCS. We understand our research and the development of policy recommendations as a form of participatory research and advocacy for Cree and other Indigenous networks in Canada. We've advocated for Indigenous-owned and operated networks, as well as issues such as spectrum sovereignty through our contributions to policy proceedings, including the Government of Canada's *Broadcasting and Telecommunications Review* (Government of Canada, 2019), the CRTC's co-development of a new Indigenous Broadcasting policy (CRTC, 2019), and the ISED policy proceedings *Spectrum Outlook 2022–2026* (ISED, 2022). We understand our work in the policy realm as part of a long and complex history of Cree and settlers working respectfully in collaboration and friendship to advocate for Cree self-governance, self-determination, and control over development in Cree territories.

Kretchmer (2017) proposes that the SCOT and SST approaches prove useful frameworks from which to explore questions of digital inequities and inequalities without repeating misperceptions and assumptions about internet use. She notes these theoretical approaches provide the means to explore how technologies have emerged from particular cultural circumstances, and thus are inscribed with values and priorities that correlate with that particular culture's mainstream and are subsequently culturally interpreted, modified, and altered by users. The interpretative flexibility of SCOT and SST allows for an interrogation of how various forces have interacted within the context of a settler-colonial state to produce inequities and inequalities. Researchers have demonstrated that colonial-settler discourses create and perpetuate profound digital inequities and equalities in First Nations communities (Philpot et al., 2014), but research has also shown that Indigenous communities have also successfully navigated obstacles posed by settler-colonial policies and practices, and built their own networks (First Mile Connectivity Consortium, 2018; McMahon et al., 2010). SCOT and SST theories offer ways to study digital inequities and inequalities without flattening the geographies of the places where policies play out, or simplifying the relations between these entities and forces. The following dispatches represent our attempt to address the complexity and multi-layeredness of networks in Eeyou Istchee while exploring how a range of forces including Cree community communications practices and aspirations interact with Canadian policies—sometimes at odds, other times in agreement with it; as they entangle in unexpected and unruly ways, offering lessons and potential futures.

3. Traditional Networks and the Cree Radio Network

In an interview, Grand Chief Dr. Ted Moses speaks of both Cree and American networks coming into contact, (Glustein & Bernard, 2008):

> In the 50s I spent my early childhood on the trapline in the bush with my family from September until June. My father was a trapper and a hunter. The way it works was, people would leave the community in September; in earlier days they would paddle, but when I was young we used to take a plane. I used to get a kick out of flying. It was an hour and a half flight to my father's trapline. First, we would build a teepee and stayed in the teepee until the winter lodge was built, which was made out of sod and wood and very well insulated. We would use the snow as part of the insulation. We'd stay there all winter, and then, in March, we would move to another location and stay in a teepee, and lived a real nomadic life. When we would arrive at a certain place, we would leave with a canoe and paddle down the Eastmain River, back to the community in the middle or end of June. I was with my family: my parents and my siblings. It used to go down to −50 Fahrenheit for about four weeks, and when the temperature went up to −25, we'd say:

> "Hey, it's warmed up; you can actually feel the change in the weather." Life could continue even at that temperature, such was the life of a hunter and trapper. We worked everyday except Sundays. Sundays were a day of rest and you would stay in Camp with the family and we'd have a cookout. My mother would prepare a big meal for the whole family. We basically took in just the staples: flour, baking powder, salt, sugar, tea. I think we even had a little bit of coffee…and milk, but in powder form…otherwise we would rely on what my father brought in on the hunt: beaver, ptarmigan, porcupine, moose, and fish. My father used to have an old radio with an antenna. It had a battery that was about twice the size of a car battery, and the radio itself was wood. It was quite a big radio, but it never worked during the day, but in the evening we would be able to catch programs from the US. One of the stations that we used to like to listen to, especially in the morning when it was still dark (when the sun rose, we lost the airwaves) was WWVA from West Virginia with this guy, Lee Moore, the Coffee Drinking Nite-Hawk. It was quite something to hear the music. I never understood the lyrics because I didn't understand English. This was before I had gone to school and spoke only Cree.

We understand networks as "patterns of interconnection and exchange that organize social and aesthetic experience" (Levine, 2015, p. 113); they're separate and have their own logics, but they also overlap and allow for different forms to come into contact. Ted Moses' story of listening to a West Virginia radio broadcast in the early hours of the morning from his family's traditional trapline in Northern Québec illustrates the overlap of several different networks: those of the Cree network of oral history, traplines, and winter camps with that of an American commercial radio broadcasting network.

The Cree began their own radio broadcasting network in the early 1980s, and since then have developed programming in the Cree language that specifically addresses community issues and interests, as well as serves as an important cultural and social lifeline. Radio broadcasts provide critical information to communities, including emergency messages, municipal and regional news in the Cree language, advertising programs and events, sharing shout-outs to family and loved ones, and the words and language of elders. Alia (2010) notes that radio is particularly well adapted to oral cultures and remote community life by providing a sense of interconnectedness. The Cree have developed networks and technology practices that reflect their needs and endeavours, whether issuing weather warnings or using tracking devices and satellite imagery to record the negative impacts of extractive colonialism on the land (Mark et al., 2019, p. 7).

Edward Georgekish, radio station manager of Wemindji, produces recordings that are broadcast over the Cree community radio network and share elders' stories and Tallymans' observations of changes in the land, including legends; the correct Cree terminology for words that have particular contemporary relevance (like "vaccine" and "face mask"); warnings about the ice conditions and where to be careful on the trails; admonishments for over-harvesting game; words of caution about leaving children unattended on skidoos, no matter how quick the errand; and pleas to watch out for other hunters and those checking snares. These transmissions also included mandatory Covid-19 updates and reminders of good hygiene practices during the Covid-19 pandemic (Georgekish, personal communication, January 15, 2021). The use of radio, digital devices, satellite, and fibre optic technologies have been adapted to meet the particular realities, geographies, social relations, and rhythms of the Cree communities. Their adaptation and use of these networks and devices support the Cree language, ways of knowing, and living, and remain grounded in the everyday lives and worlds of the Cree.

4. A Struggle for Land and Sovereignty

> On April 30, 1971, we were stunned to hear a radio announcement that the Province of Quebec was planning to build three hydroelectric complexes on our lands in James Bay. We were not given any advance warning of the proposal. Sure, we had picked up the possibility that something was coming, as we had seen the exploration crews for a few years. But Premier Robert Bourassa's public announcement of the project of the century was made as though we did not exist, or had never existed. (Moses, as cited in Gnarowski, 2002, p. 26)

On June 28, 1971, a number of Cree leaders gathered to discuss a response to the Hydro-Québec project (Carlson, 2008). With hopes of protecting their ancestral lands, trap lines, and hunting grounds, the Cree, together with the Inuit, filed an injunction in the Supreme Court of Québec in 1972 and declared all development in James Bay unconstitutional (Niezen, 1998, p. 48). They testified that neither they nor the Crown had ever extinguished their rights to the land. On November 15, 1973, the judge issued a court order to halt construction on the dams, ruling it violated Aboriginal rights and threatened environmental damage (Desbiens, 2013, p. 44). Declaring the project had not been properly evaluated, the decision read: "Cree and Inuit rights were being infringed and their cultures were potentially threatened" (Reynard, 2000, p. 216). The Quebec government appealed the decision and it was overturned in the Quebec Court of Appeals a week later on the basis that it was in the public interest that the project continue and that any losses or damages to Cree territory would be compensated (Desbiens, 2013, p. 44).

The court, however, recognized that Cree had rights concerning these lands which constituted their "rightful owned territory," and urged the Quebec government to

negotiate with the Cree and Inuit to reach an agreement (Desbiens, 2013, p. 44). Through the Court's process of discovery and deliberation, the Cree became a political and legal people, developing new negotiating power to protect their lands (Carlson, 2008, p. 205). The James Bay and Northern Quebec Agreement (JBNQA) differs from previous historical numbered treaties in its complexity and modernity; it involves settling issues as varied as land use, resource extraction, taxation, language, culture, heritage, health, education and social programs, eligibility, and enrolment, and has the legal certainty of self-government (Penikett, 2006, p. 87). The JBNQA has been followed by over eighty subsequent agreements that extend the scope of self-governance of Cree communities (Cree National Government, 2020). It also sets out the policy that determines the establishment of organizations like the JBCCS and community radio stations as a right (Crown-Indigenous Relations and Northern Affairs Canada, 1975, Sections XII-164 and XIII-133).

5. The Beginnings of JBCCS: Laundromats and Bingo

In 1981, the Grand Council of the Crees in the James Bay Area formed JBCCS as a means of keeping people informed of developments with the JBNQA (MacLeod, personal communication, December 15, 2020). The organization began with the publication of a monthly magazine and the production and circulation of videos that were to share information among the geographically distant Cree communities. The first radio station in Mistissini was set up in an abandoned laundromat with a waterlogged roof and an old UHF tower strapped to the building (Glustein, personal communication, November 24, 2020). CBC provided minimal equipment, offering only a few consoles and microphones, but the community was able to round up the necessary turntables, vinyl records, cassette machines, and other essential technologies and furnishings. Georgekish remembers being surprised at the conditions of the operation when he visited in the early 1980s. The Canadian government's funding program, the Northern Native Broadcast Access Program, offered established communications societies in northern Indigenous communities funding for radio and TV programming, but there was nothing for emerging communications entities. Georgekish began looking into ways to fundraise; monthly bingo tournaments initially brought in enough funding for the network station to build a new network station, providing safe working conditions and establishing more regular services to the community. Furthermore, it gave the organization the means to incorporate and become eligible for federal funding.

6. Where Is the Cree? CBC in Eeyou Istchee

The 1957 *Report of the Royal Commission on Broadcasting* (known as the Fowler Report) introduced a concerted effort by the CBC to extend its services to the North (MacLennan, 2011). Radio service in northern Quebec, northern Labrador, and the Northwest Territories depended on shortwave until the late 1970s, and at that time CBC Northern Service transmitted 18 hours a day, including three hours of Inuktitut programming, one hour of Cree programming (from Ontario), and one hour of French programming (Hudson, 1977, p. 131). The claim of multilingual programming by CBC was understood as an overstatement for many northern Indigenous listeners; control over the content and broadcasting network remained largely in the hands of the CBC (MacLennan, 2011).

When CBC started Cree programming, there was a concern by the Grand Council that none of the programs were produced locally, and that CBC was merely translating their own news into Cree. In 1985, JBCCS was mandated to offer daily programs, but the CBC allocated only four hours a week to Cree programming. The CBC insisted the programs be recorded on reel-to-reel and air shipped every day for play the next morning; many shows were never broadcast because they didn't arrive on time, or they were bumped by the CBC for their own reasons (Glustein, personal communication, November 24, 2020). Luke MacLeod, executive director of JBCCS, felt that this was not a meaningful way to participate, and proposed to the CBC that the programs be phoned in at nine each weekday morning over a dedicated phone line. The CBC agreed and, after negotiating with Télébec for enough bandwidth, JBCCS was able to offer live programming. The sound was tinny at best, and often one the lines failed. Meanwhile, a disaster was brewing, the community had only been assigned four outside lines on the Télébec phone system, so when JBCCS took half the capacity of the community and did a live interview over the phone, almost all of the phone capacity was tied up. This method of transmission virtually depleted phone service, leaving the community without telephone service. Some time later, Telesat launched its first satellite and JBCCS was able to secure a small space for a signal to provide CBC with a clearer connection.

7. Dark Fibre and the Beginning of ECN

In a 2015 CRTC hearing on basic telecommunications services in Gatineau, Québec, Moses told a story of how ECN was founded. Addressing the Commissioners he explained:

> I discovered fibre optic without knowing it. When I was a Grand Chief, as part of my duties, I traveled extensively and I traveled a lot with my family, driving up to Eastmain, several hundred kilometres away. And on the way I crisscrossed the high-tension 750 KV lines with a line going on top. It always intrigued me: What was that line for? It was not one to transport 750,000 volts of electricity. (CRTC, 2015)

He went on to explain that after some investigation they found it was a fibre optic line, and that it was used by Hydro-Quebec in the operation of their powering generating stations in James Bay. He continued: "It dawned on me that having fibre optic could mean a big advancement for the Cree Nation" (CRTC, 2015). This story is notable not only because it speaks to the conception of the fibre optic network in Eeyou Istchee, but it also evokes the long and complex history of the relationship of the Cree with Hydro-Québec. If we follow the high-tension line Moses spoke of through space and time, it leads us to the La Grande generating station in the very north of Eeyou Istchee and back in time to the signing of the JBNQA. The story of ECN is embedded in complex geographies of pre-existing networks and infrastructure, colonial-state politics and policies, and technologies.

In the mid-1990s, a number of Cree communities began to experiment with internet service provision; community members in Chisasibi had built a cable TV plant with a satellite internet connection (actually the first small cable internet service in Canada) and offered better service than dialup, but not much. Once everyone in the community signed up, the service slowed to a crawl (Glustein, personal communication, December 11, 2020). In Wemindiji, the business development agency set up a trunk line with a dialup Internet provider a thousand kilometres away, offering telephone internet service by local and long-distance dialup throughout the Cree communities, but again demand soon exceeded the capacity of the system. Meanwhile, in Mistissini, JBCCS was distributing its programming to all community radio stations by satellite and began looking into internet service provision. It tried promoting a convergence approach by adding TV and the internet to its offerings, but it proved too costly. These projects created interest in the communities and brought awareness to the potential internet connectivity could have for Cree.

An important impetus for ECN came from an unexpected turn of events in a 1998 CRTC policy proceeding on the telephone service to high-cost serving areas in Val D'or, Québec. Jimmy Neacappo, councillor for the Cree Nation of Chisasibi, Raymond Menarick, the station manager of Chisasibi Telecommunications Association, and Hyman Glustein, consultant to the Association of Broadcasting and Communications gave a presentation to the Commission in which they argued that Télébec, the licensed provider of telephone services in Eeyou Istchee, had been giving preferential treatment to Hydro-Québec. They presented the results of tests they had run from Télébec phones located in Chisasibi, four different Hydro facilities in the region, and Radisson, a non-Cree community located 84 km from the Grande-1 Hydro facility. They found that calls from Chisasibi to anywhere outside of the small community were long-distance, thus subject to Télébec long-distance rates, whereas, calls from Radisson to any of the Hydro stations, as well as between the four stations, despite being up to 335 kilometres apart, were local, thus not subject to long-distance rates. Neacappo observed that Télébec had two types of local service, one for Hydro-Québec workers and another for the Cree communities.

Menarick argued that as the licensed provider of telephone services in the James Bay area, Télébec had an obligation to assure that any other telephone system operating in its area, and accessing its network for interconnection, follow the same rules as any other user (CRTC, 1998). If the phone company didn't take action against Hydro-Québec and oblige them to pay long-distance charges, Télébec would be accepting their service and, therefore sharing their licence. This was in contravention of CRTC regulations. Télébec denied preferential treatment, but the CRTC wouldn't make a decision, shuffling the issue aside. Glustein realized that the CRTC wasn't going to act so he had the Cree legal department send a letter to Hydro-Québec addressing the issue, pointing out that this practice was in contravention of the JBNQA. Sometime after, Glustein received a call from a hydro company staffer; keen on having the legal case dropped given the current litigious climate, he said he would offer Glustein proof that they were not getting local rates from Télébec. Glustein received maps and technical manuals for their telecom service. He couldn't believe it: In his hands was a map of fibre optic lines transversing Eeyou-Istchee, the key to beginning the Cree network. Soon after he met with Moses and a team of people began to coalesce, and plans for the network were developed and implemented.

8. FM Radio

In Eeyou Istchee, there are still a number of monolingual Cree who continue to depend on regional and local radio broadcasting for news, information, and entertainment. The need to support traditional forms of broadcast shouldn't preclude the support for development and innovation. With the ability to connect comes the capacity to enable broader participation within the broadcast ecosystem; multiple streams can be absorbed directly into the broadcast facility, and distributed to different stakeholders within or external to that system.

FM Radio is the primary activity of JBCCS and Cree media, but there is an increasing expectation that all Cree media content be searchable and available on a range of platforms. Outdated and customized studios, analog equipment and weak transmission equipment in community broadcast operations are currently being replaced, and broadcast facilities and systems modernized. To build an interconnected network, this project requires the interconnection of broadcast stations and systems that allow for common tools to be used to distribute and manage content. It creates an incentive for all stations to adopt a common protocols such as audio-over-IP (AOIP), as management of remote facilities is greatly improved through ECN's network. JBCCS has worked with ECN to connect its stations and towers to the fibre optic network, while developing its own

systems that allow for a range of new services that are specific to the Cree communities and their needs. JBCCS has developed the capacity to digitize, ingest from discrete systems, index, and catalog materials, so that they can be searched throughout the territory, as well as deployed out to web applications. This type of broad access is important, as many people within Eeyou Istchee (students and workers) are forced to make the choice between seeking opportunities outside their communities and maintaining access to their culture.

