

**VAMOS A RESOLVER: COLLABORATIVELY CONFIGURING THE INTERNET
IN HAVANA**

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Presented to
The Academic Faculty

By

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**VAMOS A RESOLVER: COLLABORATIVELY CONFIGURING THE INTERNET
IN HAVANA**

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When trying to get online, there's something that helps a lot, and that is the Cuban personality. We Cubans, in part because of the economic situation we are obliged to live in, really relate to one another. On a bus you'll see a lawyer sitting next to a horse-drawn buggy driver, next to a bici-taxi driver, and over there is a courthouse judge. You see? We're all in the same boat. We know what it's like to suffer together. People help each other. And that cooperation part is added on to the Internet experience. That's how we make do.

Aimee, Research Participant

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SUMMARY

Globally, nearly four billion people do not have access to the World Wide Web (WWW), and efforts to expand WWW access are growing rapidly. Despite these initiatives, local and international barriers along political, economic, and social dimensions continue to limit meaningful Internet engagements for individuals in resource-constrained contexts. Scholars have highlighted the innovative and creative ways in which individuals and communities negotiate constraints in their pursuit of Internet access. I focus on the case of Havana, Cuba, where, until recently, WWW access was limited to 5% of the population. Based on fieldwork and qualitative research conducted throughout 2014-2018, my dissertation provides an empirical study of how increasing access to the WWW interoperates with locally-configured information networks to form a “Cuban” Internet.

Against the backdrop of international media narratives that frame Cuba as an “isolated” country, I investigate the emergence of grassroots-driven information networks for knowledge-sharing through content sold on USB thumb drives (“El Paquete”) and an intranet custom-designed by citizens (“StreetNet”). I also explore the introduction of government-sponsored WWW access initiatives through select workplaces and public WiFi hotspots. In Havana, the imagined potentials of the WWW collide with the realities of scarcity and barriers to access, as people collaboratively configure an Internet sustained by a human infrastructure. I draw on traditional perspectives of Internet appropriation to examine and complicate the tensions between arduous work, cultural and individual values, rewarding outcomes, and moments of exclusion or unfair treatment. Incorporating the Cuban ethos of resolver (creative problem-solving amidst scarcity), I uncover the collective enterprises and negotiations that go towards the production of the Internet in Havana, thereby challenging established notions of what an (or the) Internet “should” look like in more and less connected contexts.

CHAPTER 1

INTRODUCTION



Figure 1.1: The streets of Havana (photo: M. Dye)

1.1 *Vamos a Resolver*

"In Cuba,¹ we create things from nothing and work with what we have. We persevere together. We live within frustrations and learn to enjoy both the good and bad parts of life."— Idania (F, 26)²

After the dissolution of the Soviet Union in 1991, Cuba entered a period of scarcity in the 1990s [1]. Known locally as “El Periodo Especial³,” food and resources were scarce and the majority of the population suffered from famine and malnutrition. It was during

¹The title of this section, “Vamos a Resolver,” can either mean “we will resolve” or “we are going to resolve.”

²In this dissertation, I italicize participants’ quotes to distinguish between my data and quotes from published academic and media articles (which I do not italicize). Moreover, I use pseudonyms for participants’ names to protect their anonymity.

³El Periodo Especial: The Special Period.

this time that I first traveled to Cuba as a child. Over the course of two months, I experienced how people lived through an ethos of *resolver*, collectively navigating constraints and resources in order to survive. *Resolver* literally means “to resolve” or “to solve” but, in Cuba, it is a cultural ideology describing the ways people work together to invent, make do, reuse, and persist despite hardships [2, 3]. Sanchez and Adams position *resolver* as, “any instance where someone takes care of a difficult situation,” whereby the practices required “suggest great cunning and ingenuity” ([3]:36). In Cuba, *resolver* connotes the need to *luchar* (struggle) as people persist in an attempt to overcome barriers. These practices are evident in everyday life in Cuba, from grocery shopping to repairing old cars [4]. In this dissertation, I apply the ethos of *resolver* to the pursuit and configuration of the Internet⁴ in Havana. I explore *resolver* as both a mindset and an action, focusing on the motivations that drive internet appropriation, as well as the resulting innovations and tensions from these efforts.

Cuba has been called one of the most “isolated” countries in the world [5], which has been attributed to limited WWW access, restricted travel for citizens, and lack of media sources outside of the official government-run press. In 2014, less than 5% of the Cuban population had access to the WWW. After Cuba normalized relations with the U.S. and began incremental steps to increases WWW access points, international press proliferated narratives of the forthcoming “digital revolution” in Cuba, describing WWW access as a potential catalyst for social change. Globally, the WWW has been positioned as a force for democracy and social equality, as well as a driver of human development. The promising narratives of WWW access have made their way into Cuba, as participants discuss the *need* for WWW access in order to drive collective economic and educational development. Cuba boasts one of the highest literacy rates in the world (99.8 %) [6] and provides free higher

⁴I use the upper-case word, “Internet”, to refer to the world wide web (WWW) and often use both “WWW” and “the Internet” interchangeably. I distinguish this from the “Cuban Internet,” which I consider to be the various forms of access to the WWW as well as the local information networks that have evolved in Havana (El Paquete and SNET). When describing grassroots information networks as an internet, I use the lowercase form.

education for all, while also contending with scarcity. Through acts of *resolver*, participants in Havana, contend with both the imagined potentials of the WWW and the realities of scarcity and access barriers as they collaboratively configure sociomaterial elements, acting upon cultural identities of Cubans as “natural” inventors.

Despite limited forms of traditional access to the WWW, as well as perceptions of Cuba as an isolated society, throughout my fieldwork I encountered a culture of *resolver*, where “end users” act as innovators, experimenters, and designers, taking charge of various versions of the internet. The narratives underpinning the *resolver* mentality contribute to collective coping mechanisms as people persist together alongside constraints. It involves an awareness of the reliance on others to solve problems as people partake in social processes to navigate various resources. *Resolver* requires one to be inventive and resourceful due to scarcity. It involves understanding the legal gray area and how to operate “in parallel” to the law, knowing that you will not succeed unless you do. *Resolver* is intimately linked to the appropriation and configuration of the “Cuban Internet” as people move between material and social elements in the pursuit of digital engagements.

When studying WWW appropriation in Accra, Ghana, Jenna Burrell describes the Internet as a “thorny object to define” since “it evades any conventional definition of a technological artifact” ([7]:15). Similarly, when studying “the internet” in Cuba, I found it difficult to pinpoint the exact technology in question. Not only did people use various devices in attempts to engage with the internet (including laptops, smartphones, DVD players, routers, USBs, and paper printouts of websites) but they also participated in different “types” of internets. People described the internet as the WWW, while also saying that just having access to email (which is more common) is not the internet. At the same time, if one is only able to get on Facebook, this *does* count as the internet. Beyond the WWW, participants also described the internet as the informal networks that have developed in Cuba like El Paquete and StreetNet. Each of these networks offer different types of engagements and serve multiple purposes, yet none encompass all of the elements that participants’ desire

from an internet. To that end, I set out to study each of these “pieces” of the internet, how people moved within and between them, and what type of “internet” emerged. In this dissertation, I ask: How do people configure the internet in Havana? What type of internet is produced? How do participants experience this sociotechnical system?

This dissertation complicates traditional perspective of WWW access by focusing on shifting natures and perceptions of access, accompanying practices, and the alternate internets that emerge in Havana, Cuba’s capital city. I contribute to a nascent but growing body of work [8, 9, 10, 11, 12, 13] that provides more nuance to our understanding of internet appropriation and the factors that influence configurations, especially since “the internet” manifests itself differently in particular contexts [14, 7]. Based on fieldwork and qualitative research conducted throughout 2014-2018, this dissertation contributes an empirical study of the collaborative configurations that people undertake in their pursuit of the internet in Havana. Throughout this dissertation, I juxtapose a variety of representations – scholarly, historical, technical, institutional, and popular – with the subjective accounts of Cuban participants as they configure elements of the internet throughout their day-to-day lives. I draw on critical perspectives from the fields of anthropology, computer supported cooperative work (CSCW), and information communication technologies and development (ICTD). In the following sections, I first situate my work within the narratives of development and the WWW, highlighting the histories and perspectives that underpin the nature of WWW access initiatives, particularly in underconnected contexts. Then, I review literature on technology appropriation and configuration, highlighting the work I draw on to assess *how* people receive, engage, and adapt internet technologies, highlighting the collaborative nature of this process. I also review related work on human infrastructure and conclude with an overview of the dissertation.

1.2 The Internet + Development

While technology use in highly connected contexts has been debated, celebrated, and explored, less work has been conducted from the perspective of users outside of traditional sites of technology adoption and development. As such, I draw on the field of ICTD, which has contributed rich accounts of technology appropriation among communities outside the “Global North.” The field of ICTD, according to Burrell and Toyama, “broadly involves a consideration of human and societal relations with the technological world and specifically considers the potential for positive socioeconomic change through this engagement” [15]:83). Although the field of ICTD is relatively new, modern notions of development draw on U.S. foreign policy originating with Harry Truman’s “fair deal” proposal in 1949, whereby he appealed, “to the United States and the world to solve the problems of the underdeveloped areas of the globe” ([16]:3). Gillian Hart describes this perspective of development as big ‘D’ Development, an intentional approach to development where policies are created by large institutions intended to help the countries in the “Global South” [17]. A contrasting perspective of development is that of little ‘d’ development as an immanent approach [17], which involves a range of political, economic, and sociocultural processes that result in both positive outcomes and setbacks depending on the places and people involved [18]. According to Hart little ‘d’ development consists of, “the development of capitalism as a geographically uneven, profoundly contradictory set of historical processes” ([17]:650). According to Chant and McIlwaine, development in this sense refers to, “the ways in which certain ideas are grouped into a discourse or way of thinking that is influenced by a range of different political, economic, and social positions that cohere in particular ways in different places” ([18]:14).

Given these rather broad definitions of development, more specific versions have emerged in the past several decades, one of the most prominent being development as equated to economic growth [18]. These perspectives have led to development initiatives focused on GDP

growth, increased personal incomes, industrialization, and technological advance, which Amartya Sen has described as “narrower views of development” ([19]:3). Among others, Sen has argued for an expansion of development to include personal freedoms, such as freedom of choice and political agency [19]. Although the economically driven perspective has been heavily critiqued, economic growth remains a underlying tenant in many modern conceptions of development [18]. More recently, development scholars have begun to argue for a breakdown of the binary between “North” and “South,” advocating for an approach to development that is global and focused on the most pressing needs where ever they occur [20]. Despite critiques, a preoccupation with “progress” (usually economic) continues to dominate and frame interventions, policy, and perceptions.

Against the backdrop of globalization, Don Slater argues, development has been “narrated as a transition to unimpeded and technically enabled global information flows and associated forms of organization and sociality” ([21]:12). The connection between development and “technically enabled global information flows” can be traced back to the 1990s and 2000s, when the expansion of the WWW and the use of ICTs became incorporated within development discourse, framing technology as a means through which to pursue development. Dorothea Kleine argues that the current WWW reflects the values of the spaces within which its basic technologies were designed (American college campuses in the 1960s). These values include personal liberty, individualism, consumer empowerment, and flat hierarchies [22]. When the WWW went public in the 1990s, utopian hopes for the WWW gave way to the rise of digital libertarianism, particularly in the U.S. [23], whereby each individual was responsible for their own actions and livelihoods, fueled by the new possibilities encountered through the digital space [24]. The idealistic tropes surrounding the WWW are not new. As Langdon Winner notes, the introduction of technologies have long been accompanied by utopian hopes that “new technology will bring universal wealth, enhanced freedom, revitalized politics, satisfying community, and personal fulfillment” [25]:1001). Other scholars have argued that technology itself has at-

tained ideological status [26] or charisma [24], especially when designed to “help” those “out there” [27]. Various assumptions and promises accompany the WWW, particularly in “developing” contexts where the WWW has been touted as an equalizing, empowering, and democratizing space.

With more than half of the world’s population not connected to the WWW [28] and increased concerns over the digital divide, in 2015, the United Nations named access to Information and Communication Technologies (ICTs) as critical for achieving the Sustainable Development Goals and, in 2016, declared WWW access to be a fundamental human right [29]. Globally, governments, corporations, and institutions such as the World Bank have adopted goals of connecting the “unconnected” to the WWW, with the goal of improving livelihoods through information access. Efforts to expand access have grown during the past decade, with massive initiatives being undertaken by a variety of actors, such as Facebook’s Express WiFi [30] and Google’s partnership with Indian Railways and RailTel [31]. Provision of the WWW has also become part of the policy program for development institutions, such as the United States Agency for International Development (USAID), which included the WWW as part of their democracy promotion program in developing countries [32]. Although no study to date has proven that information communication technology (ICT) use has had a positive impact on regime change [32], development actors continue to emphasize the use of ICTs to promote democracy, particularly in “authoritarian” regimes.

Along with assumptions regarding the imagined outcomes of WWW access, WWW initiatives (particularly when linked to development) are often framed around prescriptive notions of what users “ought” to do with WWW access, with priority placed on work that seeks to make advances in development areas such as education, health, and employment [33, 34]. Despite WWW access being framed as an “essential” need, research consistently demonstrates the leisure-based motivations underpinning digital engagements. ICTD scholars have begun to advocate for work that focuses on leisure-based uses of technology arguing that work that focuses on development should consider leisure-based uses of

ICTs as “legitimate” [35, 9]. Key relevant contributions in this regard include Smyth et al.’s research, which found that a motivation for entertainment drives urban Indian users to overcome social, economic, and technical obstacles that come in the way of accessing, consuming, and sharing media [36]. In an anthropological study on the use of mobile WWW among youth from Indian slums, Rangaswamy and Cutrell argue that, “adopting a narrow development lens of technology use may miss the actual engagements and ingenious strategies marginal populations use to instate technologies into their everyday” ([33]:85). In related work, Chirumamilla and Pal put forth the notion of ludic design for ICTD, proposing that “non-productive” activities be taken up in development projects, focusing on the need to have fun [37]. This body of scholarship challenges the perspective that ICT interventions in ‘developing’ contexts should focus on targeting more traditional development outcomes, a notion that Arora and Rangaswamy offer a valuable critique of [38].

In addition to arguments for development projects to adopt a broader view of what counts as “legitimate” WWW engagements, empirical work increasingly demonstrates how groups at the margins of traditional sociotechnical design creatively adopt and adapt Internet technologies without formal interventions. As Anthropologist James Ferguson argues, when development initiatives ask the question of what should the “downtrodden masses” do with technology, the answer often is, “they are already doing it!” ([39] cited in [40]). In light of the various approaches to and definitions of development reviewed above, my work includes investigations of what might be considered both “big D” development (government-led WWW access initiatives in Chapters 3 and 4) and “little d” development (grassroots information networks in Chapters 5 and 6). I depart somewhat from these perspectives of development in that I keep the actions and perspectives of my participants at the center of my investigation, looking critically at the ways people receive, adapt, and engage with internet technologies, resulting in an “internet” that has been collectively configured by its users.

In the following section, I review related work on the ways communities in resource-

constrained contexts appropriate and configure technologies, drawing on scholarship that moves from seeing such users as passive consumers of technology to active agents capable of sociotechnical change [41, 9, 7, 14, 40]. In light of the narratives surrounding the need and imagined outcomes of WWW access in “developing” contexts, I seek to move beyond prescriptive, top-down notions of the WWW, to explore how and why people pursue meaningful internet access and engagements through collaborative configurations, or the daily, ongoing practices of participants. Moreover, due to the celebratory nature that the narrative of the WWW has taken in Cuba, I aim to demystify these narratives, paying attention to the way the internet is enacted in peoples’ everyday lives in Havana. In the following sections, I review scholarship from CSCW and ICTD regarding sociotechnical appropriation and configuration as well as human infrastructure, which I draw on to unpack the daily, collaborative interactions between people and technology in the formation of the internet in Havana. To do this, I focus on the practices (which I describe as collaborative configurations) undertaken by people (or a human infrastructure) that are necessary to produce the internet in Havana.

1.3 Collaborative Configurations

Along with increasing WWW access initiatives, scholars have explored the ways that people in “developing” contexts actively change both social and technical elements as they engage with internet technologies [41, 9, 7, 14]. I draw on appropriation scholarship that moves beyond limited descriptions of technology users as passive consumers to reconstitute people as active agents capable of influencing sociotechnological change. CSCW scholarship has a rich history exploring the appropriation of technologies within places of work. Building on customisation scholarship, Dourish proposes the term “appropriation” as a way to highlight how customisation is inherent to collaboration in that, “the ongoing, incremental adaption of interactive technologies is inherent to the emergence of practice, and practice is inherently shared” [42]:466). Dourish specifically defines appropriation as

“concerning the adoption patterns of technology and the transformation of practice at a deeper level” ([42]:465). More recently, Lindtner et al. incorporate cultural appropriation and imagination in their work with IT professionals in China. According to the authors, cultural appropriation, “emphasizes appropriation as process of meaning making that can occur through both technical means and processes of imagination” ([43]:83). The authors consider appropriation as peoples’ “aspirations and expressions of belonging” as well as the socioeconomic and politic struggles people encounter ([43]:84). Lindtner et al. argue that translocal processes and the global flows of people and information influence the local contexts of technology adoption and design. The authors propose that technology appropriation cannot be understood apart from the wider web of political, historical, and economic factors that influence these movements. Similarly, studying mobile media in Latin America, Bar, Pisani and Weber define appropriations as, “the process through which technology users go beyond mere adoption to make technology their own and to embed it within their social, economic, and political practices” ([44]:617). The authors argue that this process is fundamentally, “a negotiation about power and control over the configuration of technology, its uses, and the distribution of its benefits” ([44]:617). These perspectives suggest that appropriation of technology is an ongoing process that involves both moments of achieved desires while also contending with friction. Technology is not one-size-fits-all and users must contend with various factors to “fit” technology into their lives as they pursue activities that hold value for them.

While I draw on these perspectives of appropriation, I found that prior scholarship in this realm did not quite encompass the amount of work my participants undertook (particularly when occurring outside of traditional workplaces), nor their ability to artfully align and create complex sociotechnical systems. In addition to pursuing traditional modes of access to the WWW, people in Cuba have designed their own versions of the Internet. To that end, I argue that one cannot understand Internet appropriation without a grounded, nuanced perspective of the *configurations* at play, paying attention to collective values enacted

in these practices. Drawing on the ways that actors artfully align “multiple infrastructural commitments,” and the opportunities for analysis that result [45], I use the overarching term “configuration” to encompass the continuous efforts required in the appropriation and creation of the internet in Havana. I explore the assemblage of multiple agents (or actors) and the configurations that facilitate flows of materials, ideas, and information and the sociotechnical system(s) that emerges as a result. My perspective of configuration draws on feminist approaches to technology research. In her work on agency in technology design, Lucy Suchman describes two commitments of feminist research: first, the commitment to the ongoing configuration of sociotechnical assemblages, work which is often invisible and, second, questioning assumptions about agency in regards to where it resides and whose matters [46].

Several researchers have sought to reconstitute the approach and perspectives of human agency, particularly in relation to technological engagements. Although I do not directly incorporate a materiality or Actor Network Theory (ANT) framework, I draw on perspectives of sociomaterial agency that consider humans and artifacts to be mutually constituted. I explore the dynamic and multiple forms evident in sociomaterial configurations [46] as people pursue the internet in Havana. Arguing that mutual constitution warrants a closer look, Suchman highlights the “relation to the dynamic and multiple forms of constituents that are evident in specific and sociomaterial assemblages” [46]:8). Karen Barad weaves together materiality and agency through the term “agential realism,” arguing that, “materiality is discursive (i.e., material phenomena are inseparable from the apparatuses of bodily production: matter emerges out of and includes as part of its being the ongoing reconfiguring of boundaries), just as discursive practices are always already material (i.e., they are ongoing material (re)configurings of the world)” ([47]:822).

Throughout this dissertation, I highlight the variety of *collaborative configurations* enacted by participants, drawing on approaches from CSCW, ICTD, and beyond. Under this umbrella of configuration there are moments of stitching (moving between multiple over-

lapping sociotechnical systems), articulation work (the work it takes to make work work), and maintenance and care (fixing and re-purposing broken things). Through this lens, I consider the ways participants design their sociotechnical systems through the configuration of both social and material elements, as well as their capacity (and perceptions of capacity) to do so. In this sense, I explore the ways that people pursue *meaningful* internet engagements. Katz and Gonzalez define meaningful digital connectivity as, “having the technical skills necessary to engage technology and mobilize resources to address everyday needs” ([48]:236). However, I take a broader perspective of meaningful internet engagements drawing on Sen’s view of development as “as a process of expanding the real freedoms that people enjoy” ([19]:3). Sen positions individual freedoms (which include political freedoms, economic facilities, social opportunities, transparency guarantees, and protective security) as the basic building blocks of development, which may be reached through an expansion of the capabilities of people “to lead the lives they value and have reason to value” ([19]:18). Therefore, I consider meaningful internet engagements as those that encompass peoples’ freedom to choose the types of engagements they engage in, with a broader consideration for the substantive freedom of people to lead lives they value. Known as the capability approach, Sen incorporates human agency viewing the “agent” as “someone who acts and brings about change, and whose achievements can be judged in terms of her own values and objectives” ([19]:19).

While I draw on elements of Sen’s capability approach, I concur with scholars who have criticized Sen’s perspective as overly individualistic [49, 50]. Specifically, Fernandez argues that Sen’s approach both ignores the structural impediments influencing the capability to act as well as the fact that people act and move within social groups [50]. In the scholarly shift from individual to collective agency, researchers have highlighted how acts of agency are often performed collectively and shaped by communal values and intra-group power relations [50, 51]. Within ICTD, scholars that focus on collective agency often draw on Albert Bandura’s work where he argues that, “people do not live in individual

autonomy... many of the outcomes they seek are achievable only through interdependent efforts” ([52]:75). Similarly, Solava Ibrahim describes how collective capabilities move beyond the sum of individual capabilities to comprise the properties of a collective that an “individual alone would neither have nor be able to achieve if he/she did not join a collectivity” ([51]:404). Research in resource-constrained contexts has demonstrated how people must rely on others if they wish to pursue digital engagements. For example, Kumar and Rangaswamy’s analysis of the media-sharing actor-network in urban India demonstrates how the presence of mediators and intermediaries results in the decentralization of piracy and gradual promotion of digital literacies [53]. This would suggest that, through collective action, WWW and media engagements become available to a wider population. In sum, I consider configuration to be the ongoing arrangements of sociotechnical elements, whereby the capacity for action is relational, dynamic, and collective. I explore the collaborative and innovative efforts involved in the production of the internet in Havana, highlighting both opportunities and tensions in this process.

I call these efforts collaborative configurations, highlighting how people exhibit agency collectively through an acknowledgement of their reliance on one another as they pursue digital engagements. When exploring how people in Havana enact sociotechnical change, configuration is an apt lens through which to think about collective agency, particularly through the ethos of *resolver*, which encompasses the value of community solidarity [2]. I draw on prior work in CSCW that has focused on configuration work as innovative practices undertaken by people that are not traditionally considered to be designers. Margunn Aanestad uses the term “design in configuration” to highlight the in situ work required to align the complex sociotechnical environment of minimally invasive surgery [54]. Conducted primarily by women, Aanestad demonstrates how this ongoing labor occurs on-the-ground by individuals seldom considered as designers. In her description of this work, Suchman emphasizes that Aanestad’s, “analysis makes clear again how in such a setting the capacity for action is relational, dynamic, and collective” ([46]:4). Goodwin et al. argue that capac-

ity for action is determined by the reconfigurations of human and non-human actors in a complex web [55]. Similarly, when considering sociotechnical innovation and agency, the space in which the internet is produced in Havana occurs is far from the places typically considered to be sites of design. Even as design research (particularly participatory design) attempts to make participants more central in the design process, there is still the notion of “designer” as a trained individual working with a community. Instead, through my fieldwork, I encountered alternate internets that had been designed by and for “end users,” driven by notions that Cubans are natural inventors *capable* of innovative configurations (a key element of the *resolver* ethos).

Drawing on feminist studies, scholars have adopted a commitment to decenter sites of innovation through explorations of often overlooked practices [46, 56, 57]. Using the term of “artful integration,” Suchman sought to shift the focus from “heroic designer” to instead consider, “ongoing, collective practices of sociomaterial configuration, and reconfiguration in use” ([46]:12). A focus on these seemingly mundane practices, she argues, “represents our best hope for genuinely new reconfigurings of the technical” ([46]:12). Increasingly, scholars have explored the resourceful and creative ways communities in resource-constrained contexts implement, maintain, and repair technological infrastructures and artifacts [58, 59, 60, 61, 62]. In rural Kenya, Wyche et al. consider mobile phone repairers as innovative designers, capable of informing designs for both local and global consumers. Within the mobile phone repair shops of Bangladesh, Jackson et al.’s participants exhibited creative problem solving, collaboration, and technical mastery in repurposing sophisticated devices, which, the authors argue, constitute an innovative form of human-computer interaction [60]. Among his work in Brazilian Favelas, David Nemer argues for a shift in perspective from seeing the poor as passive consumers to innovative producers and agile agents of ICT services and products [41]. Similarly, Burrell demonstrates how WWW appropriation is a means of agency among users in Ghana [63].

Similar to the *resolver* ethos, related work has explored various cultural ideologies that

contribute to creative, resourceful practices emerging from environments of constraint. In India, Nimmi Rangaswamy and Nithya Sambasivan define the culture of *jugaad* as an innovative, low-cost way of doing something [64]. Similarly, Neha Kumar describes *jugaad* as the “innovative and improvised solutions that arise as workarounds or shortcuts in response to the scarcity of resources” ([9]:4). In China, the term *zizhu chuangxin* refers to independent, self-reliant, indigenous innovation from homegrown solutions [65]. In Nigeria, Dayo Olopade describes the spirit of *kanju* as, “the specific creativity born from African difficulty” as people piece together resources in the formation of creative solutions ([66]:20). Olopade says that the most important thing about *kanju* is that, “it is born out of everything outsiders pity in Africa” ([66]:22). These cultural forms of innovation describe the ways that people work within constraints, “to do much more with far less” ([66]:22). Scholars have focused on these cultural ideals as demonstrations of community resilience, advocating for a legitimization of such practices as innovative in their own right [67, 33].

Drawing on prior work, I view collaborative configurations as both a means of agency [63] and empowerment [41] while also acknowledging the conflicts, tensions, and barriers present as people are required to *resolver* in order to navigate the sociotechnical landscape. Drawing on the move to decenter innovation within Science and Technology Studies (STS), anthropology, and information studies, Lilly Irani explores innovators in India that are considered to be at the peripheries, questioning whose acts of configuration count as innovation [68]. Demonstrating how innovation has been incorporated into development narratives, Irani notes how, “the entrepreneur... has become an agent of change, an ideal worker, an instrument of development, and an optimistic and speculative citizen” ([68]:4). Irani argues the move to decenter innovation still renders the definition of innovation as unproblematic. Irani defines innovation as, “the designation of agency, discerned in sites of social interaction,” arguing that, “we should examine innovation as a process of the recognition of value rather than granting it concreteness it does not have in practice” ([68]:191). Irani rejects the idea of innovation as intrinsically important and, instead, seeks to reveal

“the limitations of innovation as a grounds for establishing the value of people and their lives” ([68]:192). Drawing on the everyday practices of individuals in India, Irani moves towards deconstructing innovation, demonstrating how these processes are embedded in relations of power and political economy.