With access to ECN's reliable high-speed broadband access, JBCCS offers services that facilitate participation in public and cultural life. For example, in recent years, JBCCS has regularly live-streamed Chief and Council meetings, general assemblies of the Cree School and Health Boards, funerals of important figures in the Cree communities, and consultations on a lithium mine in Cree territories, to name a few. These services are an important component of both keeping Cree community members informed of what is happening in their nation and territories and allowing Cree to participate in real-time through chat, messaging, and call-in features. These broadcasts challenge conventional ideas of digital inclusion and exclusion, as non-adopters of digital technologies can still participate in the live-streamed event through the use of analogue media. JBCCS's use of both analogue and digital media complicates the traditional distinction scholars have drawn between users and non-users. Kretchmer (2017, p. 98) points out, "digital social equality is not synonymous with everyone conforming to the mainstream," rather true equity asks that technology be infused with diversity from the first stages of design to end use. JBCCS faces a range of constraints and challenges in regard to infrastructure, hardware and software, broadcasting, and telecommunications policy that have all been designed for mainstream settler society and are not easily translated into services that meet the needs of diverse communities. However, the Cree organization has proven itself capable of appropriating a range of technologies in order to further the Cree peoples' participation in social, cultural, and political life, regardless of whether community members are adopters of digital devices or not.

Reisdorf and Rhinesmith (2020) argue that digital inclusion doesn't necessarily translate into social inclusion, rather initiatives that seek to understand and increase digital inclusion should develop more refined understandings of internet use and non-use. The definition of digital inclusion most cited is that of the National Digital Inclusion Alliance (NDIA) which defines it as users having reliable access to high-speed Internet with digital devices that meet the needs and skills training of users and with tech support and software that are "designed to enable and encourage self-sufficiency, participation and collaboration" (NDIA, 2017). We contend that how JBCCS and other Cree have integrated broadband services into the everyday lives of Cree community members offers another version of digital inclusion. That is, the assimilation of the allowances of ECN's network and JBCCS's services into a range of public health, education, cultural, and social institutions includes everyone, even non-users, in a digital ecology. One example is the interactive virtual landscape the Wemindji Eeyou knowledge centre is creating through experimentation with new media and different modes of documentation and presentation (Mark et al., 2019, p. 8). The new media installation cannot replace the experience of living in hunting and fishing camps, but it can communicate and cultivate forms of knowledge among both its developers and users. Non-adopters of digital technology such as elders are involved in various levels of development and engagement as knowledge-keepers of place-names, the Cree language and traditions, or Tallymen advising on changes in the land and water. The ways we might understand digital inclusion are challenged by these kinds of collaborations, but perhaps even more salient are the ways in which digital IT projects like this bring different networks together, those of kin, traditional and new knowledge, trap lines and hunting grounds, radio, and fibre optic. We might think of this as network inclusivity—social and digital inclusion through engagement with any in a number of established Cree networks.

9. Community Practices and Aspirations: The Revitalization of Cree Language and Culture

These were the words of Sanders Weitsche (Cree National Government, 2018):

> Many old, old Cree words are being lost; they are leaving us. It is true that we must try not to let this continue to happen; for our language to leave us. There are other first nations who weep because they have lost their language.

The 2018 *Eeyou Istchee Language Engagement Sessions Report* identified Cree as currently undergoing a shift from a stable to a threatened language. Concern over the decline in the use of Cree by children and adolescents has led to a number of recommendations including the development of radio broadcasts with Cree language instruction and elders' stories. Other recommendations include broadcasting home-made programs, having Cree language lessons using Facebook, and using cellular phones or tablets to record elders and other family members telling stories in Cree (Cree National Government, 2018).

The JBCCS has undertaken several projects that are oriented toward sustaining and improving Cree language skills and fluency, including broadcasting radio programs entirely in Cree, repatriating Cree language audio and video materials held by non-Cree institution, coordinating the maintenance of repositories for Cree language video and audio recordings, and recording and preserving elders' stories to create an online archive. MacLeod has developed techniques to ensure

broadcasters use the highest quality of Cree possible in their radio broadcasts and actively endeavours to ensure the correct terminology. Emphasizing the importance of documenting elders, MacLeod reports that they offer older and more complex forms of the language that are being lost. Working closely with elders, staff announcers verify terminology, and work on a daily basis to improve the quality of their Cree language skills.

The use of these media and technologies in the preservation of "old, old Cree" speaks to both a strong desire to safeguard the language, but also a willingness to experiment with a range of media and create new ways of documenting oral histories and traditions. A scroll down through JBCCS's Facebook feed gives a sense of both the vitality and the threatened state of Cree. Recently, JBCCS aired its fifth episode of *Speak Cree to Me*, a series designed to document the Cree language and local knowledge. Two community members, John P. Bosum and Glenn Longchap discuss traditional Cree uses of trees in the Cree language, noting the proper Cree terms for things like what to say when you retrieve wood for making snowshoes (Psesamanu), and joking that the Cree tradition of leaving markings on trees over portages to communicate with the following canoeists was an early form of Facebook (JBCCS, March 29, 2023). The comments on the posting reflect both appreciation for the production, as well as questions about whether the Cree terms used are inland or coastal Cree, and testimonies that teachers and parents use the JBCCS videos to teach children Cree. The concern expressed in both video and comments is less about digital inequalities or lack of inclusion, and more about the threat of losing Cree traditions and language. Access to digital technologies may offer more tools for dissemination and documentation, but these concerns create tensions that deny easy conclusions about how we might define social and digital inclusion in the context of a culture facing the loss of language and living traditions.

10. Colonial-Settler Policy and Spectrum Licence Auctions

The natural resource known as electromagnetic spectrum in Indigenous territories is administered by ISED through spectrum license auctions or other assignments. The Canadian ministry is governed by the 1993 Telecommunications Act, and lists among its policy goals the development of a telecommunications system that protects and enhances Canada's social and economic fabric (sec. 7(a)), to enhance the efficiency and competitiveness of telecommunications services (sec. 7(c)), and the availability of reliable and affordable communications services for all Canadians (sec. 7(b)). Allocation of spectrum through licensing mechanisms is one of ISED's most important policy tools and is governed by the objectives set out in the *Spectrum Policy Framework for Canada* (Government of Canada, 2007), which include deriving economic and social benefits from the radio frequency spectrum resource. Since 1999, ISED has used auctions for spectrum allocation (Taylor, 2013, p. 123) and generated billions for the general revenue pool (Longford & Wong, 2007, p. 3). In the case of spectrum bands that are useful for services like cellular or broadband services, large for-profit commercial telecommunications service providers tend to be the only entities that have the resources to participate in ISED's spectrum license auctions. As a result, they often own spectrum licenses that cover Indigenous communities and territories but don't deploy mobile and fixed wireless broadband infrastructures and services, citing little to no profit motive given the large territories and relatively small populations.

The current spectrum licensing regime has led to a situation in which, as of 2023, no Indigenous entity in Canada has ever successfully bid on and attained a licence for the provision of mobile and/or fixed wireless broadband services from an ISED spectrum auction. There are a number of obstacles for Indigenous entities seeking a spectrum license, including tier size, high licence fees, and an overly complex licensing system. While the negative impacts of a lack of access to spectrum for Indigenous peoples across Canada have not been studied, we know that digital exclusion has been correlated with detrimental health outcomes (Sieck et al., 2021), lower educational outcomes (Drossel et al., 2020), and it has been demonstrated to exacerbate economic disadvantages and levels of poverty (Warschauer, 2003; Wilhelm, 2004). On the other hand, digital ICTs have been demonstrated as effective tools to support cultural resurgence and self-determination (Beaton & Campbell, 2014; Perley et al., 2016).

11. Eeyou Mobility Inc. and Traditional Cree Lifeways

In 2018, ECN began to work with SSi Canada, an ISO in Nunavut, to develop a plan to offer cellular coverage to the communities and major transportation routes in the territory Eeyou Istchee/James Bay. A joint venture between ECN, Eeyou Companee, SSi Canada, and Eeyou Mobility Inc. was founded. Through pooled resources, SSi obtained a subordinate license through an agreement with one of Canada's big telecommunications corporations (Loon, personal communication, January 31, 2023), and Eeyou Mobility Inc. began offering cell service to all nine Cree communities and the five Jamésien municipalities in November of 2021. Coverage of 1,750 km of roadways with the deployment of an additional 80 cell towers is expected by March of 2025. Many of these sites are energy-autonomous, off the Hydro-Québec grid and producing their own clean energy. This project will increase road safety and emergency response times, and complement a long-standing two-way radio communications network developed by the Cree Trappers Association (CTA).

As evidenced by Moses' story, two-way radio has been a critical mode of communication for the Cree for decades. It is the primary medium for diverse

applications, including: ambulance and emergency response units; first responders for triage responses as well as the fire and police departments; the Cree School Board uses it for internal services; road and maintenance crews for remote management; trappers use it for re-supply requests and emergencies; an early warning system for extreme weather events; and family communication. It is even integrated into Cree social media. Unique to the northern and isolated community experience, two-way radio serves as a lifeline for those in the bush, on the roads and highways throughout the year. It is a basic utility in Eeyou Istchee, common in homes, businesses, and services.

Over the past few years, two-way VHF radio has undergone significant improvement; with the integration of digital technology, handsets have become more powerful with more features and services have expanded to allow IP integration and merge with cellphones, cameras, and GPS systems. Two-way radio can now be used for text messaging, tracking and monitoring, and connecting to data systems, Wi-Fi, and external telephone systems. These affordances are important for a range of services including emergency notification services for community emergency services and travellers along the remote highways of Eeyou Istchee. Cell towers and service along major roadways will increase the capacity of existing networks, as well as support environmental impact assessments and give the Cree better capacity to be "the eyes and ears" of Eeyou Istchee (Mark et al., 2019, p. 7; see also https://www.creegeoportal.ca).

12. Spectrum Sovereignty

Electromagnetic spectrum is a natural resource and, under JBNQA, the Cree, Inuit, and Naskapi are guaranteed levels of harvesting equal to current levels of harvesting of all species in the territory (Crown-Indigenous Relations and Northern Affairs Canada, 1975, para. 24.6.2). It reserves exclusive rights in certain land categories; Native people have exclusive right to establish and operate outfitting facilities within Categories I and II and have a right of first refusal to operate as outfitters in Category III (Crown-Indigenous Relations and Northern Affairs Canada, 1975, para. 24.9.3). Philip Awashish, one of the JBNQA signatories explains that as a document, the JBNQA is fixed in its time, thus it can be difficult to reconcile particular terms and social, technological, and environmental changes; however, if all parties are genuine and willing to see the document as such, thus adopt broad interpretations, it can be understood to include digital services and spectrum (Awashish, personal communication, April 8, 2023). We argue that Cree have the right to harvest electromagnetic spectrum in their territories as they do with wildlife; establishing the right of first refusal to electromagnetic spectrum for the Cree by ISED would be consistent with the JBNQA and subsequent agreements.

The Canadian government, its ministries, and agencies haven't explicitly recognized Indigenous rights to spectrum, and thus licenses remain in the possession of large Canadian telecommunications companies and their subsidiaries. In recent proceedings, ISED acknowledged policy developments in the US, New Zealand, and Mexico that have prioritized Indigenous access to spectrum. The Federal Communications Commission (2020) introduced a 2.5 GHz Rural Tribal Window that allowed more than 400 Tribes to deploy services in their territories, while in New Zealand, the Māori Spectrum Group will receive 20 percent of future national commercial spectrum allocations at no cost, as well as NZ$57 M of funding to develop a range of digital enterprises and jobs in healthcare, education, and rural businesses (Clark, 2022). These are positive developments, but ISED has yet to announce any new programs specifically for Indigenous communities and ISPs.

Access to spectrum is a key component of the CTA project, and their proposal to maximize two-way radio coverage for their members living and hunting on their traditional territories should be understood as a critical aspect in the maintenance of the Cree language and culture. The CTA is bound and guided by the Traditional Eeyou Hunting Law (TEHL), a body of laws founded in the knowledge, beliefs, and customs associated with the traditional Cree practices of hunting, fishing, and trapping, and continually evolves to adapt to changes in society and technology. The TEHL offers an interesting model from which we might think about how spectrum is allocated in Indigenous territories. As it suggests, it has the adaptability to respond to changes in social, technological, and environmental changes:

> Eeyou law can be regarded more as a continuing process of attempting to resolve the problems of a changing society, than a set of rules. It is not the heedless reproduction of outmoded practices that makes an effective Eeyou law and a vigorous tradition, but a strong connection with the living past especially a strong and living connection with the land—Eeyou Istchee. (CTA, 2009, p. 2)

This expression of law is grounded in "a living connection with the land" and remains open and flexible to respond to the changing conditions, needs, and demands on the land. This includes the development of digital technologies and programs that require access to spectrum, as well as innovative infrastructure—hardware and software. The Cree have a long tradition of managing the resources of Eeyou Istchee and, as Blackwater (2020) has pointed out, spectrum is a natural resource that has been on the land since time immemorial.

13. Conclusion: Eeyou Istchee Media Futures

The report *Connectivity in Rural and Remote Areas* (Auditor General of Canada, 2023) indicated that, in

2021, only 42.9% of First Nations reserves had access to minimum 50/10 Mbps speeds. First Nations communities are lagging in terms of access to broadband, and this is consequence of inequities and inequalities including profound infrastructure disparities, sparse and overly complex (and competitive) funding programs, lack of policy support, and limited access to electromagnetic spectrum. The stories of JBCCS and ECN reveal a number of points of contact between networks of community knowledge and practices, and those of settler colonial government agencies and extractive colonialism. We've offered an account of the importance of spectrum to shortwave and FM radio, cellular coverage, and broadband services in the communities, and argue that the need to support traditional forms of broadcast doesn't preclude support for developing innovative approaches to the changes the social, environmental, and technological aspects of modern Cree everyday life. With the ability to connect comes the ability to enable broader participation within the broadcast and digital ecosystems, allowing people to participate in a range of activities, whether they are digital device adapters or not. The challenges the Cree face is not necessarily digital exclusion, but a loss of language and culture that can put networks of social inclusion at risk. As Marisa Duarte points out, Indigenous youth are increasingly comfortable with digital technologies and navigating cyberspace, but their challenge is how to apply these tools along with their own forms of knowledge and expertise toward retaining traditional values, histories, languages, and philosophies (Duarte, 2017).

The Cree word *Eeyou Istchee* translates into something like "the living land" in English and this understanding is threaded through the laws that govern traditional and current Cree practices on the land. The TEHL and those responsible for its interpretation and implementation are responsible for the *Anaacatawaayiitaacanouch*, or conservation, of wildlife and other resources of Eeyou Istchee (CTA, 2009). We argue that radio spectrum is an important resource for the continuation of Cree traditional lifeways, as well as for adapting to the challenges posed by settler-colonial policies, extractive colonialism, climate change, and a threatened language and culture. A radio station can—and, in the case of Eeyou Istchee, does—play a significant role in cultural, technological, and spectrum sovereignty. Canada acknowledges the risk of cultural imperialism that can result from not having a vibrant broadcast ecosystem—similarly, the inability to exist and speak to people in a traditional broadcast or digital space carries the very real risk that connection to a culture is damaged or lost.

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Conflict of Interests

The authors declare no conflicts of interest.

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Article

Bidi Bidi Creativity: The Liminality of Digital Inclusion for Refugees in Ugandan Higher Education

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Abstract
Educational inclusion for refugees is increasingly being framed through digital technologies. This is problematically characterised at the macro level by global and national narratives that portray the digital as an external and universal force capable of radical transformation and inclusion, and at the micro level with more nuanced accounts that acknowledge an already-present political economy of technology of everyday practices of (non)adoption and use. Particularly for refugees, inclusion is further characterised by a persistent liminality with its attendant experiences of transition and tentativeness. Digital inclusion becomes an ongoing act of managing these liminal experiences, noting where barriers exist that stall efforts at further assimilation, and developing practices or workarounds that attempt to move refugees away from the margins of social inclusion. Such management is inherently precarious, and one made even more precarious in digital spaces, where inclusion is increasingly intertwined with systems of control and surveillance. To illustrate this, this article presents findings from a project exploring educational participation by refugee students in Ugandan universities. It notes the subtle tensions that emerge from the expectations of participation in university life, and Ugandan life more broadly, amidst digital structures and narratives that complicate inclusion. In this article, we argue that more nuanced conceptualisations of digital inclusion, ones rooted in liminal experiences, are needed to anchor digital technologies in refugee communities.

Keywords
digital inclusion; higher education; liminality; mobile technology; refugees; Uganda

Issue
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1. Introduction

The discussion on digital inclusion as presented in this article is situated amidst the landscape of forced displacement, an ever-increasing and increasingly visible fixture of modern society. In 2022, the number of forcibly displaced people crossed the 100 million mark (UNHCR, 2022). This creates social, economic, political, and environmental burdens that affect not only the displaced themselves but also the host countries in which they are situated (Barman, 2020). Many host countries have managed extended, even seemingly intractable, displacements.

One such country, and indeed the focus of our article, is Uganda. Uganda hosts the most refugees in sub-Saharan Africa, over 1.5 million refugees and asylum-seekers mainly from South Sudan, the Democratic Republic of Congo, and Burundi as of 2021. Over 80% of refugees are hosted in settlements in 13 districts in the North and South-Western regions and the capital Kampala. Education is increasingly seen as a necessary driver for national assimilation, repatriation, or

relocation. Increasingly, educational inclusion is being expressed in digital terms, or in ways that make technology an interdependent variable in refugee inclusion into higher education. As such, there is a need for further research that looks at how digital inclusion is being framed and performed in education, and how that sits with the challenges inherent to the refugee experience.

2. The Ugandan Digital Landscape

The emphasis on digital technologies in global and national efforts at educational inclusion with refugees is characterised at the macro level by narratives that portray technology as an external and universal force capable of radical transformation, and at the micro level with more nuanced accounts that acknowledge the multitude of practices employed within existing political economies (Gallagher & Knox, 2019). These macro- and micro-narratives are increasingly pronounced for refugees as more of what constitutes civic participation—political participation, access to economic, educational, and medical services, and broader communication on social media—is enacted in digital technologies. The political economy of digital use for these populations is informed, to a large degree, by their status and overall visibility in Ugandan society. Formal efforts at digital inclusion employed within Uganda itself are expressed often through means of technological access and removing barriers to the use of that technology. These include efforts at cutting prohibitive mobile data costs (Njoya, 2022), providing learning centres equipped with internet connectivity and, in some cases, the development of community-run internet networks (Bidwell, 2021), the creation of internet infrastructures in refugee settlements (Le Blond, 2018), and training for digital skills and digital literacy provided to communities (Lipeikaite et al., 2022).

Mobile phones are often the most accessible digital devices that refugees can use. However, prior to 2019, they could only obtain SIM cards with a Ugandan government-issued refugee ID card, the acquisition of which is often time-consuming. Workarounds to obtain SIMs involve registering multiple SIM cards with a single person, registering with a Ugandan national, or through the auspices of an NGO (Clarke & Tukundane, 2021). As such, even when digital inclusion was achieved, it involved a misdirection that rendered the accounts of this inclusion invisible. Uganda recognised this and eased access to mobile-enabled services for refugees in 2019 (Casswell, 2019). Since 2019, and particularly for refugees, digital inclusion and civic participation are increasingly intertwined. This might manifest in biometric IDs and their use by refugees to access basic services such as medical care and education (Holloway et al., 2021), a process that also exposes them to a comprehensive surveillance regime (Al-Khateeb, 2021).

In Uganda, there have been government interventions in digital spaces to restrict civic participation and expressions of opposition to government rule (Nanfuka, 2021). This has included a now discontinued 200-shilling daily tax on users of social media, an attempt to suppress political dissent (Kakungulu-Mayambala & Rukundo, 2018), as well as deliberate internet outages (Anguyo, 2021) working towards the same effect. This has significant ramifications for civic participation as "perceived risks of retribution and intimidation" (Grönlund & Wakabi, 2015, p. 1) stunt civic engagement. Refugees, in their use and non-use of digital technologies for civic participation, must navigate these regimes and do so with the little social capital their liminal state affords. On one hand, digital inclusion provides the potential for exiting a state of perpetual liminality and becoming more fully assimilated into Ugandan life; on the other, it exposes these populations to a surveillance regime that potentially discourages that same assimilation.

This article explores how refugees engage with the narratives and practices of digital inclusion in Uganda. Persistent liminality is a hallmark of refugees, and this persistence is often managed through digital technologies. Ultimately, this presents a conceptualisation of digital inclusion that is rather respective of offline/online continuums than those presented in the grand global narratives that portray the digital as an external and universal force capable of radical inclusion.

3. Conceptualising Digital Inclusion and the Refugee Context

This brief review explores how digital inclusion is conceptualised, particularly in Uganda, and notes how that conceptualisation is being applied to refugee populations. Digital inclusion is often framed, particularly at the macro national and international levels, in techno-deterministic means, as "technologies themselves are offered as participation outcomes" (Dutta, 2020, p. 193). In this framing, the presence of technologies alone suggests a means for—and expression of—inclusion. Digital inclusion, therefore, rests on the acquisition of digital technologies and the development of a robust digital infrastructure.

A recent (2021) $200 million financing operation in Uganda acts on this framing by setting out to expand access to affordable internet, to improve digitally enabled public service delivery, and to strengthen digital inclusion (World Bank, 2021). This same project notes how greater connectivity will also strengthen the digital inclusion of host communities and refugees by improving digital infrastructure, digital skills, affordability, and accessibility of digital technologies. Digital inclusion is conceptualised for Uganda in terms of skills and the accessibility of a digital infrastructure. This framing is notable for an explicit emphasis on a more robust digital public service delivery, and implicit in its assertion that more of the acts of inclusion will be, or already are, digital.

Digital inclusion is often framed around building resilience. Leurs (2022, p. 28) notes how resilience "has

become the buzzword of choice…pertaining to vulnerabilized and marginalized groups." This is a turn towards what Ilcan and Rygiel (2015, p. 333) refer to as "responsibilizing" refugee groups for asserting their own inclusion. Discourses on resilience often predicate a digital expression: open educational resources in place of dedicated face-to-face instruction, more digital public service delivery in terms of health, education, and financial inclusion, and biometric identification programmes linking individuals to their activity. As Sseviiri et al. (2022) note, this was accelerated during the pandemic as emergency response, awareness building, and enforcement of quarantine restrictions from the government often found a technological expression through digital media platforms. Bukuluki et al. (2020) and Ssali (2020) critique these efforts in relation to their engagement with refugee groups as the digital communication provided during the pandemic was not culturally nor linguistically accessible. This is problematic insofar as it erodes the context specificity that these refugee groups exhibit and in which their efforts at digital inclusion are often directed.

The literature on the use of digital technologies by refugees, a use that supersedes more systemic efforts at digital inclusion and the digital framing presented thus far, is concerned with how mobile technology is used to navigate the migratory passage, and then how it is used to manage protracted displacement within a host country. The latter would include literature noting how refugees use technologies to assimilate into the host country, however incrementally. This literature, with its emphasis on individual and networked digital practices, often sits in tension with how digital inclusion is being conceptualised in broader national and international structures. The purpose of digital technologies in the migratory passage itself is multidimensional, serving to provide a means of maintaining links to family and support networks, financing their journeys, providing emotional support, documenting their experiences, and relieving boredom in the liminal stages of their journeys (Alencar, 2020). Tsatsou and Boursinou (2017) argue that understanding the use of digital technologies during the time of the "immigration travel" itself is critical to more fully understand these digital uses in transit, and to more fully appreciate the "implications of digital inclusion,'' or lack thereof, "for immigrants experiencing, combating or alleviating all sorts of adversities, volatile emotions, unanticipated problems and moments of uncertainty crisis they so often encounter while on the move from homeland to another land, from one life setting to another" (p. 4).

Digital inclusion in this context notes the relevance of the functionality of mobile technologies often to maintain digital intimacy. Greene (2019) notes how voice and video chat are often the preferred digital means for maintaining family relations for refugee women. Twigt (2018) notes how different digital technologies help refugees document and share their experiences with distant family members and within refugee communities. Many other examples exist suggesting a sort of digital inclusion, but all are predicated on a particular precarity of access (or lack thereof) to stable, affordable, and legally permissible (due to their uncertain legal status) mobile networks. Digital inclusion in this context becomes an act of navigating this precarity, or an act of navigating a "fractured information landscape" that enables or constrains efforts at inclusion (Kaurin, 2020, p. 8). Schoemaker et al. (2021) note how refugees make active efforts with and without technologies to negotiate the various identities available to them and to maximise their access to services, eligibility for employment, and spatial mobility. Kandasamy et al. (2022) emphasises digitally mobilising refugee networks to activate support; Irani et al. (2018) surface the role of digital technologies in helping refugees to integrate and attain independence, or what might be seen as a moving out of protracted displacement.

What is underrepresented in the literature on digital inclusion for forcibly displaced populations is a synthesis of how digital practices from the migratory journey and the period of protracted displacement might inform how digital inclusion is performed in the educational context. Many initiatives might inform this synthesis in Uganda including Kolibri, an open-source learning management system that allows for authoring and peer-to-peer sharing without the need for internet. Kolibri, under the auspices of the Government of Uganda through the Ministry of Education and Sports and National Information Technology Authority of Uganda (NITA-U) and UNICEF, has been used to educational effect throughout Uganda in refugee education contexts (Nanyunja et al., 2022) and in select government schools (Kabugo, 2020). Beyond providing an openly available technological option, Kolibri highlights the role that connectivity plays in the narrative framing of digital inclusion as an act of mitigating the exclusionary barriers posed by intermittent, expensive, and often unavailable internet access.

Drawing on this past research, our article explores how digital inclusion is being conceptualised in the Ugandan context for refugees, how micro accounts of technological practice sit with broader narratives of digital inclusion, and what implications that has for digital and educational inclusion of marginalised groups. It also notes how universities themselves act on these digital conceptualisations by manifesting opaque administrative practices through digital means, which can lead to the reinforcement of social stratification and work against the idea of inclusion predicated on social justice.

4. Theoretical Framework: Liminality

This article is concerned with exploring how efforts at digital inclusion for refugees must involve a critical appreciation of their complex arrangements of liminality. Derived from anthropological but used widely in sociology, cultural studies, and educational studies, liminality denotes

the spaces of transition between known social contexts and unknown ones, or the "symbolic and/or spatial act of transitioning between one socially sanctioned position or state to another" (Downey et al., 2016, p. 6). This liminality is often characterised as the spaces occupied by rites of passage as the individual transitions across and between "culturally recognized degree of maturation," such as legal status, profession, office or calling, rank, or degree (Turner, 1987, p. 4). As Chakraborty (2016, p. 145) notes, the Latin *limin* roughly translates as threshold, which carries with it theoretical implications:

> Such a spatial structure has an essential influence on social interactions: Relationships and social status are negotiated at the threshold; one is either rejected from or welcomed to the other side. The term "threshold" evokes images of entering and leaving, passages, crossings and change. It marks the point at which choices and decisions must be made in order to move on, and it would be unusual to think of it as a place to stay, a place of permanent existence.

Yet this state of liminal permanence is often the reality for refugees, often trapped between repatriation and assimilation. This threshold, that passing through to a generative state equivalent to the completion of a journey, is elusive. Thresholds represent "a transformed way of understanding, or interpreting, or viewing something without which the learner cannot progress" (Meyer & Land, 2006, p. 1). The liminality of refugees often portends that the threshold is visible, but not always attainable.

While in a liminal state, the individual is "unstructured" in that they are between "all the recognised fixed points…of structural classifications" (Turner, 1987, p. 7). They are transitioning between states of classification as they move through three highly interlinked and overlapping phases: initiation and separation, transition, and reincorporation (Elbanna & Idowu, 2022, p. 131). For refugees, these phases are acutely felt as they are often rendered invisible: legally, socially, educationally, and linguistically. In the initiation and separation phase, these refugees both literally and metaphorically occupy a "seclusion site" both in terms of being housed in settlements often far away from urban centres, and their seclusion from recognised legal, policy, and educational infrastructures. As Elbanna and Idowu (2022, p. 131) note, the indigenous term for this liminal phase among the Ndembu of Zambia is *Kundunka, kung' ula*, meaning "seclusion site."

Liminality is often characterised by periods of transition, experimentation, tentativeness (Lim et al., 2016, p. 2149) and the sort of ambivalence experienced on a transitional journey. "Leaving behind known ground to travel to a new reality, the voyager, also referred to as the liminar, will only reach this new reality once the transitional journey has been completed" (Darveau & Cheikh-Ammar, 2021, p. 867). Yet, this journey, particularly for refugees, is rarely ever complete. They are, often but not exclusively, trapped in a phase of perpetual transition. As Downey et al. (2016, p. 6) note, there is tension in this as "one cannot occupy an in-between space or exist (in-)between two binary states without a resultant tension and/or mobility between both elements of the binary, which resist but also merge with the middle in-between." Individuals, and cultures as liminality is most assuredly an intercultural space, experiencing this "in-between state" will move between either end of the binary routinely, oscillating between "home" and "host." Yet this tension, marked as it is by indeterminacy, ambiguity, and hybridity carries with it the potential for subversion and change (Bhabha, 1994, p. 4). When experiencing a liminal transition, the individual acquires knowledge and skills and (often) commits to society and their future role (Elbanna & Idowu, 2022, p. 131); liminality can be generative for the individual and the cultures engaging with it. Liminality has been used to interrogate aspects of the experiences of displacement. Hartonen et al. (2022) identified patterns in the liminality presented by refugees, particularly noting how ontological insecurity and spatial-temporal inconsistencies inform these liminal periods. Boer's (2015) study of Congolese refugees in Kampala notes how narratives of an often irretrievably past home and a desire for a future, often inaccessible, home fuel this liminality.

The role that the digital plays in constructing and navigating this liminality is complex as well. The digital can help refugees navigate the stages of their displacement experience—departure, arrival, and, in some cases, assimilation in host countries-while allowing them to maintain connections to their countries of origin, and the often-faint hope of repatriation. While the digital is found to function as an "anchor" (Williams et al., 2008) for some refugees in liminal spaces, tethering them to their transitional journey as well as their larger diasporic communities, for others it exacerbates the state of transition (Lim et al., 2016). Digital inclusion is in some ways a state of managing the liminality associated with forced displacement.

5. Methodology

This article is a synthesis of past project work (2019–2022) alongside a broader discussion of the liminality of digital inclusion for refugees in Uganda drawn from desk-based research. Much of the empirical nature of this project can be found in discussions on the lifeworlds of Ugandan higher education for refugee students and the role of non-educational actors in structuring them (Najjuma et al., 2022) and the communicative action and the language of othering these same students experience (Nambi et al., in press). Data was collected from three public and four private universities beginning in 2020 and ending in 2021. The first activity of data collection included desk research whereby the researchers carried out an extended literature review to establish patterns in the literature and policy regarding refugee

education in Uganda and globally. The second activity involved holding semi-structured interviews with two categories of participants. Five interviews were held with administrative staff at the selected universities who were at the level of deputy vice chancellor; 20 interviews were conducted with refugee students in universities. For the third activity, we conducted seven 10 focus group discussions with refugee students who were available at the university at the time of data collection. We collected data during the time of Covid-19 restrictions and hence we had to visit some universities several times because some students were not available on campus depending on the adjusted university calendars.

Interview and focus group discussion transcripts were read holistically and open and then axial coded using annotations and text highlighters as finer themes emerged from the data. Since we worked with various categories of participants—university administrators, lecturers, refugee students, and personnel from refugee support organisations, several themes surfaced from the data and they could not all be justifiably presented here, including universities as spaces of access, administrative omission, and the construction of workarounds to engage with university study, how non-educational actors perform a role in inclusion for refugee students, and the role of (both digital and analogue) social networks on participation in higher education. This article and its explicit focus on how digital approaches are positioned in the accounts of refugee students and those who work with them should be regarded as complementary to a further publication by the same authors on the institutional dynamics of participation of refugees in higher education (Najjuma et al., 2022).

The authors acknowledge the fact that refugees are a vulnerable group of people and hence there are various ethical complexities associated with researching them. The work by other researchers (Awidi & Quan-Baffour, 2020; Dryden-Peterson, 2006a, 2006b) and our interaction with stakeholders such as Windle Trust International and the Refugee Law Project was instrumental in providing some ethical considerations regarding this group of people as we prepared the research activities. We obtained written and informed consent from the participants after explaining the purpose of the project clearly to them. The authors sought and received ethical clearance at both their universities through the formal ethical review bodies to which they submitted the relevant documentation such as the objectives of the project, the timeline for data collection, and the research instruments. All names presented in the following analysis are pseudonyms to protect the identities of those participating.

6. Scaled Online Education and Interpersonal Acts of Digital Inclusion

This analysis revealed several findings of importance for how we might problematise and conceptualise digital inclusion, for both refugees and, more broadly, marginalised populations. These findings are digitally mediated yet reveal a more sociocultural nuanced perspective than is traditionally found in more technodeterministic accounts of policy and practice. All validate to some degree Dutta's (2020, p. 284) assertion that "communicative inequality is relational, reflected in power imbalances in relationships that shape the differential access to actors to communicative infrastructures." This relationality was found in our data as well, suggesting that digital inclusion is first predicated on broader sociocultural patterns of power that limit access to that communicative infrastructure. The following passage from Akiki, a refugee and second-year undergraduate student at a private Ugandan university, is suggestive of this. Note that Luganda refers to a Bantu language spoken in the African Great Lakes region:

> We have a course WhatsApp [group], then we have the administration WhatsApp group. Then you will find that sometimes the communication people who are Luganda tend to communicate in Luganda. You understand? They text things in Luganda. Therefore, you who [are] there, you can't understand what they [mean]. You will be seeing them reacting. They're like chatting and commenting, but [as] for you, you'll not understand. Yeah.