While contributing to decentering traditional sites of innovation in relation to ICT engagements, I also contribute to Irani’s argument, demonstrating how “innovation” in the case of my participants is tenuous and, often, problematic. In other work, scholars have also noted the tensions that arise from such practices. In Brazil, Nemer and Chirumamilla describe how the innovative, mundane practices of repair by slum residents serve “as a lens that highlights both the systemic instability and individual creativity that constitute the effort to create workable technological systems in the favelas” [69]:222). These innovative, creative practices, therefore, also underscore underlying tensions. Similarly, Christian Sandvig demonstrates how maintenance of Digital Tribal Village in California resulted in innovative practices that provided high-speed WWW for residents of Native American lands, while also serving as a reminder for participants of their ongoing mistreatment and exclusion [62]. In my work, one such reason for the tensions that arise in the configuration of the internet is due to the fact that people *have* to rely on collective, laborious tasks if they wish to pursue digital engagements. Therefore, while positioning *resolver* practices as legitimate innovations, I also argue that this ethos must be contextualised within the larger structures within which it operates, lest we romanticize these practices and ignore the wider structural inequalities that contribute to their emergence. An understanding of the opportunities and tensions embedded in collaborative configurations requires a focus on the people who undertake the efforts required to sustain the internet in Havana. In the following section, I draw on the framework of human infrastructure as a lens through which to analyze the processual, social underpinnings of the “Cuban Internet.”

1.4 The Human Infrastructure of the Internet

While I consider the collaborative configurations to be the small and large actions that people undertake in the formation and maintenance of the internet, I view the human infrastructure as the relationships, social practices, flows of information and materials, and the creative processes [40] that underpin the internet in Havana. In other words, the collaborative configurations are the actions that contribute to the human infrastructure supporting the “Cuban Internet.” I draw on the framework of human infrastructure to demonstrate how the formation of and engagement with the Internet in Havana is a distinctly collective process that is ultimately dependant on people, which influences the type of Internet that is produced. I draw from Wacquant who posits that structures (or, for my purposes, infrastructures) and agency collide in social practices, which are collective, cultural-material actions varying across time, spaces, and distributions of power [70]. The configurations occurring in the production of the Internet in Havana are not relegated to one-to-one engagements between an individual and a machine (i.e. a computer or mobile phone). Instead, the Internet that is produced is not primarily hardwired, individualistic, or fixed. It must be created and re-created on a regular basis through collaborative efforts. To explore this phenomenon, I draw on infrastructure scholarship to study the relational, shifting natures of the Internet in Havana.

Scholars from the fields of CSCW and beyond have contributed rich, ethnographic accounts of the human and technical relations underpinning infrastructures. According to Star and Ruhleder eight dimensions of infrastructure, scholars often consider infrastructure to be: (1) *embedded* or existing within other structures, technologies, and social relationships; (2) *transparent* in that it invisibly support tasks and does not have to be reinvented or reassembled each time; (3) it has a *reach* beyond a single event, site, or practice; (4) it is *learned as part of membership*; (5) it *links with conventions of practice* that both shape and are shaped by infrastructure; (6) there is an *embodiment of standards* achieved through ne-

gotiation during conflicts; (7) it is *built on an installed base* of pre-existing infrastructures and systems; (8) it tends to be *invisible unless it breaks down* [71].

Building on these dimensions, Susan Leigh Star's foundational work uncovers the embedded nature of infrastructures and how they emerge as part of human organization [72]. While there has been increasing work on social engagements with technological infrastructures, particularly in the 'developing' world [73, 74, 75], my research focuses on the human organization of infrastructure [72] or the human infrastructure, defined by Lee et al. as "the arrangements of organizations and actors that must be brought into alignment in order for work to be accomplished" [76]. This move is not meant to ignore the technical or material elements of digital engagements, instead I aim to "amplify the human side for the sake of analysis" ([77]:2).

In an ethnographic study of a distributed cyberinfrastructure project, Function Biomedical Informatics Research Network (FBIRN), Lee et al. build on Star and Ruhelder's definition of infrastructures, using human infrastructure as an analytical lens to highlight the social aspects of cyberinfrastructure [76]. The authors demonstrate how people rely on personal networks to augment professional collaboration, thereby facilitating access to information as well as human and technical resources. They highlight the strength of human infrastructure resides in its flexibility, which also lends itself to a chaotic structure that may be difficult to manage. The authors underscore that, while cyberinfrastructure is concerned with bringing information to people on a global scale, human infrastructure lends itself to local concerns. In the case of FBIRN, "people are not grappling with a disembodied and disembedded global cyberinfrastructure, but rather a series of local concerns and arrangements which blend in and can be achieved through a a human and technological infrastructure" ([76]:9). This work describes how individuals facilitate information access for others, achieving "collective action not by making [a user's] relationship to the whole visible, but by making it invisible" ([76]:9). In this mindset, invisibility is something to be desired, drawing attention to how infrastructures (including Human Infrastructures) *should*

run seamlessly. However, in resource-constrained contexts, like Havana, seamlessness (at least as it is perceived in Western contexts) is often not achievable. Graham and Thrift highlight how, “in global South cities, the deep infrastructural ideologies of the West—which tend to normalize a ubiquitously networked urbanism and work to deny the very possibility of spaces and times when networks are not available, or do not function—have long been utterly untenable” ([78]:11).

While work in CSCW has focused on ways that people use ICTs in order to collaborate, my work also draws on ICTD, demonstrating how, if people want to use ICTs in resource-constrained contexts, they *must* collaborate. Sambasivan and Smyth first incorporated the lens of human infrastructure into the field of ICTD, illuminating the close proximity of the social and technological facets that make up information infrastructures against a backdrop of development [77]. Understanding the human infrastructure requires an analysis of “the relationship between the materiality of technology and the constellation of human actors, relationships, activities, spaces, and networks” ([77]:7). While previous human infrastructure scholarship focuses primarily on workplaces and organizations, Sambasivan and Smyth apply this lens to the function of technology in the daily lives of individuals in Indian slums. The authors stress how, in resource-constrained environments, technological engagements are often impossible without a human infrastructure. While I would argue that all sociotechnical infrastructures rely on a human infrastructure, this is often not as visible in “highly connected” context. Sambasivan and Smyth call for more work that considers human infrastructure as the “inter-connected pieces forming a larger whole” that include nodes and edges, hubs and spokes, strong and weak ties, and actors that enable or disable access to resources [77]. They advocate for a broadened understanding of infrastructure that goes beyond tangible artifacts to include “social practices, flows of information and materials, and the creative processes that are engaged in building and maintaining these substrates” [77].

Focusing on the human infrastructure, I draw on Star and Bowker’s analytical device

of “infrastructural inversion” to unpack the backstage elements of configuration work involved in the production of the Internet in Cuba and the type of Internet that is produced. Lee et al. note how the word “infrastructure” as a noun is misleading, as infrastructures are constantly in flux [76]. Similarly, I consider the human infrastructure that sustains the “Cuban Internet” as a relational process and one that never quite fades into the background. In Cuba, human infrastructures are critical in the process of creating the internet as people configure multiple entities and move within and across seams in the pursuit of digital engagements. In order to bring multiple discontinuous elements into working order, people undertake a variety of tasks. Borrowing the language of seams, or the gaps between each system, from Wiser [79], Vertessi proposes the analytical lens of stitching focusing on the ways individuals work with and across the seams of overlapping sociotechnical systems [45]. Vertesi highlights how actors artfully align “multiple infrastructural commitments,” and the opportunities for analysis that result. She argues for a micro examination of systems, where the focus is on “actors’ observable, reportable activities as they wrestle with many infrastructures’ limitations and possibilities to bring them into moments of alignment” ([45]:5).

Building on this research, my work explores the multiple infrastructural layers that compose information networks in Cuba, emphasizing the importance of the human infrastructure and the collaborative configurations that contribute to the formation of the internet. Through the ethos of *resolver*, I build on previous human infrastructure scholarship, demonstrating how the internet in Cuba is a relational process that is produced through ongoing, collaborative configurations. This results in a human infrastructure (and, thereby, an internet) where seamfullness (as opposed to seamlessness) and regular breakdowns are considered normal, making the human infrastructure more visible than infrastructures have previously been conceived. Further, it facilitates an examination of the collective agency enacted in the process of sociotechnical innovation in the creation of the internet. While the notion of collective agency is not a new concept, technology and human development initia-

tives and research draw on assumptions of individualistic engagements with sociotechnical systems. To that end, I consider internet appropriation through a collaborative framework of the configurations occurring through the human infrastructure. Through a focus on the collaborative configurations involved in the process of producing the internet in Havana, I call into question the type of internet that is produced in Havana and how this might inform the way that the WWW is conceived of and designed.

1.5 Contributions + Overview of Dissertation

Contributions

This dissertation contributes an empirical study through a grounded examination of the process and experience of the internet in Havana. Specifically, this work advances our understandings of sociotechnical collaboration through a demonstration of how engagements with internet technologies hinge on collaboration, which permeates even the most basic sociotechnical engagements. Through collaboration, participants navigate constraints and collectively produce a different way of engaging with the internet through a transformation of the sociotechnical system in Havana. Second, this work contributes to human infrastructure scholarship demonstrating how the internet in Cuba is a visible, relational process. The visibility and awareness of the human infrastructure facilitates different types of engagements that may or may not have been available had people only had traditional access to the WWW. Finally, through the lens of *resolver*, the findings presented in this work complicate traditional perspectives of grassroots innovation. While resolver is similar to other cultural ideologies of making do (like *jugaad*), because of the sociocultural context of Cuba, this work demonstrates how resolver hinges on notions of social reciprocity and collaboration. Crucially, while people described feelings of collective agency through resolver, they also speak about how they do not have a choice but to engage with the internet in these ways. Therefore, while arguing that local configurations are innovative and capable of providing lessons for other contexts, this dissertation also contributes to problematizing traditional

perspectives of grassroots innovation through a focus on both the tensions and opportunities embedded in these practices. In this work, I demonstrate how the utopian hopes for the WWW and progressive narratives bump up against limiting realities, reinforcing the need for participants to be collaborative and innovative as they attempt to move towards an imagined vision of the what they think the internet “should” be.

Dissertation overview

In order to ground this research within the embedded space that it occurs, in **Chapter 2**, I review a brief history of Cuba including WWW initiatives and sociopolitical infrastructures that have contributed to the practices I explored through my fieldwork. Further, I describe my own background as it relates to Cuba including my motivations for undertaking this work. I also explain the approach I used when exploring my research questions, outlining the methods I employed in this process.

Throughout Chapters 3-6, I describe how the imagined potentials of the WWW collide with the realities of constraints, and how individuals attempt to bridge this gap through the notion of *resolver*, which requires collaborative configurations. I unpack the tensions and opportunities that result through these processes, contributing to the emergence of sociotechnical systems that are uniquely suited to the Cuban context. Specifically, Chapters 3 and 4 describe the shifting natures of access to the WWW as participants make use of limited access in workplaces, universities, and parks. In Chapters 5 and 6, I shift my focus from government provisions of WWW access to examinations of the grassroots sociotechnical networks, or alternate internets, that have evolved in Havana.

Chapter 3 includes my study of early adopters of the WWW in Havana in 2014-2015 prior to the introduction of public WiFi hotspots. Specifically, I explore participants access limitations and the activities they do online, as well as what WWW access means to them. My findings suggest that access limitations and slow network speeds greatly restrict participants WWW use. To counter these limitations, participants are collaborative, often

conducting online research and posting photos for friends with less access. I describe how participants act as and rely on internet intermediaries to help them accomplish tasks that they are unable to undertake individually.

In **Chapter 4**, I present my study on public WiFi hotspots in Havana and examine the possibilities of internet access these limited and expensive hotspots present to individuals, many of who are experiencing the WWW for the first time. Drawing on fieldwork conducted in 2015-2016, I underscore the reconfigurations that have resulted from this access, as evolving internet users reconfigure their interactions with place, time, and individuals in their efforts to “locate the internet.” I also discuss the implications our findings have for the design of internet access interventions in Cuba and in other low-resource environments across the world, as well as the broader implications for social computing across diverse geographies.

In **Chapter 5**, I present a qualitative inquiry of *El Paquete Semanal* (EP) or “The Weekly Package,” an information-sharing ecosystem in Havana, which has emerged as the predominant means for Cubans to engage with local and foreign media and information on a weekly basis. Drawing on fieldwork from 2015-2017, I underscore the human infrastructure of this ecosystem, shedding light on a particular kind of collaborative configuration, articulation work, and the values that motivate it. I complicate and strengthen our understanding of the roles of human actors in information networks in resource-constrained environments.

Chapter 6 presents my study on StreetNet (SNET), a community network (CN) that has grown organically, reaching tens of thousands of households across Havana. Through fieldwork conducted from 2016-2017 (as well as online, follow-up interviews in 2018), I investigate participants’ innovative strategies as they engage with a network where the material elements—cables, switches, nanos, and servers—are regularly breaking down. Drawing on maintenance and care scholarship, I present an in-depth investigation of SNET and my participants’ day-to-day efforts in maintaining it. This chapter contributes a unique

perspective on how CNs are run locally and organically, while also complicating perspectives of innovation through a discussion of cultural ideologies and tensions underpinning maintenance and care practices.

Finally, **Chapter 7** concludes my dissertation with a review of the ways that participants piece together the internet in Havana and the type of sociotechnical system that emerges as a result. I also unpack the open questions that result from this work and the contributions this research makes to the fields of CSCW and ICTD, as well as sociotechnical research and design, more broadly.

CHAPTER 2

BACKGROUND + METHODS

As with any research location, Havana presents a shifting landscape with a unique combination of factors. This research is set against a complex backdrop filled with political ideologies, complicated histories, and a multitude of actors. The largest island in the Caribbean Sea, Cuba is culturally considered to be part of Latin America, drawing on culture and customs influenced by the Ciboney and Taino peoples, hundreds of years of Spanish colonialism, the African slave trade, and the Cuban Revolution [80]. In order to better ground this research within the local and global context within which it is situated, the first-half of this chapter presents a brief history of Cuba, the Internet in Havana, and U.S. involvement. In the last half of this chapter, I describe my own background and motivations as they relate to this dissertation as well as the methods I used to explore my research questions.