In this instance, the communicative infrastructure that proves inaccessible isn't necessarily bound in the digital; it is a linguistic and ultimately sociocultural one that excludes and renders opaque university administrative practices even more opaque:

> The lack of institutional policy coordinating refugee students, classifying refugees as international students, financial restrictions and processes associated with universities and at times opaque administrative practices have a structuring effect on the lifeworlds of these students and their capacity for communicative action. (Najjuma et al., 2022, p. 10)

The accessibility of communicative infrastructures, in this instance, begins with a shared language and extends far beyond mere possession of a digital device.

However, the digital practices of students within the academic, not administrative, context were aimed at communicative accountability. This is suggested in the following exchange between the interviewer and Sanyu, a refugee and fourth-year student at a public university who also held a leadership position within a refugee student network at his university:

> Sanyu: As students, we have our WhatsApp group, and also the lecturers, they give us their WhatsApp group, and they give us their emails. In case you don't access them via phone calls, you access them via email or WhatsApp.

> Interviewer: And how have you found that to be useful?
>
> Sanyu: It has been easy, because when you are sent…when you send someone an email, the person cannot deny it, the reference is always there.
>
> Interviewer: The reference is there, they cannot say they didn't receive it.
>
> Sanyu: They cannot say [they didn't receive it], even if you send a person a WhatsApp message. The reference is always there, not like the phone call, where the person [can] say: "You didn't call me." But if you send a WhatsApp message, email…
>
> Interviewer: It's always there.

We note the communicative, largely interpersonal, digital practices being displayed here and how these sit problematically with the narratives of scaled online education that were advanced during the Covid-19 pandemic and the subsequent eight-month national lockdown in 2021. For many, education in the formal sense stopped abruptly as the devices needed to engage in formal online education were inaccessible. Sanyu reiterated this same liminality in the following passage, structured partly because of this move to online teaching which required access to a communicative and technological infrastructure that proved impossible to maintain:

> Sanyu: It was hard because, during locked [sic] down, universities were told to start [this] program of online teaching. So, for us, we were locked down there.
>
> Interviewer: In the settlement?
>
> Sanyu: In the settlement, yeah. There the network is bad and it is also hard to access…to get data. It consumes a lot of data. That's why it was hard for us.
>
> Interviewer: So how did you overcome that?
>
> Sanyu: I cannot say I overcame it but we tried. When the president recalled that finalists should come [due to the partial opening of institutions during the Covid-19 lockdown], we came [back to university] directly. So, we did not overcome it from there, we just came [back to the university campus].

Sanyu's act of physical mobility as an expression of educational and digital inclusion was found throughout the data, as many students left their settlements to stay in hostels near their universities so they could access its digital infrastructure. However, this physical mobility was not available to all, with another respondent, Miremba, recalling: "We're just at home waiting."

More broadly, we note how this move to online education and its emphasis on computers and connectivity sits with the more interpersonal accounts of education taking place largely through mobile technology. This was a form of education available to many during the lockdown in contrast to online education which was available to a select few. Yet it was not often recognised as education by even the students participating in it, suggesting the power of the dominant narrative of online education as the proper form. The following exchange with Mukisa, a third-year undergraduate student at a public university, suggests this:

> Interviewer: So, [this] means [that] for the whole of the eight months, the whole time of the lockdown, you were not able to do anything?
>
> Mukisa: No.
>
> Interviewer: Not even participate in any WhatsApp group with your peers, or university platform?
>
> Mukisa: For the issues that were top [important], I was participating in some Bidi Bidi kind of creativity. We were having some Zoom chats with some students also from Canada [and] some from America. So, we could have like a conversation. We discussed how things are, we also share our challenges.

Bidi Bidi is a refugee settlement in North-Western Uganda; Mukisa is referring here to a type of creativity that makes use of limited resources in creative ways.

What Mukisa presents is a sense of agency in his digital practices, as he is accessing networks and educational opportunities potentially unavailable to him at his own university where those opportunities have been largely equated to formal online education. What Mukisa might have seen as an informal workaround, or a "Bidi Bidi kind of creativity," is an act of digital inclusion, one that begins to act on the liminality that he may be experiencing due to his position as a refugee situated on a settlement. Yet the communicative access he has achieved through this act of digital inclusion is not specifically tied to a Ugandan context, but a broader multinational one ("some students also from Canada, some from America"), suggesting that liminality in terms of transitioning into Ugandan society remains problematic. Mukisa goes on to note the workarounds to formal online education that were being discussed specifically for students in rural contexts, which could also apply to those living in settlements:

> Some of us stay in a remote area where internet is a problem. Network is always a problem. You understand? So, another way around [it] might also hinder other people who are in the remote area. So, it is a bit complicated. But I remember having a meeting….It was on Zoom, during the lockdown. They were discussing…how we can help the people in the remote

> areas. I raised [the] issue of some students being in the remote areas, how are they going to help them? So, they said they had CDs [and] they put all the things in the CD. Then, for you, if you have a laptop, [you] go and fix it, then you hear the recordings.

Again, we see how the narratives of formal online education sit even within the workarounds designed to alleviate their demands: CDs with recordings and course materials for laptops to play in a national context where less than 3% of Ugandan households have access to such devices (NITA, 2022), which is where most settlements are located. In parallel to these workarounds at the institutional level, many universities in Uganda negotiated zero-rated access to designated educational internet domains which meant that students could access these materials without accruing data costs on their mobile devices (Olweny et al., 2022). While zero-rating has received considerable critique for its violation of net neutrality and its increasing commercialisation of the internet (Belli, 2017; Willems, 2021), it allowed for some continuity of education to proceed, if mobile technology was available. This was not an option available to all universities, however, as Mukisa's context seems to suggest, or it was made opaque by a narrative framing of online education and its attendant emphasis on laptops and desktop technologies.

This emphasis on connectivity in the digital inclusion framing was echoed by many of the students themselves, noting the role that the university performs as a broker to free and relatively stable connectivity and hardware, a point that Mukisa reiterates: "For me, I was thinking the university providing a free internet kind of services." Balinda, a third-year undergraduate student, refers to the role of the university in mitigating barriers to access, and notes the role that physical mobility plays in performing inclusion in this context:

> Balinda: Previously, before we could come back physically [to] the university, we were learning at our various places. But because of [the network in] the refugee settlement, I decided to come to Kampala and settled in my hostel to [have] access…to university premises. We could not be able to do it at the camp because [the] network is a problem. We had to come to the university and then access…university premises, yeah, on permission.
>
> Interviewer: So, the university offers you access.
>
> Balinda: There's free internet.

Balinda again emphasises the physical mobility needed to perform both the act of a student and digital inclusion more broadly, countenancing Dutta's (2020, p. 284) assertion that "communicative inequality is relational, reflected in power imbalances in relationships that shape the differential access to actors to communicative infrastructures." Access in this digital education framing is not exclusively an act of mitigating barriers to connectivity, hardware, stable electricity, and so forth; it is an act of physical relocation to move nearer to the university campus and its brokerage of access to wifi and hardware. For those who cannot relocate, this produces a communicative inequality and exacerbates the liminality these students already experience ("we're just at home waiting for the school to resume"). The digital, particularly in its narrative emphasis on online education and hardware, compounds this liminality by making physical relocation a necessity for inclusion.

7. Conclusion and Implications for Digital Inclusion

The authors assert that the way digital inclusion is framed in these contexts, particularly in how it interacts with higher education, is problematic. We note that the narrative of digital inclusion in higher education is one that sits in tension with the more granular accounts of practice in an already present political economy of technological use amongst refugees and more broadly in Ugandan society. The narrative of digital inclusion is one predicated on adherence to neoliberal discourses around the scaling of education that is predicated on greater and greater technology use. The attendant materiality of this scaling is an increasing reliance on laptop and desktop-based technologies, and the implicit assumption of reliable connectivity and electricity. This emphasis structures how digital inclusion is performed by these students, an inclusion that is reliant, somewhat paradoxically, on physical mobility. Through these acts of digital inclusion, these students, indeed all marginalised populations, are increasingly reimagined as responsibilized and rational neoliberal subjects with great degrees of autonomy and flexibility at their disposal (McCarrick & Kleine, 2019).

The workarounds that these students surfaced in their acts of digital inclusion speak to a synthesis of the digital practices from the forced migratory journey, and from the period of protracted displacement where the function of digital technologies is in alleviating adversities, emotions, unanticipated problems, and uncertainty (Tsatsou & Boursinou, 2017). Workarounds, whether they be physical relocation, obtaining SIM cards, or supplementing interrupted formal education with online groups and communities, all speak to an existing political economy that suggests a more nuanced presentation of digital inclusion is possible, one that emphasises practical ingenuity, or a Bidi Bidi kind of creativity.

Yet what is problematic in this framing is how it renders those unable to access this communicative infrastructure, bound as it is on the university campus, largely invisible and immobile. Many, if not most, cannot relocate and the technological infrastructure of the settlements is inadequate for participating in the types of online education being proffered by higher education and its emphasis on wifi, hardware, and

power. Workarounds often emphasise mobile technology. When mobile technologies are available, there is evidence of digital inclusion taking place: "maintaining connections with contacts at home while forging new ones with hosting communities, and the 'collective sense-making' of processing and triangulating information" (Dolan et al., 2022, p. 6). Many Ugandan universities understood and acted on this digital inclusion by providing zero-rated access to educational infrastructures, or in some cases by emphasising connectivity-sensitive applications like Kolibri. Further university adaptations such as this, ones that contest the dominant narratives of digital inclusion as the purview of hardware, Wi-Fi, and unfettered access to electricity, are welcome.

The authors argue that digital inclusion for refugees involves managing the liminality of protracted displacement more broadly, and the attendant ambiguities of engaging with higher education more specifically. This management is inherently a political one of navigating power asymmetries that routinely submerge "voices that are erased by the rules, norms, and guidelines of dominant discursive spaces" (Dutta, 2020, p. 284). Digital technologies do not counteract this erasure in any sort of essentialist way. Indeed, they tend to accelerate them by providing additional barriers to moving on from liminal positions. Beyond the material barriers of access, use, connectivity, power, and so forth, sit the narrative frames that further render inclusion inaccessible. The liminality experienced by these refugee students, entwined as it is in the digital, in higher education, and in the possible assimilation into Ugandan society is marked by "extended time periods of self-guided process, self-made communitas and incomplete or culturally problematic narrative where new scripts emerge" (Elbanna & Idowu, 2022, p. 132). A feature of these processes, communities, and scripts are creative workarounds where greater access to education and broader society is possible.

When access is achieved, the potential to allow the refugee student to move beyond liminality, to reach "this new reality once the transitional journey has been completed'' (Darveau & Cheikh-Ammar, 2021, p. 867) is complicated by the hierarchies of digital spaces. We countenance that "mediated communication must be understood as both producer and a product of hierarchy and as such fundamentally implicated in the exercise of, and resistance to, power in modern societies" (Silverstone, 2005, p. 190). Without this understanding, we will see "ongoing erasures at the margins of the margins" (Dutta, 2020, p. 284) in the broader narratives of digital inclusion.

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Conflict of Interests

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Article

Transformation of the Digital Payment Ecosystem in India: A Case Study of Paytm

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Abstract
Paytm is a payment app in India providing e-wallet services; it is also the most prominent mobile e-commerce app in the world's third-largest economy. This article uses Paytm as a case study to better understand the global platform economy and its implications for social and economic inequities. We contextualize the emergence of Paytm by drawing attention to its relationship with India's developing digital infrastructure and marginalized populations—many of whom are part of the platform's user base. We use a political economy lens to investigate Paytm's market structure, stakeholders, innovations, and beneficiaries. Our research is guided by the question: What resources, infrastructures, and policies have given rise to India's digital payment ecosystem, and how have these contributed to economic and social inequities? Accordingly, we audited the international and Indian business press and Paytm's corporate communications from 2016 to 2020. Our analysis points to the tensions between private and public interests in the larger platform ecosystem, dispelling notions of platforms as neutral arbiters of market transactions. We argue that Paytm is socially beneficial to the extent that it reduces transaction costs and makes digital payments more accessible for marginalized populations; it is detrimental to the time that it jeopardizes user data and privacy while suppressing competition in the platform economy.

Keywords
digital wallet; financial inclusion; multi-sided market; network effects; platforms

Issue
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1. Introduction

1.1. Significance of the Research Problem

The International Telecommunication Union (2023) defines a "digital financial services ecosystem" as interoperability between consumers, businesses, and government with a regulatory framework for the digital financial services sector. This article uses Paytm, a fintech firm operating in India, as a case study to demonstrate the significance of digital intermediary platforms in financial services ecosystems. Paytm is a payment app that provides financial services such as automatic bill payment, money transfers, and payment services (for example, travel and movie tickets). Paytm's mission statement declares its intention to bring half a billion people in India into the mainstream economy (Paytm Bank, 2020a). Digital intermediary platforms have the potential to play a significant role in curbing social and financial exclusion by facilitating the widespread adoption of digital financial services. Our case study explores how the regulatory frameworks adopted by the Government of India and digital financial intermediaries have approached social and financial inclusion. The Government of India demonetized all ₹500 and ₹1000 banknotes in November 2016, an unexpected

economic policy reform that forced a shift to digital payments (K. Singh et al., 2017). Focusing on Paytm allows us to scrutinize the problem of social and financial exclusion and how institutions have attempted to displace a cash-reliant economy with a platform ecosystem dominated by a handful of fintech firms. Using a political economy lens, we examine Paytm's growth phases. We focus on its internal governance to show how digital payments penetrated a market formerly characterized by cash transactions. Our analysis reveals how multi-stakeholder collaborations between the government, banks, and platform developers structured the current payment ecosystem. We argue that India's platform ecosystem has enriched platform owners by creating opportunities to develop multi-sided markets in a largely cashless economy.

1.2. Literature Review

1.2.1. Social and Financial Exclusion

We believe that social inclusion is strongly linked to financial inclusion. Digital financial services can improve marginalized individuals' lives by giving them access to the formal economy. The digital divide encompasses much more than a dearth of information and communications technologies (ICTs); it also signals a lack of affordability, digital literacy, information knowledge, and quality access to networks. Various scholars have analyzed digital inequality and identified illiteracy and a lack of technical knowledge as barriers to social inclusion (Anooja, 2015; Goswami, 2016). Understanding the challenges of marginalized populations and techniques to overcome the obstacles such as cost, literacy, and infrastructure is essential. The digital divide precludes the social inclusion of marginalized people and requires policymaking at the state level. In the case of India, Zabiliute (2020, p. 78) notes that "since its inception, an economic policy promising more clarity and regulation for all was absorbed into the existing social hierarchies, precarity and the unforeseen complexity of creative and unregularized economic activities that characterize urban India." A lack of education, technological savviness, digital literacy, and stable employment has resulted in financial insecurity and social inequity.

The informal financial practices of marginalized populations are prevalent despite having access to bank accounts and digital payments (Zabiliute, 2020). Financial inclusion means ensuring all individuals are integrated into the formal banking system and have equal opportunities to access financial services. A country's financial inclusion level is strongly linked to its level of social integration, whether it is similar or different from other countries (Ozili, 2019). Two crucial development agendas that aim to improve the well-being of individuals in society are social inclusion and financial inclusion (Chibba, 2009). According to Banga (2021), former CEO and current executive chairman of Mastercard, financial exclusion refers to people's inability to utilize payment methods other than cash and to have an official credit record. This deprives marginalized people of access to the formal banking system and the larger fintech platform ecosystem. The lack of access to financial resources can negatively impact individual financial security and hamper efforts to alleviate poverty. Achieving financial inclusion will require public-private partnerships as it is unlikely that any single bank, government, a fintech firm, mobile network provider, or NGO can address the problem independently (Banga, 2021). Collaborative coordination between the public, private, and non-profit sectors is needed to create a financial ecosystem that works for the benefit of all people. The digital financial ecosystem is heavily reliant on private financial intermediaries. Phadke (2020) claims that almost 90% of digital financial transactions in India occur via non-banking institutions such as Google Pay, PhonePe, and Paytm. T. Singh (2020) takes note of the "high volume–low margin" marketing strategy that Paytm used to establish itself in the market. This gave Paytm an edge over competitors with higher transaction costs.

While digital intermediary platforms can provide people with access to financial resources, there is no guarantee that their presence alone will deliver more significant social and financial inclusion. For example, Ligon et al. (2019) observed substantial barriers to digital payment services in India despite efforts by the government to promote these systems. The authors surveyed over 1,000 merchants in Jaipur, India, and found little evidence to suggest that supply-side barriers explain low adoption rates. Instead, they discovered that demand-side factors may discourage the adoption of digital payment systems. Accordingly, they recommend that policies concentrate less on getting small-scale merchants to adopt digital payment systems and more on incentivizing consumers. Sinha et al. (2019) considered the demand-side factors impacting the adoption of digital payment services. The authors found that despite the initial wave of adoption following India's demonetization, usage and retention rates remained low due to consumer concerns about privacy, fraud, and the lack of legal protections.