2.1 Background

2.1.1 Colonization, Revolution, + Resolver

Prior to the arrival of Christopher Columbus in 1492, Cuba was inhabited by the Ciboney and Taino peoples, the vast majority of whom died during the initial Spanish colonization [81]. Cuba was occupied by Spain until 1898, when Spain withdrew from the country following the Spanish-American war [80]. After 3.5 years of U.S. military rule, Cuba achieved “formal” independence in 1902 [80]. Despite economic development in the years following independence, political corruption led to the overthrow of dictator Fulgencio Batista in 1959 by the 26th of July Movement, led by Fidel and Raul Castro Ruz (better known as the Cuban Revolution) [82]. The revolution led to the establishment of communist rule in Cuba and, since 1965, the country has been governed by the Communist Party of Cuba.

Since the revolution, business sectors have been under state ownership and Cubans' access to foreign press, entertainment, and other media content has been restricted [83]. Travel in and out of Cuba has also been heavily restricted. Since 1959, more than 1 million Cubans have left the country as exiles (almost 10% of the current population) [84]. Although nearly every person in Cuba has close relatives and friends who have exiled, due to limited landlines and an unreliable postal service, communication with people outside of Cuba has been severely restricted. Cuba has also been accused of human rights violations by organizations such as Human Rights Watch, which criticizes the government for using repressive tactics including detaining political prisoners, beatings, public shaming, travel restrictions, and employment terminations [85]. At the same time, the government has prioritized education and health initiatives across the country. It is estimated that 99.8 % of the 11 million inhabitants in Cuba are literate. Moreover, according to the Worldwide Fund for Nature (WWF), Cuba is the only country in the world to meet the conditions for sustainable development [86]. Despite widespread health and education initiatives, Cubans still describe the ways they must make-do in order to contend with shortages and regulations.

Since the revolution, the Cuban society has relied on social reciprocal relations as a means to navigate constraints from material shortages and state bureaucracy [87]. This undecurrent of acknowledged reliance on others integrates itself into everyday life in Cuba, as people work through an ethos of *resolver*, making do with the resources they have. As mentioned in Chapter 1, *resolver* is rooted in experiences from *El Periodo Especial*, the decade following the dissolution of the Soviet Union. From 1991-2000, widespread scarcity led to famine and malnutrition across the country. Cristina García-Alfonso, a Cuban-American theologian, says that *resolver* means “to survive, to overcome obstacles with inventiveness, spontaneity, and most important, humor” [88]. Evolving out of a need for survival, García-Alfonso argues that the term *resolver* is, in and of itself, a way of *resolviendo*¹. *Resolver* describes a range of informal survival strategies involved in *luchando*²

¹Resolviendo (resolving) is the gerund form of the infinitive verb, *resolver*.

²Luchando: fighting or struggling

against scarcity [2].

While *resolver* is a colloquial term, its core tenants are also espoused in the professional and governmental sectors in Cuba. For example, in 1996, Cuban architect Mario Coyula wrote an essay in response to the current *Periodo Especial*, in which he suggested sustainable socialism: the ability to achieve and maintain “the difficult equilibrium between the built, natural and social environment and a supportive economy; that is, a creative socialism, viable and deeply participatory” [89]:96). Coyula expresses a faith in Cubans’ ability to improvise and make-do together through creative struggle in the midst of decay. The *resolver* ethos is also reinforced through government narratives, that acknowledge the need for Cuban citizens struggle and sacrifice in order for the revolution to succeed. *Resolver* acts as a mode of resistance to Cuba’s external enemies (such as the U.S.), supporting the Cuban Revolutionary value of people working together in solidarity to resist neoliberal capitalism [2]. Prior to the 1990s, Cuba had rejected most external development projects as the Cuban government espoused a narrative of self-reliance while also being understandably resistant to U.S. government involvement (which I describe further in Section 2.1.3). However, after the fall of the Soviet Union, Cuba began to allow the involvement of development agencies, of which there are currently nearly 200 in Cuba focused on agricultural, educational, and humanitarian-based goals [32]. Still, the government maintains the narrative that the revolution is still underway and that Cubans must work together to overcome hardships. For example, in the heading of the national newspaper, *Granma*, each date is followed by the current year of the revolution (i.e. “May 23, 2016, year 56 of the Revolution”).

Among communities outside of Cuba, when exploring the resilience and improvisational strategies of individuals dealing with scarcity, scholars often focus on populations at the lower end of the socioeconomic stratum [9, 64, 90]. However, in Cuba, the need to *resolver* is evident across all levels of society as no one is completely immune to the impacts of widespread scarcity or government regulations. Although the Cuban Revolution

sought to do away with classism, sexism, and racism, these elements still exist in Havana (as with any human society). Though not the focus of this research, I mention this because the goals of the revolution and the ways that the government has enforced them impact how all Cuban citizens contend with their current situation.

Although Cuba is no longer in *El Periodo Especial*, the need to *resolver* is still very evident. While I focus on *resolver* as it relates to configuring the Internet in Havana, this ethos underpins everyday activities required for survival. For example, since 2018, food shortages have increased in Cuba. When chatting with one of my participants, Alysa, via Facebook Messenger in May 2019, she told me about the increasing shortages in Havana: “*The shortages are drastic. There is practically no meat in the stores, no brooms for sweeping, or oil to cook with. We acquire bit by bit and the lines are immense.*” An understanding of the history of Cuba and the ethos of *resolver* is necessary when considering the configuration of the Internet through the everyday actions of Cuban citizens. In the following section, I review a brief history of the Internet in Cuba as it relates to each of the studies that compose this dissertation.

2.1.2 The Internet in Cuba

In 1996, with the support of the National Science Foundation (NSF), Cuba became one of the first South American countries to connect to the WWW. Access was extended to a select few, including certain researchers and government workers, tourists at hotels, and students on college campuses, but not to homes for personal use [91]. As Internet use grew rapidly across the global South, access rates in Cuba took a hit. In 2001, Cuba’s access to the Internet was at its lowest as measured against the “six dimensions of Internet access” [92]. With only one state-run telecommunication company that was tightly controlling network access and a single fiber-optic cable that connected Cuba to the world, Cuba was lacking in both technical infrastructure and political will to increase Internet access [91]. In addition to the lack of Internet access, the ownership of mobile phones was illegal until 2008. Prior

to that date, the 11 million Cubans in the country depended entirely on a limited number of land lines (approx. 900,000) [93] to communicate with an extensive Cuban diaspora. In a 2011 survey of 25 Cuban professionals, all reported very minimal access to information technology and each expressed increased Internet access as critical for development of both the professional and economic sector in Cuba [82]. The combination of limited Internet access, restrictions on mobile phone ownership, and unreliable postal services has contributed to slow development of methods for information access and communication with those living outside of Cuba.

During this time of limited Internet access, the majority research on Cuba and the Internet focused on activist bloggers in Cuba. Hoffman argued that the need for public debate in Cuba was not mediated by the government, and the current blogger community in Cuba arose as a result of that need [94]. According to Hoffman, through the blogosphere and e-mail, a virtual public sphere has formed; however, this has not deeply penetrated the physical world in Cuba. Others have argued that the blogosphere in Cuba was becoming an emergent public sphere in which bloggers had forced their way into the public arena, challenging the ingrained narratives perpetuated by the Cuban regime. In this way, the current blogosphere may present a model for democratic sociability in Cuba [95]. Further, some suggest that online communication technologies have allowed for a more pluralized public space in Cuba, bringing together microsites that were once segmented and isolated [19]. However, in my fieldwork, none of my participants engaged in the blogosphere. In addition to participants describing a disinterest in politics, political blogs dealing with Cuba are blocked. I discuss this complex interplay between political discourse and participants' uses of the Internet throughout the following chapters.

In addition to a preoccupation with “democratic” uses of the WWW, a focus on traditional Internet access misses the rich ecology of digital engagements occurring in Havana. Scholars have highlighted the sophisticated, informal media sharing networks that have evolved in Cuba since the early 2000s [96, 4]. Through interviews and ethnographic

research, Anna Cristina Pertierre explored the informal digital sharing economy in 2005-2010 in Santiago de Cuba, Cuba's second largest city [96]. Focusing specifically on mobile media, Pertierre demonstrates how, contrary to notions perpetuated by the global press, Cubans are not isolated from popular culture [96]. For the past two decades, many Cubans have been able to consume transnational media through state supported television channels as well as informal (but tolerated) media sharing practices [96]. These informal consumption practices, Pertierre argues, are motivated by a desire for entertainment and serve to reinforce social bonds since they rely heavily on co-located social networks [96]. El Paquete Semanal (the Weekly Packet) is the most extensive and popular information-sharing network in Cuba [4]. Across the country, El Paquete distributors sell theme-based USBs filled with movies, television shows, YouTube videos, news articles, music, and more. As a result, Cubans have access to a wide variety of media originating from outside of the country, a phenomena that I explore in more depth in Chapter 5. Similarly, in Havana, people have designed a local Intranet, called StreetNet (SNET), with the initial goal of gaming with one another from their homes (which I describe in Chapter 6).

Despite scarcity, during the past two decades, the Cuban government has implemented various efforts aimed at increasing technical and digital engagements. Prior to increasing access points to the WWW in Cuba, the government supplemented Internet access through the development of national intranets. These include, among others, a local email system (Nauta), medical portal (Infomed), and an education portal (RedUniv). Further, after being banned for almost a decade, in 2008, the Cuban government began allowing Cubans to buy mobile phones and personal computers [97]. The adoption of mobile phones has grown since 2008 and there were more than 2.6 million mobile phone users in 2014 [93]. In 2014, the Cuban government's telecommunications firm, ETECSA, began allowing Cubans to send and receive emails on their phone through a .cu email account [97].

In 2013, Cuba connected a high speed ALBA-1 fiber optic cable to Venezuela, enabling increased data transmission speeds and bypassing a reliance on the U.S. for high-speed

WWW access [98]. Regardless of this connection, access to the WWW did not improve for the vast majority of the Cuban people. Research from 2014 showed that Cubans were severely restricted in their Internet use: only 5-25% had access, with only 5% of the population having full access to the Internet (usually through their places of work) [99]. I focus on this version of access in Chapter 3. In Spring 2015, In March 2015, Cuba allowed the launch of the first free, public Wi-Fi service in the country. This service is run by a prominent artist, Kcho, which costs the artist approximately \$900 per month [100], and is located at his studio in Havana. Soon after, the government began opening public, paid WiFi hotspots in cities around the country, changing the nature of Internet access for the Cuban people (which I discuss in Chapter 4).

2.1.3 U.S. Interventions

In order to better understand the space within which participants configure the Internet in Havana, I find it necessary to highlight the attempts by the U.S. to intervene in Internet and ICT development in Cuba.

In December 2014, the U.S. and Cuba announced that they would begin the process of normalizing relations [101, 102] and, in July 2015, formal diplomatic relations were officially re-established [103]. The two countries also agreed that Cuba would allow Internet access for its people and the United States would facilitate this access by permitting Cuba to connect to fiber-optic cables linking the two countries as well as allowing North American telecommunication companies to do business with Cuba's state-owned enterprises [102]. In a speech delivered during his visit to Havana in 2016, U.S. President Barack Obama implored the Cuban government to increase Internet access: "The Internet should be available across the island so that Cubans can connect to the wider world and to one of the greatest engines of growth in human history" [104]. Echoing overly-positivist narratives of the Internet, Obama continued: "If you can't access information online, if you cannot be exposed to different points of view, you will not reach your full potential and over time the youth

will lose hope” [104].

Although the U.S. government has stated that increased Internet access should be a goal for Cuba, U.S. policy has also contributed to limiting information access in the country. This has occurred primarily through the U.S. embargo (which is still in effect), which often makes downloading software from servers hosted in the U.S. impossible [105]. Moreover, U.S. agencies have focused on using ICTs for democracy promotion in Cuba for more than three decades, starting with U.S.-sponsored clandestine radio broadcasting in 1985. Although USAID’s Democracy Initiative states that efforts must be transparent and have support of local governments, USAID has supported various covert efforts to use ICTs for democracy promotion in Cuba. In 2011, a USAID contractor, Alan Gross, was sentenced to 15 years in prison for bringing in routers, laptops, satellites, and cell phones in an effort to promote Internet connectivity [101]. Further, in 2012, the USAID launched the project ZunZuneo, which was designed to be a Twitter-like social network that some argued was an attempt to “upset the balance of power between the state and civil society and create a push towards a democratic transition” [106].

More recently, official press in Cuba has directly questioned the U.S. Government’s interest in developing the WWW in Cuba (especially the U.S. Government’s formation of the Cuban Internet Taskforce in 2018), asking “what are the real intentions of the North American Government for this project?” [107]. Further, the Cuban government published an article, titled, *The Computerization of Society, a Priority for Cuba*, which states that Cuba, “has been and is determined to connect with the world, despite the propaganda against it, the economic siege, the redoubled surveillance and the fourth generation wars. The decision is taken not only to drink from that immense source of knowledge that is the “information highway,” but to put in it the best of our culture, education, knowledge and humanism, which are the founding nucleus of the Cuban Revolution and the thinking of its leaders” [107]. The complicated, strained relationship between the U.S. and Cuba, therefore, underpins the nature of the engagements with ICTs in Havana as the Cuban government seeks to

both advance Internet access while not accepting U.S. interventions aimed at overthrowing the current regime. Instead of taking a political stance, I am specifically interested in the reality of the Internet in Havana through the perspective of Cuban citizens. In order to do this, I take an approach that focuses on the daily, ongoing configurations that underpin the appropriation of the Internet in Havana. I provide an overview of my approach to this research in the following section.

2.2 Methods

In this research, I use a combination of qualitative and ethnographic methods, drawing on my training as a sociocultural anthropologist and a human-centered computing scholar. Ethnography acts as both a rigorous method and a way of knowing [108], serving as a critical way to study and document social and cultural processes. Ethnographic approaches also require constant reflexivity on behalf of the researcher. I approach this work with an understanding that all researchers speak and write within a particular context that has been created by their own history, experiences, beliefs, and cultures. Inspired by Alan Peshkin [109], I sought to actively search out my own subjectivity throughout this work and the ways that it impacted my research. In this section I describe my own background, motivations, and perspectives that contribute to the approach that I bring to this work, starting with a brief overview of my personal connection to Cuba. In chapters 3, 4, 5, and 6, I describe the specific methods I used for each study as they relate to data collection and analysis. However, following the description of my motivations and researchers reflexivity, I provide an overview of the methods I used to conduct this work, including the selection of fieldsites, participant recruitment, data collection and analysis.

2.2.1 Motivations + Reflexivity

When I was 10-years-old, I first traveled to Cuba in 1995 with my family so that my father could conduct fieldwork for his dissertation. For my mother, this was the first time since

1962 that she had returned to Cuba, the place of her birth. Having previously lived in Costa Rica and Spain, I was fluent in Spanish and accustomed to living in other countries (as well as standing out due to my pale skin and blond hair). However, during this time, Cuba was in the midst of “El Periodo Especial,” and the widespread scarcity I encountered was vastly different than any other context I had previously experienced.



Figure 2.1: Michaelanne in Cuba in 1995 (Photo: S. Thomas)

The daughter of an anthropologist father and educator mother, I kept a journal with thoughts and sketches during my time. I also immersed myself in activities of my Cuban friends, from accompanying them to public school to waiting in line for their weekly food rations. It was during this time that I first began to grapple with my own sense of privilege, as my friends pieced together resources to acquire food for their families and worked with what they had to make do (like using old car tires and rope to make shoes).

Upon leaving Cuba, the only way to contact my friends was through hand-delivered letters carried by the rare visitor to Cuba. In the late 1990s-mid 2000s, WWW access increased in the U.S. and Europe. I digitally reconnected with friends of mine from other countries where I had lived as a child, but Cuba seemed to remain “dark,” as none of my Cuban friends got online. Increasingly, I came across news reports about clandestine blogs that originated in Cuba and were carried out of the country on USB sticks, only to be

published on the WWW through intermediaries in other countries. Following my master's thesis on the use of Facebook for political activism by Colombian women in Atlanta [110], I began the doctoral program at Georgia Tech wanting to explore the current state of the WWW in Havana from the perspectives of people living there. I have to admit, that my perspective on the WWW, at the time, had been influenced by the use of social media in political uprisings among people living within "authoritarian" regimes. However, although there had been a lot of "hype" in the media regarding the potential for a "digital" revolution in Cuba, I realized that the American media has a history of predicting a revolution in Cuba any time there is a sociopolitical change (i.e. the fall of the Soviet Union, Raul Castro becoming president, etc.).

Therefore, instead of focusing on the potential for a political or social uprising, I took an exploratory stance. I was curious to understand the interplay between the Internet and people as individuals began to appropriate the WWW for the first time. When starting my doctoral program at Georgia Tech, there were hints that the Cuban government might begin increasing WWW access. I began this research wanting to gain an understanding of the way that people in Havana, who did not identify as dissidents, used the WWW in order to lay a baseline to study the potential changes that occurred if WWW access increased. My time in Cuba as a child, my Cuban heritage, and subsequent research interests, therefore, all contributed to my motivations for conducting dissertation work in Havana. More broadly, my work is motivated by a desire to contribute to positive social change, particularly within communities that are often at the margins of traditional sociotechnical research and design. However, the goal of this work is not to provide a technological intervention intended to "help" my participants. Instead, my research seeks to place my participants at the center of my analysis in order to learn from them as co-theorists. As a result of some of my findings, however, I do offer implications for both design and research with the intent that they will inform responsible design of future interventions in the area of ICT engagements.

In addition to the ways that I approach this work, I also sought to stay cognizant of the

ways that my participants approached and viewed me. Within this research, I positioned myself neither as a native nor as a passive, foreign observer. While my Cuban heritage and family connections to Havana granted me legitimacy in the eyes of participants, I am still a white, American woman who was not raised in Cuba. I also recognize that I have been educated in American universities, which frames the way I approach my work and the perspectives I draw on.

I returned to Cuba for the first time as an adult in March 2014 to conduct an exploratory research trip to help set the groundwork for future work. During this time, I did not conduct or record any formal interviews. Instead, I sought to gain a better understanding of the culture, perspectives, and daily lives of people living in Havana. Given the ways that Cuba has been represented by foreigners, both through ethnographic accounts and media stories, I wanted to take great care in the ways I chose to frame my work and how I approached and engaged with participants.

As my research continued and as I increasingly spent time with participants in their homes and among their friends, I felt that I was increasingly treated as a friend, although I still recognized my position as a researcher. However, when entering public, urban spaces, such as EP stores and WiFi hotspots, it was evident that I stood out in Havana due to my complexion, light hair, and *gringa*³ clothes and hairstyle. Men would often call to me in the streets saying, “oye, rubia!” (hey, blondie!). Most people were surprised when I opened my mouth, however, speaking in Spanish with a mix of a Castilian and Cuban accent (leading people to initially believe that I was Argentinian). After learning about my Cuban heritage, participants would often remind me that, although not born or raised in Cuba, I still had Cuban roots (especially when I did or said something that they considered to be quintessentially “Cuban”). However, I was aware of my position as an outsider and a person of privilege, and I recognize that this framed the ways that participants interacted with me.

³Gringa is a term used to describe an English-speaking foreign woman, usually one who is from the U.S..

Although I have Cuban heritage, I am a white, American woman and was working in a country where “machismo” (masculine pride) is a visible and palpable concept. I experienced sexism on various occasions (men speaking down to me about technology as if I would not understand, flirting with me, and making direct advances even though they knew I was married). However, more often, my position as an American graduate student studying technology lead to participants assuming that I knew as much or more than they did about the inner-workings of technological artifacts. I reminded them that, in fact, *they* were teaching *me* about technology (which they were, especially when it came to learning about the creation and maintenance of networks like SNET). Further, once they understood my Cuban background and that I had been conducting research in Havana for some time (particularly towards the end of my research), people regularly told me that, “*you probably know more about how technology works in Havana than we do.*” In response, I reminded them that I am interested in their own perspectives and experiences (of which no one knows more about than them).

When talking with participants, I informed them that I was interested in learning about the ways they were interacting with, shaping, and experiencing internet technologies. All participants had attended (or were currently enrolled in) a university (consistent with the vast majority of the Cuban population). Therefore, explaining my role as a researcher was not difficult since many were familiar with various forms of higher-education research. I made efforts to continually state my goals and to be cognizant of the time, energy, and knowledge that participants were contributing to my project. Moreover, I regularly reminded participants that I was not in Havana to introduce a technical intervention. Some participants, upon learning that I was studying in a technical university, would suggest things that I might design to “help” people in Cuba. When I first began this work, I also had the idea that it might lead to a potential design intervention. However, as my research evolved I became increasingly convinced that the goal of my work was not to design a technical intervention, but, instead, to learn about the ways participants were engaging with and

designing their own “interventions.”

Repeatedly and continuously throughout my research, participants told me they felt honored to have someone who lived outside of Cuba show a deep interest in them and their lives. For example, during my research on SNET, a participant, Alejandro told me, “*I wish everyone would take an interest in something that is ours, that we have created. Thank you for doing this work.*” Similarly, Enrique said, “*I think it will be hard for Americans to understand how we have to configure the internet in these ways but, thanks to you, I think that they are going to get a glimpse into our perspectives. No one has done work like this with us and it means a lot.*”

2.2.2 Data Collection + Analysis

My research data comes from online participant observation and remote qualitative interviews, as well as fieldwork spread across four phases: April 2014, April 2016; June-July 2016; July-August 2017. During my trip in April 2014, I traveled to Havana with my maternal grandfather, who was born and raised there. After leaving Cuba in the 1960s, he has been traveling to and working in Cuba since the 1970s and has a large social network across the country. This, combined with my own time in Cuba as a child, provided an invaluable connection to the community, where I reconnected with old family friends who introduced me to others as, “*Anita, la nieta de Allen*”⁴.

I recruited initial contacts from family connections to people in Cuba as well as childhood friends that I knew when I spent time there in 1995. I also recruited participants from Cuban friends of mine in Atlanta who had family members still living in Cuba. I relied on snowball sampling to connect to additional participants, resulting in a variety of participants, the majority of which I did not have initial connections to. Overall, my participants include 152 individuals, ranging in age from 18-74 (see Table 2.1). Some of the participants from my research overlap across studies (i.e. there are participants that participated

⁴La nieta de Allen: Allen’s granddaughter.

Table 2.1: Dissertation Participants

	Early Adopters (Ch. 3)	WiFi Hotspots (Ch. 4)	El Paquete (Ch. 5)	SNET (Ch. 6)
Age Range	18-60	18-54	19-74	18-65
Females	5	24	23	15
Males	7	17	30	31
Total	12	41	53	46
		Subtotal		152

in more than one study). However, to further protect their anonymity, I do not connect these participants throughout my chapters and use different pseudonyms for them in each study.

Initially, I had planned to conduct multi-sited ethnography, combining both virtual spaces and offline spaces where people engaged with the internet. In previous research, I had used both in-person and virtual ethnographic methods and found them to produce rich data [110]. While chapter 3 does consist of research conducted via Facebook chat and participant observation on Facebook, the majority of my participants do not have regular access to the WWW. In order to study the “Internet” in Havana, I realized that much of my data had to come from spending time in the “offline” engagements. Although the majority of this research took place in Havana, I also relied on data collected remotely through digital means. I followed similar methods to other online researchers [111, 112, 113], who create content heavy online ethnographies by employing text and direct quotes from users in order to explore the ways people are living their lives online. Utilizing Facebook’s chat feature, I asked participants to comment on a task as it was occurring (or soon after) [114] (i.e. I see that you recently posted this, can you tell me more about that). However, as my research proceeded, I mainly used online ethnographic methods to maintain to remain connected to my participants while I was away from the field and to ask them about how they were interacting with the internet “offline” (instead of asking them about their current activities or why they were online at the time). I stayed in contact via email and Facebook with the participants that had access to these services, recognizing that the majority of my participants still do not have regular access to the WWW.

I chose the capital of Havana for a variety of reasons. First, I had already reconnected

with old friends there that had agreed to connect me with potential participants. Second, the government often starts new initiatives in the capital and I wanted to research the interactions with the internet that were occurring first throughout the country. Third, Havana is where El Paquete originates and where SNET is located. I should mention, however, that Havana is not representative of the experience of the "internet" across the country. In more rural parts of the country, ways of accessing the WWW are not available and it is more difficult to get access to El Paquete. Moreover, while other forms of offline internets similar to SNET have evolved in other large Cuban cities, the majority of cities and towns do not have access to these types of networks.

I still relied on multi-sited ethnography to conduct this work, recognizing that the capital of Havana is too large in scope to conduct meaningful, ethnographic work across the whole city. In keeping the participants as the center of my data collection and analysis, the sites I chose for fieldwork resulted from places that participants found important as well as practical considerations. When in Havana, I lived in a Casa Particular in *Habana Vieja*, a neighborhood in the center of the city. This is where many of my initial participants lived and I spent time in Wifi hotspots, homes, and Paquetero stores close to my Casa Particular. However, I also spent time in WiFi hotspots that were recommended to me by participants and, many times, I would accompany participants in their activities (all of which I describe in more detail in each chapter). Further, I participated in other cultural customs: I attended church with participants, went to concerts, attended parties, and helped with daily chores from grocery shopping to washing clothes. Although I do not describe all of these events in detail when presenting my data, they were a necessary part of studying the way that participants configure the internet and their lives in Havana as an ongoing, collaborative process that is embedded within larger sociocultural, political, and economic structures.

One of the limitations of this work is that it was conducted throughout several short-term fieldwork trips. When I first began my research, traveling to Havana was difficult due to personal reasons (I was pregnant and Cuba had been marked as a high-risk country

for contracting Zyka) and funding (it was initially difficult to find an institution that would fund research in Cuba). Due to the U.S.’s controversial involvement in Cuba’s technical landscape, I purposefully avoided pursuing funding from DARPA and USAID. To that end, I conducted the first study (chapter 3) remotely. However, after the normalization of relations with the U.S. in late 2014 and the reopening of both the Cuban and U.S. embassies in 2015, I was able to get an National Science Foundation (NSF) grant to pursue fieldwork in Havana. While I wanted to spend several consecutive months conducting research, both legal and personal barriers prevented me from doing so.

However, there was an advantage to not spending more than 30 days in Cuba at a time. In addition to the receiving permission from Georgia Tech’s International Review Board (IRB) to conduct this work, I also met informally with individuals that work for the Cuban government and who are responsible for providing research visas. I was informed that government permission would not be required, since I was not staying in the country for more than 30 days nor was I asking the government for access to participants or government data. During other long-term ethnographic studies in Cuba, researchers are under close scrutiny by the Cuban government and participant recruitment occurs via government representatives (which thereby frames the ways that people interact with the researcher and the type of information they choose to disclose). My data, on the other hand, comes from participants that I connected to, first through close personal friends, and who were often introduced to me as “a family friend who has Cuban roots and is studying to get her PhD in America.” That is not to say that the government was not aware of my existence (and in no way was I trying to conduct research “under the radar”). However, I did feel as though I had a large degree of autonomy to move about the city and speak with participants.

In order to protect myself and the privacy of my participants, I did not conduct interviews in public spaces and all of my participants were aware of my role as a researcher and the purpose of my study. In accordance with my IRB, I waived documentation of consent and, instead, asked participants to verbally (or electronically as was the case in Chapter

3) consent to participate in my research after reading through the consent form with them. I asked participants' permission to record our interviews, for which I used my iPhone as well as my LiveScribe pen. I took notes during interviews and participant observation in a journal. I also took pictures throughout my fieldwork with participants' consent.