Similarly, B. P. Singh et al. (2017) examine consumer perspectives on the quality of service in India. The authors asked 254 respondents to comment on a variety of quality factors. They found that despite widespread awareness of the benefits of digital payment systems—especially among younger people—there remain significant concerns about security, usefulness, and trust. Bagla and Sancheti (2018) also found significant gaps between consumer expectations and satisfaction with popular payment systems like Paytm. The researchers surveyed 313 respondents in Delhi and identified several factors influencing demand for digital wallet services, including cashback and reward programs, ease of use, money transfer services, security, and a lack of transaction fees. Subrahmanya and Puttanna

(2018) found that the persistence of consumer preference for physical currency slowed the adoption of digital payment services. The authors argued that despite a continued choice for physical cash, low demand indicated growth potential for digital payment services. The authors noted that the sudden decrease in available physical currency resulting from demonetization effectively increased the demand for digital payment services. However, the subsequent reintroduction of currency gave customers an alternative to digital payment, hampering the long-term effort to transition the economy to a cashless or less-cash society.

A growing body of literature has begun to take a more critical perspective on India's financial platform ecosystem. Chandrasekhar and Ghosh (2017) asserted that adopting a digital payment ecosystem may lead to the development of a market based primarily on rents or incomes derived from the ownership of assets, the costs of which are likely to fall disproportionately on poorer populations. The authors observed that the central bank typically bears the costs of cash payments, whereas the prices of digital payment services fall squarely on the backs of consumers. Once the digital payment ecosystem displaces cash transactions, considerable financial benefits will accrue to the firms providing financial services. Bose (2019) also highlighted the self-serving political aspects of India's demonetization efforts. Bose used a framework based on public choice theory, analyzing policy decisions through the conventional economic lens of self-interested agents seeking to maximize their utility. Bose argued that India's demonetization policy increased transaction costs while incentivizing the implementation of digital payment systems, irrespective of the public interest. Our case study contributes to this small but growing literature on Paytm by analyzing its function as a platform that facilitates a multi-sided market. Our analysis sheds light on Paytm's multi-sided market by identifying the platform's relevant stakeholders, including financial institutions, the government, foreign investors, neighbouring industries, merchants, consumers, and third-party developers. We seek to fill a gap in the existing literature by focusing on how these markets are part of a world system premised on global class stratification whereby platform owners and the state profit from workers who reside systemically and spatially in a core and periphery (Wallerstein, 1987). Consequently, we adopt a political economy approach to analyze the Paytm market, governance, and infrastructure. This study of the platform ecosystem is essential as India serves as a model for other countries in the Global South looking to implement digital payment services.

1.3. Methodology

We use a political economy lens to delve into Paytm, one of the beneficiaries of India's demonetization policy. Political economy helps us focus on real-world historical processes and institutional adjustments to antagonistic social relations. Thus, our investigation considers who benefits from the digital services ecosystem and how the public interest has been impacted by demonetization. Using Paytm as a case study, we seek to answer the following questions: What resources, infrastructures, and policies have given rise to India's digital payment ecosystem? How have these contributed to financial and social inequities? Accordingly, we audited the international and Indian business press, as well as Paytm's corporate communications, for the period 2016 to 2022 to contextualize the platform's emergence within the larger political-economic landscape of India. Using the University of Toronto library website, we used the keywords "Paytm," "fintech," and "India" in our initial search query. This returned 114 articles, of which we selected 28 for analysis. These articles were selected based on their relevance to the topic and research question. We surveyed the business press and Paytm's corporate communications to (a) diagnose undesirable conditions and outcomes, (b) identify both market failures and public policy failures, and (c) provide a set of recommendations for policymakers (Weimer & Vining, 2017).

1.4. Context of Paytm Innovation: Changes in Financial Infrastructure and Policies

1.4.1. State Programs to Address Digital Inequality: Policy Imperatives Shaping the Rise of Paytm

Government intervention can ease digital inequalities by offering customized regulations and policies specific to a marginalized group. The Government of India promotes social and financial inclusion through economic transparency to ensure credit record building, prevent tax evasion, lower money laundering, and direct government services payments (Athique, 2019; Roy & Rai, 2017). In 2014 a branch of India's Ministry of Finance, the Department of Financial Services, initiated a social inclusion program to provide people living under the poverty line with better access to Direct-Benefit Transfer payments. It also offered qualified residents improved access to old-age pensions, disability allowances, and Below-Poverty Line (BPL) subsidies that could be deposited directly into their bank accounts. The Ministry of Electronics and Information Technology launched the Digital India Programme (https://digitalindia.gov.in) to boost digital infrastructure development in rural regions by bridging the digital divide between urban and rural populations. The government incentivized telecommunications companies to provide customers affordable network services and inexpensive mobile phones. In September 2016, India's leading mobile phone provider, Reliance Jio, launched 4G LTE networks offering nearly unlimited cellular data for about $6 (CAD) a month (NDTV Profit Team, 2017). Non-branded phones have been readily available in India for over a decade. People of lower socioeconomic status favour them because they are significantly cheaper than name-brand phones yet

still have many of the same multimedia functions (Doron & Jeffrey, 2013, p. 99).

1.4.2. Financial Policies and Technical Innovations to Facilitate Digital Payments

The Reserve Bank of India (RBI), India's central bank, helped establish the National Payment Corporation of India (NPCI), a non-profit consortium of banks to oversee digital payment and settlement systems. Dhananjay and Suresh (2015) assert that the NPCI was created as a specialized organization to help ensure that electronic payment and settlement systems provide secure, efficient, and interoperable service consistent with international standards. The NPCI introduced the Unified Payments Interface (UPI) system to facilitate the transfer of money between the bank accounts of any two parties (i.e., interbank transfer): "UPI leverages high teledensity in India to make mobile phones as a primary payment device for consumers and merchants and to universalize digital payments in the country" (Gochhwal, 2017, p. 1175). Upon its launch in August 2016, UPI was an independent, standalone public platform that did not gather much initial interest from private firms providing mobile wallet services.

1.4.3. Demonetization and the Expansion of Paytm's User-Base

With this infrastructure in place, the Government of India demonetized all ₹500 and ₹1000 banknotes in November 2016. In a country where an estimated 98% of transactions were made with cash and most of the population lacked bank accounts, the overnight discontinuation of banknotes caused a severe cash shortage and an immediate shift to digital payment services (Faden, 2017). Before demonetization, many residents had no bank account or lacked the required identity documents to open a bank account (Agrawal, 2018). To cope with the after-effects of demonetization, citizens were forced to adopt the prescribed digital payment methods to pay bills, buy groceries, or purchase from street vendors. Bose (2019) notes that the resulting increase in bank deposits after demonetization reduced interest rates, benefiting both the banks and the corporate sector while boosting GDP in the long run. Others benefitting from India's demonetization policies include mobile data network providers, mobile wallet services, fintech, e-tailers, and other digital payment aggregators.

The demonetization created opportunities for emerging mobile wallets like Paytm, which quickly became India's most used digital payment system. Demonetization was implemented in November 2016 and, almost immediately, "Paytm's user base grew from 122 million in January 2016 to 218 million by March 2017" (Agrawal, 2018, p. 181). The largest e-wallet company in India, Paytm doubled its user base during demonetization (Mukherjee, 2019). Bose (2019, p. 41) notes that Paytm's revenues from smaller towns grew from 2% to 20%.

2. Analysis of Paytm's Phases of Growth

Economists have recognized that business models based on platforms—systems that connect two or more groups of market interactants—require analytical treatments distinct from more conventional business models (Rochet & Tirole, 2003). This is because the demand of one group of interactants depends on the order of one or more of the other groups participating in a multi-sided market. Digital intermediary platforms often facilitate market arrangements in which multiple market actors are bound together as interdependent groups. Dijck et al. (2018, p. 4) use the term "platform society" to refer to "a society in which social and economic traffic is increasingly channelled by an (overwhelmingly corporate) global online platform ecosystem that is driven by algorithms and fueled by data." The authors draw attention to the relationship between the private benefit accruing to the owners and operators of platforms and the social value platforms generate.

2.1. Paytm's Emergence as a Mobile Wallet

Paytm originated as a firm offering prepaid mobile and DTH (direct-to-home) recharge services. In 2000, the founder of Paytm, Vijay Shekhar Sharma, started One97 Communication, which provided content management and value-added text message services (Jaiswal & Joshi, 2019). Sharma incubated Paytm ten years later under One97 Communication as a mobile recharge and bill payment platform. In 2014, Paytm ventured into mobile wallet services (K. Singh et al., 2017), and within two years of its launch, Paytm had 25 million users (Joshi et al., 2019). On the eve of implementing India's demonetization policy, Paytm was well ahead of its competitors, with 100 million users (Vikas & Kumar, 2018). Paytm was popular due to its various payment methods—the most important was its proprietary QR code-based payment acceptance solution, a boon for small merchants and street vendors.

To obtain a QR code, retailers had to register for a unique QR code and provide a mobile business number. The unique QR code could be pre-printed and displayed at shop counters and roadside stalls. The pre-printed QR code contained the merchant's account details and allowed them to receive payments without access to the Internet (Sahay, 2015). Customers could scan the merchant's QR code using their phones and enter the payment amount (Sahay, 2015). While this payment solution was already available in 2015, it became prevalent only after demonetization in 2016, especially among rural communities and small merchants. Vijay Shekar Sharma claimed that four out of seven Paytm customers are rural because these parts of India generally do not have the infrastructure to utilize credit/debit card services at the point of sale (Agrawal, 2018). Paytm's

service allowed these customers to use cheap mobile phone services as the primary authentication and payment method (Kumar et al., 2018). Thus, Paytm harnessed low-cost payment solutions to develop a market among lower-income and rural consumers. While other fintech firms offered the QR code system and RBI, Paytm competed by offering different payment solutions. As of 2018, the company claimed it had established the largest offline payments network in India, with over 8 million offline merchant partners accepting payments via Paytm QR (Moneycontrol.com, 2018).

2.2. Interoperability With UPI: Competing Interests of Public Authorities in the Payment Ecosystem

UPI enables every bank account owner in India to create a virtual payment address (VPA) or a unique UPI ID to transact through mobile phones without sharing bank account details (Gochhwal, 2017). UPI streamlines digital payments by cutting costs for debit card production, relying instead on a unique-payment ID available through mobile phones (Gochhwal, 2017). At the time of demonetization in 2016, UPI and its interoperable QR code were considered competition by Paytm. Paytm's mobile wallet charges customers a fee to transfer funds back to their bank accounts, making it difficult for consumers to purchase products outside the Paytm ecosystem. Conversely, UPI enabled cross-bank transactions at no extra cost (George et al., 2023).

In November 2017, RBI issued a circular instructing all PPIs to make their platforms interoperable through UPI, which meant adding UPI as a payment solution alongside wallet and debit/credit card services. Paytm immediately integrated UPI into its platform (Malik & Verma, 2017). Before this, a customer using the Paytm wallet would have been unable to pay a rival company (Gupta et al., 2017). UPI interoperability enabled merchants to select the platform of their choice and obtain a single QR code for payment acceptance. The interoperability of PPIs with UPI also reduced the hassle for merchants who had been obliged to register for various wallets to accommodate as many customer payment solutions as possible (Gupta et al., 2017). Gochhwal (2017, p. 1178) states: "UPI provides a standard set of APIs to enable transactions on UPI platform, thus enabling a fully interoperable system across all banks, financial institutions and payment systems without having silos and closed systems.''

Nieborg and Poell (2018) use the term "complementors" to refer to the various institutional stakeholders in a platform. The authors assert that "infrastructural access to application programming interfaces (APIs) and software development kits (SDKs) is among the primary ways in which platforms control complementors" (pp. 4281–4282). UPI made API available for easy integration with wallet platforms. In January 2020, Paytm launched the "all-in-one QR," allowing merchants to accept payment through the Paytm wallet, UPI, and debit/credit cards with no additional charge ("Paytm launches all-in-one," 2020). With this seamless payment solution, a small merchant or a microentrepreneur could fashion their business model around the Paytm integration system. On October 22, 2020, RBI also mandated that interoperable QR codes would be operated only by NCPI, Bharat QR, or UPI QR. The goal was to enhance digital payment's ease of use and efficiency ("RBI set to change," 2020).

Consequently, as Paytm expanded its service offerings, it could leverage the relationships among complementors to its advantage and force competitors out of the market. For example, UPI and SDK allowed Paytm to present itself as an alternative to the point of sale (PoS) devices retailers typically use to complete a transaction. Paytm CEO Sharma asserted that India needs more infrastructure to support physical card payments due to a dearth of card terminals (Agrawal, 2018). The rise of mobile payment solutions enabled by integrating APIs and SDKs allowed Paytm users to circumvent PoS machines. This was made possible by state intervention by the RBI and NPCI, which encouraged interoperability and standardization.

2.3. Paytm's Development Into a Versatile Fintech Platform

Digital platforms allow two or more distinct groups of market interactants to come together in a multi-sided market. Over the years, Paytm has developed a complex multi-sided market bringing together banks, retailers, financial institutions, third-party developers, and buyers (Kumar et al., 2018). Paytm offers the following payment acceptance solutions on its platform: (a) a mobile wallet, (b) debit/credit cards, and (c) a bank transfer service enabled by the UPI system. The integration of these payment systems makes Paytm a complex multi-sided platform. Banks, retailers, and consumers are among the most significant market actors in the Paytm system. Banks are the financial institutions responsible for making financial transfers through the UPI system; retailers are the merchants offering their customers Paytm as a payment solution; and consumers are the end-users utilizing the Paytm platform as a means of payment for goods and services. Paytm is the mediator bringing the three nodes together: banks, merchants, and consumers. Paytm controls the relationship between merchants and their customers and between banks and their customers (merchants and depositors). However, Paytm does not function as a neutral arbiter in these relationships. Instead, it provides various incentives to keep each group engaged with the platform.

In contrast to conventional mobile banking, the mobile wallet system offered by Paytm "is a niche method of conducting mobile payments with the capability of integrating customer [relationship] management (CRM) systems and marketing-related functions" (Kumar et al., 2018, p. 747). Paytm's mobile wallet is customized to users' needs, offering a more personalized experience.

Mobile wallets can deliver customized promotions and discounts tailored to individual consumers. For example, Paytm's Cashback program incentivizes consumers with cashback offers at select retailers: "The retailer integrates the loyalty-reward programs with the M-wallet system to streamline the value chain" (Kumar et al., 2018, p. 747). Conversely, the platform incentivizes retailers to integrate loyalty reward programs to promote their brand and expand their customer base.

Paytm generates revenue by collecting transaction fees from platform users, consumers, and retailers. The fee is not based on the type of user but on the payment category. Paytm does not charge users for wallet-to-wallet transfers, debit cards, or the UPI system. Transaction fees are only incurred if money is transferred from a mobile wallet to the bank or for credit card transactions over a specified monthly amount (roughly USD 150). Thus, the overall benefit of Paytm to consumers hinges on the longevity of these low transaction fees. Paytm may raise its fees if the market becomes uncompetitive. In such a situation, the government's refusal to enact price controls based on average-cost pricing or a fair rate of return could make the transition to digital payments less beneficial for firms, households, and society in the long term.

On the other hand, Paytm's retailer and consumer demands are interdependent. Raising transaction fees may risk collapsing the platform if either side abandons it. Platforms like Paytm must integrate digital payment solutions for all sides, reducing transaction costs and expanding the system's customer base and operational efficiencies. Paytm's large user base gives rise to significant network externalities. Srnicek (2016, p. 45) asserts: "The more numerous the users who use the platform, the more valuable that platform becomes for everyone else." Each side of the market contributes to the platform's increasing popularity, generating what is known as "cross-side network effects." This occurs when one side of the platform attracts additional users, generating value for the other (Abdelkafi et al., 2019). In the case of Paytm, this happens when retailers and consumers are attracted to the platform because of the increasing size of the reciprocal side. However, network effects may result in barriers to entry if a single firm captures a significant market share. In such a scenario, only the top firm captures the lion's share of the market's revenue. The resulting lack of competition may translate into a lack of service innovation, dwindling infrastructure investment, and higher consumer prices.

2.4. Capturing Users From the Grassroots Through Bridging Language Barriers

Paytm achieved critical mass in the user base for its platform in part by anticipating the demand for payment services among marginalized and local users who needed to be proficient in English. The firm made its platform more accessible by supporting vernacular languages. In November 2016, at the time of demonetization, Paytm became the first mobile payment and commerce platform in India to offer multiple regional language interfaces ("Paytm unveils its multilingual interface,'' 2016). Along with English, the platform is available in ten different regional languages—Hindi, Tamil, Telugu, Gujarati, Marathi, Bengali, Kannada, Malayalam, Oriya, and Punjabi. This resulted "in a 5x traffic increase for the platform from smaller towns" ("Paytm crosses milestone," 2017). The company witnessed an enormous increase in digital payments adoption, especially in tier II & tier III cities (terms for smaller than metropolitan cities in India), which make up 50% of their total user base (Paytm Blog, 2018). Paytm credited the introduction of multilingual features for this growth in sales, adding that 25% of their users preferred using the Paytm app in their regional language (Verma, 2018). This gave the firm a competitive edge by making the platform more accessible to the core Indian market.

2.5. Maturing of Paytm as a Platform Infrastructure

Paytm has developed into a versatile platform infrastructure in which various products are offered in addition to the well-known wallet service. The different products on the Paytm platform can also be called "platform instances." Nieborg and Helmond (2018) use platform instances to investigate each component within a platform's infrastructure. Platform instances are individual components on a platform that can be operated as an exclusive commodity or as a part of a larger service package. In addition to providing payment solutions, Paytm offers e-commerce services, including Digital Gold, Paytm Payments Bank, and Paytm Mall platform instances. Paytm collaborated with MMTC-PAMP, a certified refinery for gold and silver in India, to offer Digital Gold, allowing users to purchase gold directly through the Paytm app ("How to buy gold on Paytm," 2019). Paytm Payments Bank offers savings accounts in collaboration with the RBI "with the aim of extending deposit and payments services to millions of unbanked and underbanked Indians" (Paytm Bank, 2020a, para. 1). It also offers a debit card by RBI and a money transfer service. Paytm Mall provides an online-to-offline (O-2-O) commerce platform that allows small merchants and retailers who lack an online presence to use the Paytm Mall for a fixed-seller fee (Thakur, 2020). Paytm Mall allows consumers to shop directly with sellers (B. P. Singh et al., 2017). Users can utilize these platform instances while also using Paytm payment solutions. Each platform instance adds another revenue stream to Paytm's business model.

3. Governance and Management of Paytm

3.1. Paytm Shareholders and Stakeholders

Several stakeholders have invested significant sums in the Paytm product platform. Before demonetization, Paytm's

parent company One97 Communications received investment from several sources. In 2011, One97 received $10 million (USD) from the German enterprise software company SAP SE (Chanchani, 2011). Before demonetization, the Chinese e-commerce giant Alibaba (operating as Ant Financial Services Group) acquired a 25% stake in Paytm in a deal reportedly worth over $500 million ("Alibaba enters India's e-commerce space," 2015). After demonetization, Paytm received $1.4 billion from the Japanese internet conglomerate SoftBank (Chanchani & Variyar, 2017). Then, in 2018, Warren Buffet's Berkshire Hathaway purchased a stake in Paytm worth around $300 million (Choudhury, 2018). Moreover, in 2019, Paytm secured an additional $1 billion from the American investment firm T. Rowe Price, giving it a valuation of approximately $16 billion (Shrivastava, 2019).

Essential stakeholders include India's telecom companies, banks, and retailers. India's telecom industry benefitted from the initial increase in demand for digital payment services after demonetization since they provided the necessary mobile data services. Demonetization transformed mobile data in India from a luxury into a necessity. Banks are another major stakeholder. As previously discussed, the RBI introduced UPI as an interoperable platform providing further linkages among banks, customers, and third-party developers. Lastly, the major retailers and businesses that partner with Paytm are essential stakeholders.

3.2. Paytm Investments and Partnerships

Several different economic incentives drive the partnership choices made by Paytm. In 2014, Paytm partnered with Uber to provide a payment option for ridesharing across India, which included various services for Uber drivers "under the Uber Care program such as savings accounts, zero-fee debit cards and significant cashback at Indian Oil" (Paytm extends payment service," 2020, para. 3). In 2015, Paytm entered another partnership with the "online booking portal for Indian Railways, which sells nearly 700,000 tickets a day and 25 million tickets a year" (Iyengar, 2019, para. 11). Paytm also partnered with Vodafone Idea, one of India's largest telecoms, to launch a mobile recharge facility for bank account holders. Paytm has frequently partnered with foreign financial firms seeking a foothold in the Indian market. In 2019, Paytm partnered with Citigroup, the US banking giant, to expand its offerings with a cashback credit card that gives users 1% unlimited cashback for each transaction (Kelkar, 2019). Paytm Payments Bank partnered with MasterCard to issue virtual and physical debit cards (Paytm Bank, 2020b). These partnerships indicate Paytm's desire to position itself as an infrastructural platform that provides infrastructural information services to other platforms and app developers (Dijck et al., 2018). If successful, Paytm will become the gatekeeper to India's vast banking and financial services, mobile service, smartphones, and retail markets.

4. Challenges Faced by Paytm

4.1. Paytm's Competitors

At the time of demonetization, Mobikwik and Free Charge were two other popular mobile wallets that co-existed with Paytm. While these firms provided similar services to Paytm, they were both dependent on the Internet, whereas Paytm offered offline transfer services using SMS text (Sain, 2016). Mobikwik also offers a cashback service, while Free Charge provides users with coupons from restaurants and movie theatres. Other competitors offering digital payment apps include PhonePe (owned by Walmart), Amazon Pay, and Google Pay (Gupta & Yadav, 2020). Digital payment apps such as Paytm, PhonePe, and Google Pay utilize UPI as the primary means of money transfer. Google Pay works only with UPI transactions, while PhonePe and Paytm also provide mobile wallet and debit/credit card services in addition to UPI.

Another major competitor is Facebook, which is WhatsApp's parent brand. Facebook launched a trial version of WhatsApp digital payments in 2018. Facebook has collaborated with Reliance, which operates several competing services to Paytm, including Reliance Mall. Reliance is the parent brand for Jio Mobile, providing India's lowest mobile data prices. *The Guardian* reported that "the Reliance–Facebook combination represents a Goliath-like opponent, especially given Reliance's track record in decimating rivals when it entered the telecoms market with Jio Infocomm and cut-throat pricing" (Anand, 2020, para. 17). Facebook and Reliance plan to launch a digital payment service called JioMart, a mobile market platform on WhatsApp. This service would compete directly with Paytm Mall. Consequently, Paytm has expanded its financial service offerings to maintain its position as the top digital payment choice.

4.2. Paytm's Strategies for Growth: Technological Innovation and Market Expansion

In addition to its current offerings, Paytm continually expands its business model to keep pace with the latest innovation trends and market developments. For example, Paytm recently launched an Android-based PoS to accommodate small and medium-sized enterprises. Paytm made the service available for Rs. 499 (approximately USD 8) as a low-cost payment acceptance solution (Shetty, 2020). The service would enable small businesses and delivery personnel to accept payments on the go. Paytm intends to distribute over 200,000 devices to accommodate "over 20 million transactions" monthly (Shetty, 2020, para. 4). Recently, Paytm introduced the Paytm subscription option, a subscription service allowing businesses to collect payments from customers using a variety of payment solutions like Paytm Wallet, UPI services, and cards ("Paytm makes it easy for businesses," 2020). In addition, Paytm is beta testing a

social commerce app called My Store, an extension of its e-commerce service Paytm Mall, which will allow customers to sell items from their homes in much the same manner as eBay (Dash, 2020b). Paytm has also delved into travel services and streaming entertainment, perhaps in anticipation of competition with Amazon and Netflix (Mete, 2020).

In 2018, Paytm received approval from the capital market regulator Securities and Exchange Board of India (SEBI), allowing it to venture into stock brokerage (Biswas, 2020). Moreover, in March 2020, Paytm Insurance Broking Private Limited (PIBPL) received a license from India's Insurance Regulatory and Development Authority, allowing it to sell life and non-life insurance (Biswas, 2020). Paytm also acquired Raheja QBE General Insurance, a joint venture between Prism Johnson Ltd. and QBE Insurance Group, one of the largest insurers in Australia ("Paytm, Vijay Shekhar," 2020). Paytm's president, Amit Nayyar, stated that the firm's aim with this acquisition is to "create a tech-driven, multi-channel general insurance company with innovative and affordable insurance products" (M. Singh, 2020, para. 5). These are some ways that Paytm has responded to the shifting competitive landscape in India's digital payment ecosystem.

About Paytm's market strategy, Paytm founder and CEO Sharma stated: "Paytm follows a 3-3-3 philosophy. Three years for product-market fit, then three years for monetization pitch, then three years for profitability" (Dash, 2020b, para. 6). In the years since demonetization, Paytm has intended to establish itself as a leading financial service company (Dash, 2020b). The various expansions detailed in the previous section reflect the firm's ambitions. While remaining a financial service hub locally in India, Paytm intends to expand into foreign markets. To that end, Paytm has partnered with Softbank and Yahoo Japan to launch a mobile wallet service in Japan known as PayPay. PayPay's head of product development explained that they are replicating Paytm's business model and engaging with users in as many ways as possible (Dash, 2020a).

Moreover, Paytm's Sharma has expressed interest in expanding into US markets. US software giant Microsoft has reportedly considered injecting as much as $100 million (USD) into Paytm ("Paytm and Microsoft to join hands," 2020; Shrivastava & Sharma, 2020). Consequently, the digital payment ecosystem in India will likely continue to be dominated by large multinational conglomerates and international investors.

5. Policy Recommendations and Conclusion

In this final section, we consider alternative digital financial infrastructure regulation approaches for Paytm and the State to balance private and public interests better. Paytm has emerged as a formidable fintech in various markets, including banking, insurance, credit card services, and online marketplaces, to name just a few. Its multi-sided market brings together banks, retailers, consumers, and third-party developers. Paytm has achieved considerable network effects by connecting these interdependent groups on a single platform. Our discussion has highlighted the payment solutions integrated into the digital payment platform: the unique QR code allowing retailers to accept payment through digital credits and the UPI system allowing real-time money transfers from bank accounts and debit/credit cards. By providing APIs and SDKs to retailers, Paytm has facilitated offline payments using scannable QR codes. Paytm has also pursued product innovations like those mentioned above, portable, low-cost Android-based PoS systems. Paytm benefits its complementors and the public interest to the extent that it has reduced transaction costs through digitizing payments. It has been detrimental to the time it has suppressed competition in the market for infrastructural information services and downstream platform instances.

Here we offer some policy recommendations to ensure that consumers' interests are served in transitioning to a digital payments ecosystem. For lowering or eliminating friction, we note that Paytm currently charges users a 4–5% convenience fee for transferring money from their wallet to their bank account (Rawat, 2020). This likely inhibits users from utilizing their wallets freely. Fintech like Paytm should avoid levying these kinds of fees on consumers. Paytm could also incentivize users to store money in their wallets by paying interest on their accounts. When there is a failed transaction for which Paytm has already taken money from a user's bank account, the amount is not sent back to the depositor's account but instead stored in the wallet. The user must then utilize the funds or pay a convenience fee to return them to their bank account. Paytm should allow customers to transfer the funds back to the account where they originated free of charge. Users should not be penalized for a failed transaction.

In assessing the balance of interests in India's digital services ecosystem, we must consider the short-term social and financial inclusion that Paytm enables with various payment options against the long-term risks associated with monopoly. Paytm is one PPI in a marketplace dominated by large competitors with similar platform models, such as GooglePay, AmazonPay, and PhonePe. These firms offer multiple payment methods like Paytm through UPI, wallet, and credit/debit card services. These PPIs provide various incentives to buyers and retailers, such as cashback and rewards, to attract more customers. Paytm achieved network effects by introducing its QR code payment acceptance solution. However, these network effects also create significant barriers to market entry for emerging fintech in India's digital payment ecosystem. As Paytm increases its platform instances by venturing into new markets and service offerings, it may become increasingly difficult for smaller firms to compete.

For the same reason, India's digital payment ecosystem is already dominated by only a handful of

international fintech in addition to Paytm. We further note that India's Competition Act of 2002 includes provisions for abusing the dominant position. We believe the firm invites regulatory scrutiny from the Competition Commission of India to the extent that Paytm suppresses competition for infrastructural information services.

India's low penetration of smartphones and low technological proficiency remains significant hurdle for the emerging digital payments ecosystem. According to Statista, as of 2015, 18.21% of the overall population in India owned a smartphone—a number that is expected to rise to 36% by 2022 (Asher, 2020). Furthermore, as per Jayant Pai, Head of Marketing at PPFAS Mutual Fund, technical skills are a more significant obstacle for older, less-tech-savvy users (Dave, 2016, para. 4). Hence, Paytm still has a long way to go to reach users without a smartphone. To reach this segment of society, Paytm can implement a campaign of easy-to-understand text messages to provide its user base with technical support. Paytm also maintains its competitiveness by providing a multi-lingual platform to attract users and creating new platform instances like insurance, Paytm subscription, Digital Gold, Paytm Payment Banks, and Paytm Mall. Paytm can also provide offline payment options through text messages for users to pay vendors.

A digital financial services ecosystem could also benefit from government-mandated incentives for investment and tax benefits for adopting digital payments by individuals and firms. The government can further support the infrastructural development and dissemination of knowledge about digital payments and digital literacy in rural areas through community-level organizations and NGOs. The government should also work to strengthen policies for data security and legal protections for the right to privacy. Along these lines, the Government of India introduced the Personal Data Protection Bill in December 2019, which enacted the first cross-sectoral legal framework for data protection. Before, India did not have a formal data protection law or an agency to administer it. This bill acknowledges the growth of the digital economy and the need to expand the use of data as a critical means of communication between individuals and firms. The bill mandates that data be physically stored within the territory of India. According to Burman (2020), however, the bill must create an adequate regulatory framework to address market failures in the digital economy. Stricter State policies on data collection, storage, and usage would help firms like Paytm develop a digital payment ecosystem that works for private and public interests. The government can impose limitations on data collection, processing, and storage, ensuring that only the bare minimum of data is requested from users and made available only to relevant personnel, with restricted access and transparent criteria for eventual deletion. The promise of digital platforms to reduce transaction costs while bringing together new groups of interactants must be weighed against the market inefficiencies arising from a platform's capacity to become the infrastructural nucleus of an economy's information services.

Future research on social and financial exclusion and the role of digital financial services intermediaries should continue scrutinizing platform policies that ostensibly serve marginalized populations. How everyday users engage with these technologies may shine additional light on the various stakeholder interests and underlying social antagonisms that give rise to fintech ecosystems.

Conflict of Interests

The authors declare no conflict of interest.

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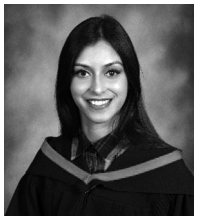

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Article

Tilting at 5G Towers: Rethinking Infrastructural Transition in 2020

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Abstract
5G has the potential to expand the horizons of digital inclusion by providing higher speeds, lower latency, and support for more devices on a given network. However, mis- and disinformation about 5G has proliferated in recent years and stands to be a persistent barrier to the adoption of this generation of wireless technologies. After rumours linking 5G to Covid-19 emerged in the wake of the pandemic, isolated actors attempted to disrupt infrastructure with a perceived connection to 5G. Media coverage of these incidents inadvertently spread such claims, engendering lasting uncertainty about 5G. Infrastructure scholars have long held to the maxim that "the normally invisible quality of working infrastructure becomes visible when it breaks" (Star, 1999, p. 482), but efforts to interpret the uptake of mis- and disinformation have struggled to define the technical difference 5G makes and describe diffused acts of anti-5G sentiment that exploited its slippery symbolic associations. What broke to make 5G so visible? This article reassesses interference with infrastructure through the lens of a literary metaphor derived from Miguel de Cervantes' epic novel *Don Quixote*. Using the Don's famed joust with windmills, I examine what efforts to disrupt the development of 5G in 2020 can tell us about infrastructural transition. With reference to Quixote's tilt, I contend that the disruptions of 2020 illustrate conflicting imperatives of inclusion and exclusion underlying neoliberal schemes of telecommunication development.

Keywords
5G; conspiracy theory; Covid-19; disinformation; infrastructure; misinformation; standardization; technical standards; telecommunications

Issue
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1. Introduction

A pair of tweets from the final days of 2022 illustrate the vexed position of 5G wireless technology today. On December 17th, @liz_churchill7, an account associated with People's Party of Canada activist and self-proclaimed conspiracy theorist Liz Churchill, posted that "inside these 'vaccines' are RNA modifying nanotechnology…that connects YOUR BODY to 5G (Pentagram)…which receives signals from CERN 666…and said 'Super Computer' that powers CERN is called 'The Beast'….CERN is located on the former Temple of Apollo" (Churchill, 2022, original punctuation). The day before, online humourist Dril said more succinctly: "5G was supposed to get us all Laid" (Dochey, 2022). The intersection of expectation and fantasy, of banal overhype and lurid imagination, illustrates the uncertain status of 5G in the years after the Covid-19 pandemic. Consumer demand has reduced, especially compared to 5G's predecessors (Gross, 2022a), corporate investment has declined (Friedman, 2022), and lingering suspicion of this new generation of telecommunication technology remains in popular consciousness. To take one example, recent polling found that as many as one in ten Canadians believe that "Covid was caused by the rollout of 5G wireless technology as electromagnetic frequencies undermined immune systems" (Monopoli, 2022). From innocuous technical terms to pandemic flashpoints to muted commercial jargon, 5G captures a waning faith in the infrastructures of shared social life and the flawed mechanisms that sustain these inclusions. Yet to follow the course of this divestment, it

is necessary to dispense with 5G as a fixed signifier and reinterpret the actions of its opponents as more than mere ignorance. To do so, I make three critical moves. First, I begin by offering a practical assessment of the difficulties of defining 5G as a discrete discursive object of mis- and disinformation. As a novel technical standard for a new generation of telecommunication technologies left to the whims of corporate marketing, there is significant slippage in the application and saliency of 5G. Second, I review existing scholarly and journalistic literature on mis- and disinformation about 5G in 2020 in light of this complexity. Though comprehensive, the exigencies of the pandemic make these efforts necessarily limited. Third, I develop a literary metaphor derived from Miguel de Cervantes' comedic epic *Don Quixote* to reassess interference with perceived 5G infrastructure documented throughout Europe and North America in 2020. I turn to an interlude in the misadventures of Don Quixote, his famed joust with windmills, which I deploy as a heuristic lens to better understand the symbolic significance and social contradictions embedded in infrastructure. I place this reassessment in dialogue with the turn toward infrastructure in contemporary media theory and conclude with a consideration of what interference with infrastructure in 2020 can tell us about infrastructural transition. By synthesizing studies of mis- and disinformation, literary criticism, and media theory, I endeavour to provide an original analysis of the critical complexities of 5G technology and outline the persistent barriers to social inclusion posed by the present scheme of privatized infrastructural development.