In addition to in-depth interviews, I conducted participant observation throughout my fieldwork. Specifically, I observed and participated in the daily *configurations* that people undertake in the appropriation and engagement with internet technologies. For example, I accompanied participants on trips to WiFi hotspots. I purchased sections of El Paquete and shared them with other participants. I also acquired digital content from participants that they had purchased from EP and recommended to me. I helped fix broken equipment that was part of SNET and attended informal node gatherings. Increasingly, part of my participation involved searching for information for participants when I was outside of Cuba. For example, Samara was planning on immigrating to the United States and asked me to collect information on university programs in the town that she was planning to move to. Another one of my participants is a journalist and regularly asks me via Twitter messages to download PDF reports of data that he is unable to access in Cuba due to bandwidth issues. I also help manage AirBnB listings for individuals in Havana, search for solutions to technical problems, and help manage individuals' LinkedIn accounts.

I mention this type of involvement for a variety of reasons. First, I acknowledge that no researcher is a silent, passive observer. Second (and related to the first) is my desire to contribute in positive (and, ideally, meaningful) ways to the lives of my research participants while simultaneously acknowledging that I am gaining much more from them than they are gaining from me. To this end, I was eager to assist with information retrieval for participants that asked. Third, I realized that the collaborative pursuit of internet engagements was a cultural and local norm and, by being asked to participate in this way, I was being included in this collective practice.

Finally, in addition to my participants, I also drew on the support of others during the

data collection process. During my summer fieldwork in 2017, my cousin and fellow HCI researcher, Josiah Mangiameli (whose mother was also born in Cuba) accompanied me and assisted with fieldwork. In two of my studies (Chapters 4 and 5), I also incorporated data from one of my committee members, David Nemer, who was also conducting fieldwork in Havana. Also, though they were not directly involved in data collection, my partner, Tim, and son, Thomas, were able to meet me during most of fieldwork trips. I mention this because, although not my intention, Thomas served as a conversation starter for many interactions as people would often approach me to meet the blond, curly haired, Gringo toddler. Further, for the participants that I had an established relationship with (especially through family connections), they told me they appreciated the fact that I brought my family to Havana and took the time to introduce them.



Figure 2.2: Michaelanne and Thomas in Havana (Photo: T. Dye)

Each evening during fieldwork, I would return to my *Casa Particular* and type up my impressions and observations from that day's research. I also kept in contact with my advisors during my research trips (as much as was possible) giving them brief updates of my progress. Upon returning from fieldwork trips, I typed up my fieldnotes, included pictures, and shared these documents with my advisors. In order to transcribe my recordings, I used a combination of personally transcribing interview data and I also relied on professional transcribers to assist in the process of transcribing and translating my interviews. Prior to sending audio transcripts to professional transcribers, I ensured that all data in the interviews had been anonymized by editing out any names or specific locations mentioned prior to sending audio files to transcribers. I stored my data on my password protected computer.

When analyzing data, I used a combination of inductive and reductive thematic analysis [115] as well as grounded theory approaches [116]. I used a variety of online and offline tools to analyze my data. I used Dedoose, an online qualitative analysis software, as well as Google Docs to highlight, tag, and sort my data based on emerging themes. I also used hand coding methods by printing out my transcripts and fieldnotes and highlighting, cutting, and sorting excerpts. Throughout this process, I wrote several memos reflecting on the emerging themes and used sticky notes to arrange and categorize themes. During this time, I also maintained contact with participants that had incremental WWW access. I followed up with participants via email and Facebook messenger in order to ask them follow-up questions and discuss various emergent themes. This was in an effort to keep my participants' views and experiences at the center of my analysis. In each of the chapters that follow, I provide more detail on the specific methods used to conduct each study.

CHAPTER 3

EARLY ADOPTERS OF THE INTERNET IN HAVANA

3.1 Introduction

“Now I have contact with the rest of the world. I’ve stopped living in the bubble.”—Alysa (F,24)

During the first year of my dissertation research, the international media was a buzz with the announcement that Cuba and the U.S. had normalized relations. It was assumed that this announcement carried the potential of increased access to the WWW for Cuban citizens (since it was one of the unofficial terms of the agreement). In 2014, current WWW penetration in Cuba was estimated between 5 to 25%, with only 5% of the population having full access to the WWW [99]. The rest only have limited WWW access that includes a national e-mail system, pro-government websites, and some other services [117]. In late 2014, I set out to conduct an exploratory study focusing on individuals that currently had access to the WWW. This chapter describes my first study, through which I explored the following questions: How do participants access the WWW, how do they use it now, and how do they hope to use it in the future?

Miller and Slater argue that there is significant intellectual value in “producing material that will allow us to understand the very different universes of social and technical possibility that have developed around the Internet in, say, Trinidad versus Indonesia, or Britain versus India” ([14]). Within these universes of social and technical possibility, Cuba presents a case that combines extremely low access to both the WWW and telephone with a highly literate population. Miller and Slater continue, “Each of these places is constantly being redefined through engagements with forces such as the Internet” [14]. In this initial study, I wondered, is Cuba at this particular historical moment “being redefined”

by the Internet? More broadly, by examining this particular situation in the world of social and technical possibilities, what insights can we draw for the use of information and communication technologies (ICTs) in other low-access spaces?

I wanted to focus on the way that participants were appropriating the WWW: both the impact they were having on it and the impact it was having on them. What I encountered had less to do with a society being "redefined" by the WWW nor an individualistic one-to-one engagement with the WWW. Instead, my findings uncovered more about the processes surrounding attempted WWW engagements, collaborative efforts, and envisioned potentials for the future of the WWW in Cuba. This chapter describes elements of resolver, which were acted upon through moments of configuration and a reliance on a human infrastructure. In this chapter, I focus on a specific element of the human infrastructure, which I describe as "Internet intermediaries," or individuals that facilitate types of access for others. In the sections that follow, I first review the related work I drew on for this research and the methods I used to conduct this work. Then, I present my findings, starting with a description of the state of the WWW in Cuba in late 2014 and early 2015. I explore engagements with the WWW focusing on the site that participants most tried to access, Facebook. I also unpack the varying configurations that people go through as they pursue the WWW and the reported needs and aspirations underpinning this work¹.

3.2 Related Work: Internet Intermediaries in Constrained Settings

As new users find access to the Internet, particularly in 'developing' countries, researchers have begun to examine what individuals do online once they get access. In addition to illuminating how and why individuals appropriate social media tools, these studies speak to the worldwide popularity of Social Networking Sites (SNSs), particularly Facebook. Studies in Kenya and India have examined the perceived affordances and subsequent benefits of Facebook while also examining constraints [12, 9]. Studies by Rangaswamy et al. in India

¹Findings from this study were published in 2016 at the CSCW Conference [118].

observe that within one month of acquiring Internet access on mobile phones, Indian youth in slum communities access SNSs such as Facebook [33, 119] and engage with SNSs in ways that are precursors to ecologies of learning [120].

However, these studies also point to various hurdles towards access and engagement. Among aspiring Internet users in Kenya, Wyche et al. describes how growing online participation, primarily on Facebook, is limited by high costs, access to technologies, and unreliable electricity [12]. Similarly, among Facebook non-users in Zambia, Wyche et al. found individuals were interested in using the site, but a variety of barriers prevented them from doing so [13]. The cost-consciousness of prepaid data users has been noted by Gitau et al. [121] and Mathur et al. [122] in Cape Town, Wyche et al. in Kenya [12], and Sambasivan et al. in India [123], pointing to the barriers and strategies in making use of network infrastructures.

Apart from technical, economic, and cultural challenges, Internet use is also intermediated by government policies. For example, in China, many websites are not permitted for use [124]. Moreover, the posts on SNSs are under surveillance by the government to stop spreading anti-governmental sentiments [125]. In Singapore, the government has banned websites displaying pornography, information about drugs, and online piracy [126, 127]. In Saudi Arabia, the Internet traffic has to pass through a filter that does not allow particular content such as pornographic content and documents supporting LGBT rights [128, 129].

In addition to economic constraints, researchers have studied the use of WWW to cope with political unrest and times of crisis [130, 131, 132], demonstrating the importance of intermediaries. Research by Shlovski et al. in an undisclosed country identified strategies used by individuals to navigate WWW blocking such as self-censorship and reliance on social ties to relay blocked content [132]. During the war in Iraq, Mark et al. [130] documented five ways citizens use social media creatively to foster resilience in times of crisis, including: (1) reconfiguring social networks (meeting new people online); (2) self-organization (organizing shared resources and collaboratively planning travel in dangerous

areas); (3) redundancy (sharing electrical power and WWW access); (4) proactive practices (making educational materials available online to make sure they are accessible regardless of travel conditions); and (5) repairing trust in information (sharing information that has been verified and cross-checked by trustworthy people). The needs of Cuban citizens are obviously quite different from the citizens struggling during wartime studied. However, a crumbling infrastructure and chronic shortages of food put significant stress on Cuban citizens [94, 133]. Moreover, in addition to economic barriers, participants also described political issues contributing to their lack of access and diversity of participation online.

I use the term “Internet intermediaries” drawing on work by Sambasivan et al. on intermediated interactions, activities that “enable persons for whom technology is inaccessible due to non-literacy, lack of technology-operation skills, or financial constraints, to benefit from technologies through digitally skilled users—thus expanding the reach of technologies” ([40]:1). Prior work has demonstrated how groups in resource-constrained contexts rely on social connections to bypass barriers to access [40, 134]. In rural Northern China, Oreglia et al. found that individuals use “information brokers” to assist them with their information needs [134]. Wulf et al. observed that political activists in a Palestinian village observed used WWW connections at workplaces and a 3G network through an Israeli mobile phone provider to bypass access issues [135]. In this chapter, I unpack an element of the human infrastructure in Cuba through Internet intermediaries, describing ways that people rely on relationships to access components of the WWW as well as the ways that they serve as intermediaries for others.

3.3 Methods

When beginning this research, finding funding to support travel to Cuba was difficult (especially due to the complicated history between the U.S. and Cuba). Therefore, in this study I relied on remote semi-structured interviews and online observations. I visited Havana in March 2014, during which time I built an initial set of contacts. I used purposeful, snowball

sampling to recruit additional participants. Between January - April 2015, I conducted 12 remote, semi-structured interviews with people living in Havana. Participants' ages ranged from 22-60; four identified as female and eight as males.

Table 3.1: Chapter 3 Participants

Females	4
Males	8
Total	12

Due to the limited access to communication technologies, I requested that each participant choose the interview method most convenient for them (Skype, phone, Facebook chat, or email). Seven interviews were conducted via Facebook chat, three via email, one via Skype, and one via phone. During interviews, I spoke with participants about WWW access and use, social media sites, self-censorship, and the resulting impacts on their daily lives. I asked participants about the activities they pursue online as well as their motivations. I also discussed the normalization of relations between Cuba and the United States as well as participants' perspectives of the WWW and their hopes for the future of Internet access. These interviews were semi-structured so that the interviewees were able to guide the flow of the conversation. In email interviews, follow-up questions were tailored to the initial responses.

With participants' consent, I also observed their Facebook activity to determine their frequency of use, the type of information they post, and the types of interactions they have. Similar to prior work [110], I used participant-observation to interact with individuals on Facebook to illuminate the details in their social media use and enrich my data set. In my preliminary research, I found that the majority of Cubans who interact on social media do so through Facebook; therefore, I focused my online participant-observation on that site. In the consent form, participants were notified about this method and each interviewee agreed to become Facebook friends with me to facilitate my research. I created a private Facebook list that included participants and monitored this feed daily. This list was only visible

to me and my Facebook friend list is private in order to further protect my participants' privacy. I noted the frequency and types of posts by participants and tailored my questions based on these observations. I conducted brief follow-up interviews with participants via Facebook chat, enabling me to interact with them more frequently and ask them specific questions about their Facebook activity. Interviews were conducted mainly in Spanish, however, some participants moved between English and Spanish depending on their preference. I transcribed all of the interview data and combined it with my observation notes. Using a combination of paper-based coding and Dedoose, an online coding software tool, I iteratively coded my data throughout three months using thematic analysis [116] and conducted follow-up interviews with participants based on the emerging themes.

3.4 Findings

My findings detail the configurations participants undertake in their attempts to access the WWW and how these processes shape their usage. I describe how participants use the most popular site in Havana, Facebook, and identify the most important aspects of WWW use for participants: connecting with friends and access to information. Finally, I discuss participants' feelings regarding their hopes and perspectives for the future of the WWW in Havana.

3.4.1 Trying to Get Online in Spring 2015

“Until now the government hasn’t been interested in the community having access to the Internet. They use the justification that it’s expensive, that there’s not bandwidth, that people aren’t ready for it... as if people were stupid.”—
Vincente (M, 45)

Since the normalization of relations with the U.S. was announced at the end of 2014, changes in WWW access by Spring 2015 had been minimal. At this time, the only way to

access the WWW was through workplaces, state-run cyber cafes, or in universities². The WWW in cafes and universities was usually limited to select sites and none of my participants reported using the cafes. In February 2015, Cuban officials announced a promotion for state-run cyber cafes allowing users to access the WWW for two hours and 16 minutes for \$5 (instead of the normal \$4.50/hour) [136]. However, the promotion ran until April 10, 2015, and was still prohibitive, considering the average monthly salary in Cuba is \$25 USD/month [137]. None of my participants regularly accessed the WWW in cyber cafes due to slow bandwidth and high cost. Alysa added that, “*Internet continues to be expensive. [This new price] is half of the first monthly salary that I had when I started working.*”

Each participant in this study accessed the WWW either at work, school, or through friends. For example, Riel accessed the WWW occasionally from the home of a friend who is a foreigner and had been granted a license to have WWW in his home. Of those with access at school, it was limited to a couple of hours per week. Participants considered themselves to be in the minority, as the majority of their friends and acquaintances did not have WWW access. Three participants, Luis, Samara and Raymon, had limited access at home since they (or their parents) worked from home and had received special permission from the government.

“The Internet access that I have is extremely limited. We have it in school, but it’s a limited quota that doesn’t work for everything. Additionally, certain sites like Facebook are only accessible at certain hours a day. Apart from that, the Internet that I have [at home] is one that I buy for a few hours per week, depending on what they allow me.”—Samara (F, 21)

WWW speeds at workplaces and universities are often faster than those in individuals’ homes, but still restrictive. Additionally, as of spring 2014, Alysa, Zella, and Yago had access to an email service on phones called Nauta, costing \$1.20 per megabyte [138] but

²There was also limited WiFi in select state-run hotels but, at this time, this service was only available to foreigners for around \$10 USD/hour.

they said the service is slow, unreliable, and rarely used.

Participants felt their WWW use was restrictive due to slow access, high costs, and blocked content. As opposed to relying heavily on content censorship like other countries with tightly controlled WWW access, such as China or Iran, the Cuban government has controlled most WWW access through high cost and slow bandwidth [139]. Throughout my research, these constraints were challenging, making it difficult to recruit participants and, at times, to remain in contact with participants throughout the study. All participants reported that there are things they would like to do on the WWW but are unable to, due to slow connection speeds and high costs.

“I always try to access Facebook to have contact with some person. But it’s very complicated because the connection is extremely slow. So, a lot of times, I can be talking with someone and, boom, the connection drops. And I have to wait to connect again... everything is a hassle.”—Riel (M, 25)

“I have access in my workplace, but it is a very slow Internet, where you can’t watch videos and sometimes not upload photos.”—Alysa (F, 24)

In addition to cost and speed, content blocking is also a factor that limited access for participants. Some participants stated that sites were blocked because of other companies or countries limiting access to Cuba. For example, Gavin said that he is unable to access certain Google services because they are blocked for anyone with an IP address that originates in Cuba. Similarly, Samara spoke about activities she’d like to be able to do online but is unable to:

“There are lots of things that I want to do on the Internet but can’t. Up until recently, there were many services on Google that weren’t available in Cuba. For example, Google Analytics. Similarly, Skype doesn’t work in Cuba. I would like to be able to use it to talk to many people but I can’t. I would like to be able to edit my Facebook profile more than once per week or be able to

use Netflix to watch the series that I like but I can't do that, either.”—Samara
(F, 21)

Participants also said that pornography is illegal and it is impossible to shop online. Other news articles at this time confirmed the inability to access pornography in Cuba, pointing out that even trying to access a pornographic site can lead to the cancellation of web services [140]. It has also been reported that WWW users must sign a contract that they will not look for pornographic content [141] and there can be harsh consequences for being caught with pornography. In 2015, participants told me that this contract was still in use. While he was in university, Gavin said the school cut off WWW access for students: “*they discovered that one student had pornography and used the connection to upload photos... they took away the WWW for the first three years for all majors. The last two years we had WWW two times per week for only 10 minutes*”³

Acting through an ethos of *resolver*, participants described how they make-do with limited access to accomplish various activities. At this time, computer hardware was purchased either during international travel or on the black market. While some hardware was newer, the majority of hardware had been cobbled together from old components. Old components and parts are often found through Revolico.com, a virtual marketplace where individuals sell goods and services from computer repair to USBs. Since most people don’t have access to the WWW, select individuals download the content from Revolico and distribute it by hand via USB sticks. Through a configuration of multiple people and resources, people find ways to pursue technical engagements. Vincente described how an “offline” Internet has formed in Havana in which citizens distribute media through USBs called El Paquete. During my initial travels to Havana, I encountered this practice among every young person with whom I spoke.

³Although the fact that pornography is not allowed in Cuba is often of interest to people in the U.S. (especially since pornography is often credited as a driver of WWW use [14]), participants did not draw much attention to that fact. From ongoing fieldwork I learned that 1) they are acquiring pornography through other means; and 2) similar to a stated disinterest in politics, participants seemed to shrug off the “ban” on online pornography.

“People here share information by way of hard drives...It’s what people call the “El Paquete” that’s around 1 terabyte. They sell it very cheap. They sell a copy of the series, movies, etc.” —Vincente (M, 42)

In addition to selling digital content via hard drives and USBs, some individuals access content and technological tools through other non-traditional means. Gavin, a data technician who lives near central Havana, described how people access and use technology:

“We exploit more technology than what most would imagine. All software that is used is pirated and we all have access to them without fear of penalty or problems with the law. Although there isn’t Internet, the average PC user [in Cuba] does much more than the regular user out in the world. Format memories, reinstall operating systems, use professional programs like Adobe Suite or others that are really expensive are easily accessible in Cuba. This is a great paradox of these times.”—Gavin (M, 28)

Like Gavin, others spoke about the sense of “paradox” they live with, reflecting the *resolver* mentality that underscores these findings. For Gavin, part of this paradox means that, despite not having access to the WWW, in his mind, Cubans do much more with technology than the “regular” user out in the world. Gavin went on to say that the “contradiction of the present Cuban is the challenge of living with good professional preparation but with an economic retribution that doesn’t correspond with the contribution to the society that they make.” In order to cope with this challenge, people *resolver* by “exploiting” technology, resources, social connections, and skills. Similarly, Luis described how he has developed “tricks” to bypass constraints:

“Sometimes you have to find ways around stuff. A trick I use for example: At home I can do the basic search of Google, but not follow links, so sometimes I feed the search something I’m looking for just to see where it might

be available and then go somewhere else to get it. People can sometimes answer messages on Facebook by replying to the email notification... You gotta be crafty sometimes.”—Luis (M, 35)

I asked Luis where he goes to look for the information he cannot follow via Google searches. Luis said he either searches in El Paquete Semanal or, at times, he's able to ask someone else that has better WWW access. Participants spoke about various collective strategies enacted to bypass limited WWW access. At this time, hotels were one of the only institutions with WiFi and this was provided for guests (who still had to pay high fees to use the service). Some participants spoke to me about people “sneaking around hotels” hacking into the network to get online. Participants also spoke to me at this time about the creation of local internets. For example, Vincente spoke with excitement about the incentive of individuals to develop the local internet, SNet.

“Some people sneak around hotels to get Wi-Fi access using password breaking... People share information in this city through an “intranet” made between people with incentive, off the record, and who have bought their own equipment, routers, etc., that they interconnect, over more than 30 km in the city. Sometimes groups of young people put a router in a building and connect the others with cables or wireless connection and they share the connection to exchange movies, documentaries, and even play. But everything occurs inside the bubble.”—Vincente (M, 45)

These collective configurations speak to this ethos of resolver as participants navigate legal, political, and resource boundaries in efforts to move towards WWW access. However, in Spring 2015, access to the WWW was prohibitive and much of the information sharing activity I observed occurred, as Vincente put it, “*inside the bubble*,” meaning that few people were able to access the WWW to connect with individuals or information outside of Cuba at this time.

3.4.2 Dimensions of WWW Use

“Things don’t happen like you think they happen. For the average Cuban, the Internet is Facebook. Perhaps you all see the Internet differently. For us, the Internet is Facebook, Facebook, Facebook.”—Yadra (M, 27)

Regardless of the high barriers to access, participants still managed to get online in 2014 and 2015. At this time, if participants wanted to access the WWW, it was normally done at their places of work. In addition to sites that participants had to access for work purposes, all participants reported that Google or Facebook were among their favorite sites, with Facebook being reported as the most used site. These findings are consistent with a 2015 survey conducted in Cuba that reported that 91% of Cubans with WWW access used Facebook [142]. Similar to Wyche et al.’s work on Facebook use in rural Kenya [143], participants’ Facebook use was mediated by access limitations. All Facebook activity by participants occurred during the weekday between the hours of 6 a.m.-5 p.m., while they were at school or work. Only Luis posted outside of this time frame because he had increased access during his international travels. Unsurprisingly, participants with faster WWW connections and more regular access posted more often on Facebook.

Being able to connect with friends has had a meaningful impact for participants. While this may seem obvious (doesn’t everyone use the WWW for this?), for Cubans it is of particular importance. Nearly every Cuban has family members outside of Cuba and many have not been in contact with them for years. As Vincente told me, “*sometimes they don’t even allow you to use regular mail to write to your closest relatives living abroad.*” In addition, phone calls to people outside of Cuba are expensive. Therefore, the WWW, particularly Facebook, has opened new modes of communication for Cubans who have the possibility of connecting online. Participants spoke about their aspirations of one day being able to be in regular contact with relatives and friends around the world. As Riel said, “*Cuba is a country that is spread out across the world. There is a whole population*

in Miami that we have been kept from.” Due to the WWW, Riel said that he “finally” has contact with his cousins that live in Florida.

In her work on WWW appropriation in Ghana, Burrell notes how contact with strangers, namely foreigners, drives many of the engagements with the WWW [144]. My participants, on the other hand, use the WWW to connect with people they already know. Due to limited access (as well as the driving motivation to reconnect with family members), participants did not put their efforts towards trying to meet new people online. In addition to connecting with people outside of Cuba, some participants spoke about using Facebook to connect with individuals in Cuba.

“In my university there were people from different provinces. Once we graduated Facebook became like our place for reunions. A lot don’t have phones and we’re able to stay up-to-date through this medium.”—Gertrudes (F, 24)

However, since the majority of people in Cuba do not have WWW access, this limits the number of people in one’s online social network who are also co-located. In other words, while participants relied on Facebook to communicate with others in Cuba, participants had a limited number of Facebook friends that were in Cuba.

While connecting with friends is important, the ability to access information online is also crucial. Some participants spoke about using information found online to help them overcome problems. Gavin said that access to the WWW has helped him *resolver* at work. He works with a lot of equipment that often breaks and it’s difficult to find a solution. As a result of having WWW access, Gavin said: *“I’ve resolved complicated technical problems thanks to the information and help forums.”* More commonly, however, participants spoke about information access in terms of knowledge acquisition and awareness of “the rest of the world.”

When discussing the impacts from the bits of increasing access to the WWW, people were often more eager to talk about how *not* having WWW has impacted them. For example, Samara told me that, *“I think the lack of Internet has limited life here, it’s limited us in*

many ways from buying things online to searching for information. The better question is how not having Internet has affected us. I think the worst thing is that is has kept us apart from the world, giving us just droplets of reality, fashion, news, everything that happens outside.”

Since the revolution, the Cuban media has been controlled by the government, limiting the amount of information that Cubans receive about the outside world as well as their own community [Biddle2013, 91]. As a result of increased access to information via the WWW, participants discussed the WWW and social media in terms of it affecting their perspectives and perceptions of reality. As a result of increased access to information via the WWW, participants discussed the WWW and social media in terms of it impacting their perspectives and perceptions of reality. For example, Samara said that the, “*Internet always allows me to see that there is so much I don’t know, so much that I am not aware of.*”

“*[The Internet] has affected me positively, because I’m kept updated on the global agenda, things that many times the press or news here doesn’t inform us.*”—Gertrudes (F, 24)

“*The most important thing [about the Internet] is to have other sources of information from other points of view and perspectives different from those of our country, which has a complacent and biased press.*”—Vincente (M, 45)

Prior research among people in Cuba has focused on of the WWW, specifically the blogosphere, as an alternative public sphere [145, 95, 94]; however, my participants did not report visiting blogs (most of the controversial ones are banned in Cuba) and, further, several reported that they were disinterested in politics. Additionally, the only political discourse on Facebook that I observed dealt with the normalization of relations between Cuba and the United States, and each one of these posts were made by other Facebook users who tagged some of my participants (and therefore the post appeared on their walls).

“Opinions may be expressed, but people rarely use social networks as platforms... I don’t know if they’re guarded. Maybe. But it’s mostly a matter of what is simply cool or not cool to post in your circle. I don’t think it’s a Big Brother thing.”—Luis (M, 35)

Although Luis attributes the type of content posted to social norms of one’s network, there may be other factors influencing participants’ use. When considering Cuba’s history in the past 50 years and the fact that political dissidents have been imprisoned for openly defying the government, it is not surprising that participants do not use Facebook to share opinions on controversial topics. During my interview, Raymon discussed negative results from something that he posted on Facebook.

“On one occasion, I fell into the trap of saying something that my bosses didn’t like and I almost lost my access. Since that day, I’ve tried to dedicate myself to only what concerns me and the path I walk on.”—Raymon (M, 60)

Raymon said that his bosses were concerned about the government potentially shutting down their access and, therefore, they are careful about what their employees post. When talking about the type of material she posts on Facebook, Alysa said, “*We could talk about politics, but I hate politics so we never talk about anything like that.*” This statement is indicative of an observed mutually reinforcing trend. Since it’s a sensitive topic, participants may say that they do not post about politics (or other controversial topics) as a way to protect themselves. As a result, others in their community refrain from posting similar content in an effort to maintain social norms. Another explanation came from Gavin, who said that, in addition to avoiding politics, “*For Cubans the embargo or the state of the stock market isn’t important. Only getting to the end of the month with food in the house.*” Again, Gavin expresses another element of Resolver: while people “exploit” technology and create creative solutions, there is still an underlying survivalist notion underpinning mentalities.

3.4.3 Collaborative Access + Use

As evident throughout my fieldwork, participants relied on internet intermediaries to collaborative access and engage with elements of the WWW. Because WWW penetration remains low, people must rely on collaborative efforts to retrieve and share information. Some participants use the accounts of others to try to get online, like Luis:

“I use the institutional account of a family member who works in the cultural sector and it’s mainly used for email service, but it additionally allows access to selected sites (usually .cu sites, Wikipedia, some foreign press). I have my own account through the University, which also provides email service, but its additional access is more limited (only sites directly related to the University).”—Luis (M, 35)

Participants spoke about others requiring information online and then spreading the news through in-person contacts. As Riel explained, “*A lot of the news that you find on the Internet you can hear from a friend who heard from a friend who heard from another friend.*” In Havana, news primarily continues to travel through face-to-face social networks. People with WWW access often retrieve content for others and disseminate information to their local communities. Participants described the ways in which they use the WWW to collaboratively retrieve information and how they ask for information retrieval from others when their access is limited.