For a literary-minded observer, it was hard to miss the quixotic undertones of the sporadic destruction of telecommunication infrastructure that followed in the wake of the Covid-19 pandemic. Quixotic, which the Oxford English Dictionary defines as "naively idealistic; unrealistic, impracticable; (also) unpredictable, capricious, whimsical," is derived from the lengthy misadventures of the mad nobleman turned knight errant Don Quixote in Miguel de Cervantes' 17th-century novel *The Ingenious Gentleman Don Quixote of La Mancha*. Widely recognized as "the world's first and perhaps still its greatest novel" (Frye, 2010, p. 17), *Don Quixote* and its wayward protagonist have long functioned as a prism for the interpretive predilections of the reader's era. In the Romantic period, Quixote "join[ed] the gloomy and desperate band of idealists who maintain the purity of their egoism in the teeth of a scoffing society" (Frye, 2010, p. 15); in Francoist Spain, he lampooned the utopian imagination of "liberal reformers" of Cervantes' lifetime (Palmer, 2021), and in the early USSR, he "was chosen to become the symbol of the new Soviet man" (Gratchev, 2019, p. 131). While interpretations of Miguel de Cervantes' comic masterwork have evolved with time, Quixote's flexible, fanciful logic opens inroads to the uncertain events that occurred over the course of 2020, when mis- and disinformation linking the rollout of 5G technology to the novel coronavirus drove direct interference with telecommunication infrastructure around the world. Efforts to report on these incidents and debunk their associated claims had the opposite effect, massively proliferating the perceived connection between 5G and Covid-19 (Bruns et al., 2021) and engendering lasting skepticism about 5G technology. Although the conspiratorial content detailing the connection between 5G and Covid-19 has faded to the fringes, 5G has failed to find the popular appeal of its forebears and emerged as a uniquely politicized discursive object. There are several reasons for this, including quotidian dissatisfaction with the quality of 5G networks and worsening trade relations between the United States and China, a major innovator in 5G technologies. However, the events of the pandemic folded 5G into a new infrastructural politics. Wireless technology is an ever more intimate part of everyday life (Greenspan, 2016) and privy to a long history of skepticism and health concerns (Bodner et al., 2020, pp. 166–169), but the rollout of 5G proceeded alongside an unprecedented animosity toward infrastructure. From the sporadic destruction of international telecom infrastructure associated with 5G in 2020 (Arkin, 2021; Cerulus, 2020; Fildes et al., 2020; Warren, 2020) to the ongoing sabotage of the US electrical grid (Bergengruen, 2023; Domonoske, 2023; Morehouse, 2022), isolated interference with critical infrastructure has emerged as a potent form of the "politics of disruption" (Atkinson & Dewitt, 2018). At present, there is little literature on the actors directly responsible for such interference, but the uptake of mis- and disinformation about 5G sheds light on the fault lines embedded in existing plans of infrastructural transition.

For the scope of this article, I focus on interference in Europe and North America, while acknowledging that hostility toward 5G is a transnational phenomenon with deep historical roots. Although I stop far short of legitimizing the content of mis- and disinformation that drove interference with infrastructure in 2020, my approach is ultimately reparative. The exploits of Don Quixote are factually misguided and often harmful, but his endeavours provide a conceptual apparatus to explore the broader social contradictions of his time. In much the same way, the chaotic efforts to disrupt the development of 5G infrastructure in 2020 demonstrate the conflicting imperatives of exclusion and inclusion underscoring an increasingly networked society. While the product of rigorous inter-governmental and industry efforts at technical standard setting, the popularization of 5G is left to the fiat of the market. As Easterling (2014, p. 202) points out, international standards like 5G are "instructive if only because they have, in a matter of decades, changed the way people across the world talk to each other while also strengthening a layer of influential intermediate authority operating in between the market and the state." Though meant to expand the horizons of connectivity, 5G also acts as shorthand for a neoliberal paradigm of privatized development that excludes public participation and treats the novelty of a technical standard as

a commodity unto itself. Without greater attention to the critical nuances saturating mis- and disinformation about 5G, corrective interventions risk polarizing ongoing debates about the utility, applicability, and necessity of wireless technology into an intractable binary of utopian optimism and illicit conspiracism.

2. What Is 5G?

At its most basic, we may define 5G as a technical standard outlining the objectives for the fifth and latest generation of wireless cellular technologies, the G being short for generation. Established by 3rd Generation Partnership Project (3GPP), the international telecommunication body that developed the 3G standard, 5G shares the features of its technical forebears. 5G is wireless, like 1G, digital, like 2G, with data transmission enabling consistent access to the internet, like 3G, and subject to the market logic of a massive consumer base, like 4G. Through shared wireless infrastructure operating on the cellular grid system that supports existing mobile devices, 5G has the potential to vastly broaden the horizons of digital life. Typically, home internet access is provided through a combination of wireless and wired technology. Situated modems support local wireless networks on the electromagnetic spectrum via their connection to wired infrastructure such as telephone lines or fibre optic cables. Mobile devices use radio waves to access the internet over the electromagnetic spectrum, supported by signals organized and distributed by cell phone towers. The potential of 5G lies in the merger of these systems, as 5G supports higher frequencies of the electromagnetic spectrum and includes advancements in wireless encryption that allow the aggregation of different frequencies toward the same data transfer. There is already significant overlap between telecommunications and internet service providers, but 5G could render local WiFi networks obsolete by drastically expanding the capacities of cellular coverage to provide faster speeds, greater bandwidth, and lower latency. These changes mean that far more devices could be supported on the same network while also allowing for the optimization of wireless traffic through software-defined networking. This has significant implications for automation and the Internet of Things, as so-called "network slicing" can reallocate bandwidth to suit the needs of networked devices in real time. Thus, 5G poses a serious alternative to the existing topography of networked society by eroding the distinction between networked computing systems and the network itself (Oever, 2022, p. 5). It is under the weight of such great expectations that the conceptual saliency of 5G begins breaking down. According to one of 3GPP's first statements concerning 5G, "'5G' will remain a marketing & industry term that companies will use as they see fit" (Flore & Bertenyi, 2015). Consistently couched in "revolutionary" language (IBM, n.d.; Kearney, n.d.; Qualcomm, n.d.), figured as a crucial part of the "fourth Industrial Revolution" (Mauro, 2019), 5G does not denote a discrete technology, but an unfixed signifier designating a panoply of technological aspirations. Their implementation outside the vocabulary of corporate branding remains to be seen as Oever (2022, p. 5) observes that "5G has not yet been standardized or implemented." While there are many technologies associated with 5G and compliant with the existing specifications of standard setters, including new models of smartphones and "small cell" broadband installations, 5G itself is harder to disassociate from the phantasmal projections of telecommunications marketing. While 5G is a technical standard with a fixed meaning, it is also a technological commodity loosely applied to market faster wireless speeds.

While absent from existing approaches to mis- and disinformation centering 5G, the discursive complexity surrounding 5G holds significant interpretive weight to the disruptions of 2020. There is little recognition that most claims about 5G encountered in popular settings, especially early in its consumer rollout, may be inaccurate by strictly empirical standards, either by virtue of omission or speculation. An American advertisement from December 2020 gives one example:

> 5G from AT&T is fast, reliable, secure, and nationwide. So should you switch? Well, historically, those were the reasons new tech was adopted. Neanderthals saw that fire heated things fast, and made their caves secure from rampaging wooly mammoths. The ancient Romans saw that aqueducts were a reliable and fast way to transport water, so they stopped carrying water jugs on their backs and adopted them nationwide. And 1800s Victorians saw electricity light up rooms fast, and be more reliable than candles blowing out, so they stopped bumping into walls and made it nationwide. (transcribed by M. Peters; advertisement no longer included in the original streaming venue)

By the end of 2020, 5G was under no circumstances "fast, reliable, secure, and nationwide" in the United States. Despite being posited as a technical novelty that consumers may "switch" to, "5G" in the advertisement can only be reasonably conceived of as the current suite of services offered by AT&T with the ongoing *potential* for faster speeds. Such semantic slippage has been characteristic of the introduction of 5G into popular consciousness and telecommunications discourse. Well before the official rollout of 5G telecommunications, internet service providers advertised and installed so-called "5G WiFi" networks. Such networks have nothing to do with 5G telecommunications as such, instead referencing that the networks in question use a 5 gigahertz frequency. While broadly similar in terms of scaling up bandwidth, and now designated as "5GHz" by some providers, this ambiguity generated widespread confusion, potentially exploiting the ordinal associations of the G nominal system. While technologies broadly defined

as 5G might do a great many things in the future, in everyday life it is rarely clear to an inexpert audience what 5G refers to or what it does differently. The gap between such revolutionary potential and practical incoherence has significant consequences; 5G has produced persistent disappointment with shaky network coverage, slower speeds, and repeated accusations of industry overhype (Grijpink et al., 2019; Johnson, 2021; Marvin, 2019). Industry insiders have even gone so far as to suggest "that it might be time to move beyond the 'Gs' and towards more organic change, which is less likely to lead to disappointments" (Gross, 2022b). With 6G already in development, it is unlikely that such seismic shifts in telecommunication standards will occur anytime soon, but in order to get a better sense of the issues underlying the implementation of a new technical standard it is helpful to turn back to the early rollout of 5G. Unlike its predecessors, 5G entered a media landscape transformed by the failed promises of prior generations of information and communication technologies. Conspiracism and the persistent spread of viral mis- and disinformation have replaced the optimism and expanded accessibility that followed 3G and 4G.

3. 5G and Covid-19

Linkages between 5G and Covid-19 emerged early in 2020. Often centering the idea that Wuhan, where the novel coronavirus was first identified, was in the midst of implementing 5G infrastructure when the pandemic began, 5G–Covid-19 conspiracy theories paid little attention to the relatively embryonic stage of 5G's development or the reality that 2019 saw the general introduction of 5G infrastructure in multiple countries (Reuters staff, 2020). These narratives traveled in the wake of the virus, erupting into the popular consciousness of the English-speaking world as the first Western lockdown measures were implemented in March. In their most spectacular form, the perceived connection between 5G and Covid-19 drove the sporadic destruction of cell towers, resulting in the disruption of wireless service to mobile devices. Across the political spectrum, a variety of actors appropriated or exploited mis- and disinformation about 5G to dangerous effect. In 2020, anti-5G activity was associated with anarchist groups, far-right nationalists, and Islamic extremists. At the time, US law enforcement internally referred to 5G conspiracy theories as "the greatest domestic threat to critical infrastructure" (Arkin, 2021). Isolated actors from Cyprus to Canada targeted cell phone towers, burning up to 77 separate sites in the UK alone (Fildes et al., 2020; Lamoureux, 2020). On Christmas day 2020, a suicide bomber in Nashville, Tennessee, briefly disrupted local wireless connectivity, including access to emergency services, after targeting an AT&T network hub. Initial reporting alleged a direct connection to the expansion of 5G networks in the area and anonymous sources involved in the investigation confirmed that "agents [were] investigating whether or not [the bomber] had paranoia that 5G technology" was harming Americans (Finley, 2020). While Luddism might seem like an appealing historical analogue to this form of applied techno-skepticism, such a comparison risks overemphasizing the coherence of these actions. Instead of sustained, pragmatic workplace sabotage, attacks on perceived 5G infrastructure were as diffused as they were confused. Despite the fixation on infrastructure, there is little indication that these saboteurs accurately identified anything technologically novel in what they perceived to be 5G installations. These incidents demonstrate how the breakdown of 5G's conceptual saliency described above took on a dangerous edge in 2020. Unlike other forms of mis- and disinformation, misleading information about 5G had significant potential for collateral damage. Responding authorities were then confronted with the challenge of reporting on these incidents without validating or spreading the rumours linking 5G to Covid-19, efforts which met with mixed success. Mainstream media coverage, in addition to governmental and intergovernmental bodies, issued myriad statements assuring the health and safety of 5G while attempting to debunk the "improbable," "wild," and "wildly untrue" (Cerulus, 2020; Fildes et al., 2020; Warren, 2020) connection to Covid-19. Yet such efforts immediately confronted the reality that greater media coverage also produced greater interest in 5G and the uptake of mis- and disinformation, prompting various policymakers, researchers, and social media platforms to advocate intervention and information quarantine as a response to the "infodemic" that accompanied Covid-19.

A variety of scholarly approaches were applied to the spread of 5G mis- and disinformation as the Covid-19 pandemic unfolded. Bodner et al. (2020) were among the first to publish on the subject and consider 5G in the historical context of techno-skepticism by tracing conspiratorial narratives along the lines of urban legends. This analysis is necessarily limited, if only by the text's early publication date in December 2020. There is only a brief mention of the sabotage of telecommunications infrastructure, which is assessed as a participatory form of folk cultural "ostension involv[ing] the rash of cell tower arsons that followed the rise of anti-5G'' (Bodner et al., 2020, p. 178). Though Bodner et al. are unique in this area for their complex consideration of the roots, propagation, and intersectional character of 5G mis- and disinformation, at the time of writing there was little sense of the disciplinary measures social media giants would take to control misleading information or the emergence of more conventional issues with 5G, such as industry overhype. 5G is positioned as necessarily innocuous and uncontroversial, if only because it does not cause Covid-19. These assumptions characterize subsequent research on the social element of 5G mis- and disinformation. One of the earliest and most widely cited scholarly articles by Ahmed et al. (2020) advocated for a policy of active intervention and information quarantine, although they find that the majority of

content on the subject "derived from nonconspiracy theory supporters" with roughly half of said content rejecting 5G mis- and disinformation outright. Despite these findings, the researchers justify their conclusions by identifying the absence of a clear authority figure "who was actively combating such misinformation." The findings of Jolley and Paterson (2020) echo the conclusions of Ahmed et al. (2020), as their research "suggest[s] that belief in 5G Covid-19 conspiracy theories is associated with violent responses to the alleged link between 5G mobile technology and Covid-19" (Jolley & Paterson, 2020, p. 637). Bruns et al. (2020) provide a detailed analysis of "the trajectory of these stories from fringe circulation to significant impact over the course of little more than four months" on Facebook. They outline the textured and highly variable content of 5G–Covid-19 conspiracy theories, but their rigorous focus on the drivers of mis- and disinformation emphasizes Covid-19 to the neglect of a clear treatment of 5G. This analysis is further developed by Bruns et al. (2021). The authors assess the popularization of 5G–Covid-19 conspiracy theories through the "backfire effect" (Nyhan & Reifler, 2010) using multi-modal methods to map the spread of the conspiracy and theorize the role of social media and professional journalism in its uptake. Though equally rigorous, this article also neglects a fulsome analysis of anti-5G sentiment. The authors rely on a single piece of business journalism promoting 5G in light of emerging conspiracy theories to make the claim that connections drawn between 5G infrastructure and Covid-19 were made by actors with "ties to broader anti-technology, anti-vaccine, alternative health, religious fundamentalist, anti-Semitic, and far-right communities" (Bruns et al., 2021, p. 2). Though these connections are evident in some anti-5G conspiracy theories, this claim is somewhat selective, and its associations are not echoed by contemporaneous literature.

Meese et al. (2020, p. 40) offer a useful rejoinder, asking that researchers "look beyond conspiracy theories to a wider set of concerns." The authors point to geopolitical competition over the market for 5G technologies between China and the United States as one such example. Sturm and Albrecht (2020) provide a productive lens with similar rationale. Although 5G mis- and disinformation is not the main focus of their article, they define it as an "improvised millennial narrative" that "presents three dominant improvisational strands…(1) Covid-19 is a government conspiracy to install 5G towers while we are in lockdown…(2) 5G spreads the virus…(3) the virus doesn't exist, rather 5G creates Covid-19-like symptoms" (Sturm & Albrecht, 2020, p. 130). Sturm and Albrecht's contribution illustrates the obstacles to analysis posed by a monolithic account of 5G conspiracy theorists as a coherent group. However, as in other literature assessing mis- and disinformation about 5G from this period, reflective analysis of 5G is absent, so it is helpful to put this work in dialogue with infrastructure scholarship directly concerned with 5G. In a position paper for the People's 5G Laboratory, Oever and Maxigas (2021) outline the necessity of a critical approach to 5G. The authors emphasize that "5G will not be implemented in isolation" and that "these technologies should also be part of a human rights impact assessment" (Oever & Maxigas, 2021, p. 10) to justify their approach. In a subsequent paper, Oever (2022) furthers this analysis, outlining the concept of "network ideology" in relation to 5G. Rendering a comprehensive treatment of the geopolitical tension represented by 5G, Oever examines the manufacture of Chinese 5G technology as a well-known security threat by showing that neither the "United States Department of Defense, NATO reports, nor any of the other countries that followed suit in the implementation of restrictive policies towards Huawei equipment, produced a *technical* reason for the exclusion of Huawei from their networks" (Oever, 2022, p. 7). Yet this analysis does not explore the dissonance between such a widely accepted form of anti-5G sentiment and more popular forms of discontent, as 5G mis- and disinformation is not considered broadly. The disjunction between these bodies of literature, one explicitly concerned with mis- and disinformation and one with 5G, is the motivating factor for this article. In the absence of a critical assessment of 5G itself, existing scholarship risks reproducing a concerning tendency in contemporary treatments of mis- and disinformation to use the uptake of factually inaccurate information to remove public agency and regurgitate the elitist rhetoric of mass society theories from the mid-20th century (Christensen, 2022). With few exceptions, the rigorous efforts of mis- and disinformation studies related to 5G to rebuke Covid-19 conspiracy theories failed to reflect on the apparent necessity of 5G or the possible perspectives of non-adopters, while taking cues from telecom industry talking points. This is perfectly understandable given the exigencies of the pandemic and the urgency of mis- and disinformation related to Covid-19, but this literature fails to examine the underlying diffusion of authority that allowed 5G to be so broadly appropriated. While this research accounts for what people believed about Covid-19 and 5G, a more holistic approach can proceed "by asking how people use these types of information" (Christensen, 2022, p. 637). Yet doing so requires a model of action that can operate in the gap between a fixed understanding of 5G as a technical standard and the more fluid associations of corporate marketing. Hence, I turn here to the famous incident of Don Quixote's tilt with windmills described in the first part of Cervantes' epic. Approaching the hostility to 5G through reference to Quixote's joust, we may sidestep the question of whether saboteurs understood 5G in the strictest sense and hypothesize the broader functions of these actions and their accompanying narratives.

4. Tilting at Towers

Early in *Don Quixote*, during the titular knight errant's second sally, the Don tells his squire Sancho Panza that the

procession of windmills before them is a troupe of giants that he must challenge in righteous combat. Despite the protestations of Panza, it is not until Cervantes' protagonist lies in a battered heap, tossed down by a spinning arm, that Quixote admits that a sorcerer has "turned these giants into windmills in order to deprive me of the glory of defeating them" (Cervantes, 2003, p. 59). In this emblematic scene, Quixote's actions are oversaturated with the ideals of chivalric romance, operating in opposition to the unromantic realities of early modern life. He constructs himself as the hero of a bygone era in sharp contrast to his surroundings and develops a flexible logic for his deeds that contain their own proofs against correction. The good-natured Panza tries to intervene in his master's fantasies, but Quixote is already prepared to counter this effort; he can absorb the reality that the giants are actually windmills, but only as it confirms his prior fantastic worldview. This is a recurrent feature of the novel, as the disjuncture between Quixote's valiant aspirations and the absence of any practical outlet for such action demands that he find creative solutions to understand himself and his society. While we may, as many others have, laugh at Quixote's folly, we may also empathize with the dissonance between social values and social reality. Moreover, from our historical vantage point we may also acknowledge that the knight errant's misguided actions offer some level of restitution to the inequalities of his time. Throughout his adventures, the provincial underclass of Spain is refigured by Quixote as lords and ladies, the impieties of the clergy envisioned as demonic sorceries, and the exploitative infrastructure of late feudal society suggestively mistaken for man-eating giants. Although the feudal period is typically treated as an epoch of sedentary agrarianism commanded by a shiftless military aristocracy, the changing dynamics of the era shed light on the discontent suggested by the actions and attitudes of Cervantes' hero. As Anderson (1974) points out, feudalism experienced concrete technical development with massive social ramifications. The introduction of powered mills, first with the watermill, "gave rise to one of the first and most long-lived of all seigneurial *banalités* of exploitative monopolies—the obligation of the local peasantry to take their grain to be ground in the lord's mill" (Anderson, 1974, p. 184). The root form of the term banal, *banalités*, not only obliged peasants to use the infrastructure of the feudal lord but also required that the peasant pay for the privilege. Such obligations propagated throughout feudal Europe and persisted well into the modern period. Though innocuous to the modern reader, Quixote's windmills embody both an ancient model of exploitation and a future that is utterly alien to his chivalric principles. Written at the inflection point between a fading model of feudal privilege and emerging modern industry, Quixote's joust captures the passage of one mode of production to another. Although much of the text is evocative of a properly medieval pastoralism well before Cervantes' time, the windmills of Castilla-La Mancha are a real and distinctly modern feature, designed after Dutch innovations in the 16th century. Embodying the newly optimized expression of aristocratic domination that would persistently parasitize the emergence of capitalism, the claim that these windmills are a threat is politically suggestive. Looming over the countryside, consuming the fruits of peasant labour, coercing "repressive profit" (Anderson, 1974, p. 184) at the peasant's expense, these descriptions are equally appropriate to the feudal noble as they are the phantasmal giant. While a holistic account of the critical position of *Don Quixote* is far beyond the scope of this article and, indeed, a matter that has spilled centuries' worth of ink, the titular knight's tilt with windmills provides a potent parallel to the targeted destruction of cell phone towers in 2020.

Quixote's tilt at the windmills offers three critical insights that will be developed here and then deployed over the remainder of this article. First, the Don provides an archetypical expression of how excessive narrativization may appear as ignorance. He is not an empty vessel, but rather overly full of ideas about how his society operates and how he may positively conduct himself. Second, the ineffectual efforts of Panza demonstrate how such narrative saturation can subvert factual correction. Quixote needs more than a third party to authenticate that these windmills are really windmills, as this corrective gesture flattens the issue to a binary matter of facticity and fails to account for the possibility that he already knows he is factually wrong. He can accept that his giants are not really giants, because what matters is not that a sorcerer "turned these giants into windmills," but that this figure did so in order to "deprive [Quixote] of the glory of defeating them" (Cervantes, 2003, p. 59). The underlying reality that there is no correct avenue for Quixote's heroism is confirmed by Panza's attempted fact-check. Third, the joust outlines the symbolic role of infrastructure as a site of social confrontation. Infrastructure scholars have long held to the maxim that "the normally invisible quality of working infrastructure becomes visible when it breaks" (Star, 1999, p. 482), but this breakage may be more than physical. The contradiction between a vast body of romantic literature espousing the virtues of generosity and goodwill with the social reality of coercive architecture and aristocratic greed inscribes this infrastructure with significant symbolic weight. Even if this contradiction cannot be accurately or adequately described, its recognition dispels the invisibility this infrastructure would otherwise have. Considering these three features illuminated by the joust, we must then consider what precisely broke in 2020 to make infrastructure with a perceived connection to 5G hyper-visible, how this visibility was mediated by third parties, and whether efforts to disrupt the development of 5G were really a matter of ignorance. Existing attempts on the part of researchers, journalists, and policymakers to combat mis- and disinformation about 5G relied on the notion that its uptake indicated the absence of

factual information about 5G. There is suggestively little evidence that any interference with infrastructure in 2020 recognized a concrete technical difference in the systems targeted for destruction. Uncertainty about the difference made by 5G included journalists as well as consumers and would-be saboteurs, who frequently treated the destruction of cell towers as confirmation of the concrete technical development of 5G in local networks. Whether this had an impact on the efforts to disrupt supposed 5G infrastructure is only a matter of speculation, but it does highlight a concerning lack of fluency with such a ubiquitous technical term across a wide spectrum of thought. Though the technical specificity of 5G may have been broadly occluded, looking at the dynamics driving such disruptions through the lens of *Don Quixote* suggests that interference with cell towers was not the result of an absence of knowledge about this technical standard, but an overabundance of knowledge about what 5G represents.

Despite identifying the lack of an authority figure "actively combating [5G] misinformation" (Ahmed et al., 2020), studies of 5G mis- and disinformation linked to Covid-19 did not acknowledge that this absence was a condition of 5G's existence. The freedom of association used to market 5G, also meant that there was little consensus among the general public about what 5G did differently at the start of the pandemic. Instead, consumers were saturated by a marketing blitz that constructed 5G as a technological commodity key to a faster, more mediated future without offering a realized use-case or perceptible application. As it "remain[s] a marketing & industry term that companies will use as they see fit" (Flore & Bertenyi, 2015), the status of 5G is little more than an empty signifier. Yet empty signifiers have political consequences and in its unstandardized form, 5G can only gesture at its own "structural impossibility in signification" (Laclau, 2015, p. 67) rather than a concrete benefit these technologies will provide. Optimistic assessments that "5G enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects, and devices" (Qualcomm, n.d.) also inadvertently illustrate a newly mediated normalcy emerging with the pandemic. Existing cell towers could thus be flexibly fitted into an imaginary that regurgitated the futuristic connotations of 5G but ascribed to them the difference made by Covid-19. By pairing Covid-19 and 5G, these narratives attempted to materialize the imperceptible, compounding multiple unseen events into the same plane of experience. An airborne pathogen is tethered to physical infrastructure and its symptoms are equated to the embodied perception of wireless signals. The appropriation of 5G infrastructure as a vector of Covid-19 gave saboteurs an individualistic, romantic alternative to the realities of responding to the pandemic. By providing a clear cause, these improvised narratives could sidestep the uncertainties of the early pandemic and fix action to concrete, if ludicrous, objectives. Tellingly, we can also observe an effort to historicize the Covid-19 pandemic in narratives linking 5G to the novel coronavirus. One claim that circulated on Facebook in 2020, long since stripped from the platform, attempted to periodize 3G and 4G with the SARS outbreak of the early 00s and the swine flu pandemic of 2009–2010 (Reuters staff, 2020). Geopolitical disruption through transmissible worldwide illness is integrated into shifting technical standards, providing prior context and a conspiratorial explanation of a global phenomenon. Like Quixote, anti-5G saboteurs were immersed in a dark fantasy of unrealized virtue and value, caught between the utopian imaginary of corporate branding and the banalities of early pandemic governance. And like Quixote's fantasies, these actions also contained proof against their correction. Regardless of their faculty with 5G technology or the unseemly connotations these actors attempted to draw between mass disease and international technologies, there is a basic connection being made between the conditions and consequences of globalized life that cannot be undone by a fact-check. The global interflow of people that produces the need for technical standards prioritizing transnational interoperability is also inextricably linked to the systems of movement that make a pandemic possible. In attempting to debunk mis- and disinformation about 5G, media and governmental organizations risked playing Panza to 5G's errant Quixotes, elevating the perceived glory of the very interference they hoped to prevent. Panza may try to change Quixote's giants back into windmills, but if Quixote's imagined sorcerers have the same power, all this effort can do is confirm the virtue of Quixote's struggle. Likewise, efforts to factually correct 5G mis- and disinformation in 2020 confirmed the apparent inevitability of 5G while failing to identify the diffusion of authority that made 5G so easily appropriated.

Laclau (2015, p. 72) argues that the condition of emptiness in signification "is the very condition of hegemony," and it is difficult to contend that 5G's emergent place in the ecosystem of telecommunication infrastructure and standardization is a sign of anything else. Surveying the terrain of technical standards and infrastructure, Oever (2022, p. 4) concludes "that there is little to no place for users or civil society in modern standards-setting if it is not in the direct interest of the industry stakeholders." Thus, the surge in hostility towards 5G and perceived 5G infrastructure in response to an unrelated crisis parallels Berlant's (2016, p. 394) late thesis that "links [the place of nonsovereignty in social life] to the postsovereign condition of the nation-state with respect to security and capital." Yet 5G is hardly the only sign of globalization and far from the most visible, so it is crucial to consider not just the wider networks enabling hostility towards 5G, but their specific expression in interference with telecommunications infrastructure. We can further reassess the uptake of mis- and disinformation about 5G through infrastructure scholar Parks' (2018, p. 3) analysis of *vertical mediations*,

or "audiovisual discourses that enact, materialize, or infer power relations as conditions or qualities of the vertical field." In her terms, mediation means more than strictly representative content, it also encompasses the power relations embedded in the material apparatus of mediation. While Parks' focus is the transformative mediations of vertical space that occurred in the wake of 9/11, the linkage of 5G and Covid-19 provides a potent parallel. Cell phone towers present the most visible aspect of the robust network infrastructure that sustains contemporary ways of life, the necessities of the radio spectrum dictating their imposing, skeletal design. Parks (2018, p. 7) entreats us to reconsider media coverage as an epistemological act, as the "practices of coverage…are aligned with particular epistemologies." The concatenation of telecommunications infrastructure, made manifest in the rollout of 5G through the implementation of concentrated "small cell" broadcast arrays, heightens coverage in the conventional sense, but it also shifts the significance of what that coverage means. Interpolated in the cellular grid system and convergent with the underlying infrastructure that supports internet routing, 5G stands to fundamentally shift public perceptions of network technologies and further entrench concerns about privacy and surveillance. Telecommunications technologies have and will continue to transform the conditions of mediated life, especially in the aftermath of the pandemic, but they also concentrate power in the hands of service providers and embed telecommunication infrastructure as the only perceivable signs of a system of oversight that is increasingly remote and governed through irregular means. Cell phone towers are "situated sociotechnical systems that are designed and configured to support the distribution of audiovisual signal traffic" (Parks & Starosielski, 2015, p. 4), but they also signify the absence of agency in an increasingly networked society. Narratives linking Covid-19 to exposure to 5G, therefore, tied an affective sense of political enclosure to coverage by cellular infrastructure. The diffused sabotage of cell towers demonstrates that infrastructure is made a fulcrum for power relations, regardless of its necessity or perceived function. Attempts to disrupt perceived 5G infrastructure show that these sites retain profound significance even without a comprehensive understanding of what they do or how they work. Acting as a practical theater to contest consensus, legitimacy, and governmentality, "infrastructure is defined by the movement or patterning of social form" (Berlant, 2016, p. 393). As Quixote's ride against the windmills resonates with the reality that, in the era his heroics harken back to, "*banalités* were deeply hated throughout the Middle Ages, and were always one of the first objects of popular uprisings" (Anderson, 1974, p. 184), we must consider the consequences of surrendering the infrastructures enabling participation in everyday life to the mandates of private entities. Just as the giants Quixote challenged still made possible his daily bread, the necessity of cellular network infrastructure also symbolizes compounding exclusions from the material undergirding digital life.

5. Conclusions

Whether antipathy towards 5G will ever again reach the heights of 2020 or continue to simmer as latent consumer dissatisfaction is unclear, but the events of this tumultuous year throw into question the precepts guiding infrastructural transition. Left to the fiat of corporate marketing, the uncertainty surrounding 5G demonstrates the destabilizing influence of neoliberal plans for public-private development. If the popular uptake of the 5G standard is to deliver on the revolutionary promises of connectivity this generation of technologies aspires to, we must demand more than the existing scheme of industry hegemony and haphazard commodification. Though the nascent stage of 5G means real development is still over the horizon, it can no longer be assumed that the adoption of this generation of technologies will follow the paths of 3G and 4G. Considering the events of 2020 and their afterlives, we might disregard the disjointed content of resistance to 5G and instead approach the excess of incoherent concerns about 5G as a broader symptom of market-driven development that destabilizes the capacity to generate consensus. Embedded in an anticipatory imaginary that envisions non-adopters as "neanderthals" without offering any clear or consistent benefit to the lay user, 5G is popularly represented as a commodity whose sole substance is affiliation with the novelty of a new technical standard. An overabundance of forms of knowledge about 5G proliferates despite this fundamental vacuity, to be appropriated or improvised into any errant narrative. By offering an analysis of the proliferation of mis- and disinformation about 5G in 2020 through the lens of Don Quixote's joust with windmills, this article has endeavored to use three critical insights to explore the limitations of the present scheme of infrastructural transition. First, Quixote shows how excess can appear as ignorance. Exposure to many competing representations of 5G may appear functionally indistinct from the absence of knowledge, but it is significantly harder to correct this position without acknowledging the mechanisms that have diffused authority in the first place. Second, this complexity is demonstrated by the position of Panza, whose intervention merely confirms that there is no correct avenue for Quixote's heroism. Efforts to prove the safety of 5G were self-defeating to the point that they accepted the premise that non-adoption was not an option. And finally, the joust reminds us of the symbolic role of infrastructure as a site of social confrontation. Suspended between a violent suspicion from the fringes and a growing reactive impulse from the center, the material substance of shared life structures is increasingly the site of conflict. Without the ability to generate real consensus about what this infrastructure should look like, adequate response to interference will remain out of reach.

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Conflict of Interests

The author declares no conflict of interest.

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