“Mostly [I share] news on current events or entertainment. Occasionally academic knowledge, too. Like the neighbor’s child needing some information for homework. Among friends, it’s a regular thing.”—Luis (M, 35)

Participants spoke about conducting Google searches for members in their community that did not have WWW access. Similar to the collaborative efforts used to retrieve information, individuals rely on friends to help them maintain their social media presence. While selfies

and pictures of friends and family were popular content for Facebook posts, due to access barriers, uploading pictures did not occur as often as it might if connection speeds were faster. The majority of participants said they would have liked to have post more pictures themselves. Instead, they have to rely on sharing content from Facebook pages of friends who are able to upload images. For example, Alysa's posts were all pictures of herself and friends, which she tagged so that the pictures would appear on their profiles. Alysa said that, in this way, her friends' families outside of Cuba could get a glimpse into their lives. Alysa said that she does this as a way of caring for her friends, since she is one of the few with access to the WWW. Nine participants had photos of themselves added to Facebook by others.

Another participant, Samara, said she wanted to incorporate a digital element to her undergraduate thesis for her photography degree, but, previously, slow and unreliable WWW access had prevented her from doing so. However, she decided to *resolver* by using an internet intermediary (in this case, her boyfriend, Tony, who lives in the U.S. and has high-speed Internet access). Communicating back and forth via email, she worked with Tony to configure multiple elements, developing a Facebook page that serves as an interactive version of her thesis. Samara shared her Facebook login with Tony, who edits her page on her behalf. After taking and editing the pictures she wants to share, Samara uploads low resolution versions of her photos and sends each on in a separate email to Tony. She then loads the emails into a queue and often waits for them to send when the connection speed allows. Tony uploads her photos and responds to comments, often reporting back the activity to Samara via email.

"I know how to use [Facebook] for things that I need, like the page for my photographs, but I've had to resort to other forms that my photos arrive on the page, I can't be the one who uploads them, who responds to the comments, the messages that people leave, etc. and that, honestly, leaves a bad taste in my mouth, like there is a piece of the process that I am not seeing."—Samara (F,

Samara said she also considers this as an inventive way to conduct her undergraduate thesis. This also gave her a sense that she was accomplishing a larger goal, which was, “*to give the outside world a glimpse into actual life in Cuba.*” However, the fact that she had to rely on Tony in order to manage the page reinforced her frustrations about the “*limitations we Cubans face.*”

In addition to the limited number of pictures on Facebook, participants did not use Facebook to mobilize or ask questions or favors of their audience. Because most of my participants’ friends and family in Cuba are not on Facebook, the majority of their co-located social capital is based on in-person connections, which may explain why participants do not use Facebook to gather support from their community in terms of seeking favors or making requests, as evident in other research of Facebook use in the U.S. [146]. One exception comes from Vincente, who shared a public post promoting a GoFundMe page for his son’s local band.

“The band started for fun but now are doing so good that the Institute of Cuban Music has evaluated them as professionals so they can work and earn some money from the music. As there is scarcity of everything here, my friend posted some videos from the band and advised us to create a GoFundMe account for people to help us.”—Vincente (M, 45)

This is unlike any other post observed during this research and the first post by a participant who was making a request of the Facebook community. In order to organize the campaign, Vincente relied on a friend in the U.S. who created the GoFundMe page and is accepting funds and equipment donations on behalf of the band. The friend plans to travel to Havana to deliver the equipment to Vincente and his son directly.

In addition to seeking internet intermediaries that had access, participants directed certain requests to certain individuals. For example, Samara reached out to me via email to

ask me to search for information for her. She said she had the possibility of moving to the U.S. and wanted to attend a master's program in photography. Via email, we went back and forth as I sent her information on various schools in the part of the country she was interested in. I would copy and paste sections of text from websites and she would ask follow-up questions and request specific information. Since Samara knew I was a graduate student myself, she said that she not only relied on my WWW connection, but my knowledge in this area to help her conduct this search ⁴. Not all participants had the possibility of having multiple internet intermediaries that they could rely on, however, so not all were able to balance between intermediaries' connections and expertise.

Imagined Potentials of the WWW

Similar to other studies on Facebook use in low-access regions [147], many participants spoke with optimism and a somewhat Utopian outlook about the potentials of the WWW in Cuba, however, there was also skepticism that increased WWW access would ever be achieved in Cuba. Participants spoke about the *need* for WWW in Cuba as an avenue to achieve other aspirations. Individuals expressed feelings of frustration and anxiety that their country is behind economically, and they hope that change is coming to their country.

“Due to being an underdeveloped country and the economic blockade that we are under, our technology is rather poor and we are very behind at this point. I hope with time the situation will improve gradually. Until then, we make-do.”—Gertrudes (F, 24)

Gertrudes expresses a resolver mentality: a hope that conditions will improve and an acceptance of the need to survive and cope until improvements are achieved. Looking towards the future, participants envisioned the WWW as a potential catalyst for change, often with a utility-based outlook. Participants also explained that the WWW is needed for education

⁴Samara did end up moving to the U.S. and was able to apply to a Master's program in Photography (which was one of the programs we found together during our collaborative searches). She also used her Facebook page as part of her application. She graduated from her Master's in 2018.

and information access in order to improve economic development and continue to educate their population.

“In academia [the Internet] is an absolute must, and much is lost or not developed by not having better access to information, tools and skills. As a teacher I notice that every day. The same applies to almost every level of society. Any profession can benefit from the Internet. The worldview would change drastically, too. For the better, I think.”—Luis (M, 35)

In addition to describing the WWW in terms of economic and educational needs, participants reported feeling as though information had been hidden from them and that there were gaps in their knowledge about the state of their world. Therefore, participants were eager to have access to more diverse information and opinions.

“Normally, what we consume is what they distribute in Cuba, the information they give us. And we need another version of reality to be able to confront what we ourselves think.”—Yadra (F, 27)

Participants said the lack of information access has hampered Cuba’s development, amplifying their sense that they are isolated from the rest of the world. Alysa told me that, as a result of limited access to the WWW at work: *“My vision has changed, because now I’m not so vulnerable to what they want me to believe; I know with my own eyes what is reality.”* When I asked her what she meant by “they,” Alysa referred to the government and the Cuban press. Individuals are eager to redefine what it means to be Cuban and to go beyond the traditional revolutionary identity that the state has perpetuated during the past half-century [148]. Echoing the sentiments of other participants, Alysa spoke about the *need* for all Cubans to have access to the Internet so that they understand *“how the world actually is.”*

As with WWW engagements anywhere, varying values and interpretations impact the way people perceive the benefits of the Internet. Although participants spoke about the

importance of the Internet, they also described concerns about its potential misuse.

“Many that have access don’t use it for purposes that it really should be used for and use it more for either recreational purposes and other things...The Internet is for work, to increase knowledge, to communicate which is also very important, but not for playing.”—Raymon (M, 60)

Although Raymon spoke about the WWW as something that is “not for playing,” the majority of his Facebook posts were links to entertainment and sports content. Gertrudes also spoke about potential ”dangers” of the WWW, while also saying that leisure and enjoyment are some of its key benefits:

“The Internet is necessary but dangerous. Necessary because Cubans need to feel like a part of the world and enjoy all of the facilities offered by the Internet. I know this sounds a little materialistic but sometimes humans need a little materialism and alienation. Dangerous because Cubans have never had the power of the Internet in their hands (to call it that) and can get carried away by all of the falsehoods that are published there.”—Gertrudes (F, 24)

Throughout my fieldwork, I encountered concerns among other people, who spoke about the potential “falsehoods” on the WWW and how people could be easily misled. When I asked individuals why they thought this way, some referenced documentaries or news articles from the Cuban government. Other participants, like Gavin, said that talking about the potentials of the WWW was a waste of time because, first, people need to get access.

“How much would Internet cost in Cuba? How could the average Cuban pay for Internet? In a country where the food is more expensive than the salary, how can one think about the Internet? There would have to be an established economic context in which all Cubans could access. I don’t see that happening.”—Gavin (M, 28)

For most participants, access to Internet presented the possibility for personal and collective advancement, as well as the ability to reconnect with family members outside of Cuba.

“[In the future] I think that people will go about adopting the Internet in their daily jobs just like has already happened in all the other countries in the world and that, in this moment, a lot of new and good things will arise because a lot of artists, painters, musicians, designers, etc. that would be able to share their work and people would get to know [them] through this route.”—Yago (M, 42)

3.5 Discussion

When I first published this study in 2016 [118], I wrote that I did not “see” social media used in most of the ways that Mark et al. had observed it being used in Iraq for resilience: reconfiguring social networks, self organization, redundancy, proactive practices, and repairing trust in information [130]. So few people had WWW access in Havana at the beginning of 2015 that people typically did not meet new people over social media. My participants used social media to connect with family and existing friends but many of the “creative” ways that Iraqis [130], Mexicans [131], and others use social media for resilience depend on widespread access to cell phones and the WWW. The lack of these factors in Havana impacts the ways in which Cubans appropriate ICTs.

Notably, participants did not describe social media use for political mobilization or as a platform for free speech. Regardless of the popular discourse surrounding the liberating’ nature of social media, Wylie and Gidden argue the idea of the Internet potentially provoking a Cuban Spring’ may be flawed [149]. My findings from this chapter and ongoing research confirm this. When examining the Internet and state control in China and Cuba, authors contradict the notion that the Internet poses a threat to all authoritarian rule by demonstrating how both the Cuban and Chinese governments have been able to control and profit from the Internet [25,26]. Others advocate for further research in this area because of the complicated history of outside development actors attempting to use IT to

promote democracy in Cuba [15]. Regardless, it is clear that participants talk about their aspirations for the Internet in terms of entertainment, connection, and information access—not to mobilize political protests.

Specifically, as in other communities around the world [150], participants expressed a desire to access Facebook. As Yadra comments, “*For the average Cuban, the Internet is Facebook.*” Intermittent access to Facebook is used for basic communication for both work and socializing. It is used as a communications channel both with others in Cuba and to reach people abroad. However, participants discussed how online participation was limited by restrictions and, as a result, the majority of people are not online.

Unlike other studies regarding the introduction of the Internet leading to gambling, shopping, or porn [62], because this type of content is blocked or inaccessible in Cuba, participants appropriated the Internet in different ways. Participants spoke about the importance of using Facebook and the Internet more generally to gather information and to advance work and education. Some participants seemed to feel the need to justify their use of the Internet, or overtly state its utility (like Raymon who said, “*the Internet is not for playing*”). However, participants mainly used the Internet for relationship maintenance and for entertainment, which is consistent with other findings on early Internet access in communities [9, 62]. Additionally, when observing participants’ Facebook posts, there was a mainly a mix of entertainment, including memes and links to YouTube videos. Some participants emphasized the importance of leisure-based Internet use, like Gertrudes said, “sometimes humans need a little alienation.” She emphasized the need to “disconnect” from the pressures of life through entertainment purposes. In his “cute cat theory of the Internet,” Ethan Zuckerman argues that entertainment applications of IT are often a first step towards more “serious” uses [151]. However, this seems to suggest an utilitarian-based bias of Internet use, which has been critiqued by ICTD scholars [33, 152].

However, while participants engaged with leisure-based use of the WWW (which I argue is entirely legitimate), they also spoke about the potential of increased WWW access as

being important beyond leisure-based use. In addition to describing how they are currently using the WWW, participants spoke about the imagined potentials of increased access. Participants expressed a sense that Cuba was “behind” the “rest” of the world and that there was a reality that had been hidden from them. For example, Alysa and Vincente described Cuba as “a bubble,” and saw the WWW as a way of potentially breaking out of that bubble. For participants, the Internet carries an imagined potential of bridging the divide between what participants have been excluded from: connections with friends and family outside of Cuba and access to diverse sources of information. In 2015, participants aspired to reconnect with friends and family from whom they had long been separated, and the Internet represented a potential avenue through which to achieve that connection. For example, Riel described how Cuba is spread out across the world and how participants have been “kept from” the large diaspora of Cubans in Miami.

The idea of the bubble also extended to participants’ discussions of Cuba being behind, partially because of a lack of Internet. There was also a sense, however, that Cubans are incredibly intelligent and savvy and, as Gavin said, *“the average computer user in Cuba knows how to do more than the average user in the U.S.”* Further, as Vincente highlighted, there are ways that access to media seeps into the country, like through El Paquete. In this way, the sense of Cuba being an isolated country meets up with participants’ notions of Cubans as highly educated, capable people, resolviendo within their current situation. Participants had rather Utopian hopes for the introduction of Internet technology into Cuba. However, I did observe skepticism—for example, concerns that people will find information online that is not true.

Central to this chapter and my larger body of work, participants described how they acted as and relied on Internet intermediaries. Participants, like Riel, described how they searched for information for neighbors. Through the collaborative configuration of resources and a reliance on Internet intermediaries, information access for a small minority has a broader impact. Additionally, participants with lower access reported that they rely

on others to help maintain their Facebook presence, further highlighting the importance of Internet intermediary efforts to use Internet tools. Sambasivan et al.’s description of intermediated interactions included individuals that are digitally skilled or literate [40], Internet intermediaries in my research were not determined because they were literate always “digitally skilled.” Instead, their role as an intermediary was determined by whether or not they had access to resources that others needed (often through faster Internet connections) as well as their willingness to do so. Participants who acted as intermediaries for friends in Cuba also relied on intermediaries themselves. Although participants did not try to connect with foreigners outside of their circle, there was an acknowledgement of their reliance on people that live outside of the U.S. who serve as Internet intermediaries. Such as Vincente, who worked with friends in the U.S. to create a GoFundMe page for his son’s band. Like Samara who collaborates with her boyfriend, Tony, to maintain her Facebook page, which she says she is unable to do on her own because of access limitations. Samara also pointed out that she knew how to use Facebook on her own, however, she has to rely on someone else, which, she says, “*leaves a bad taste in my mouth.*”

3.6 Conclusion

Having conducted this research in 2015, and after having four years to reflect, I realize that, due to the methods (remote interviews) and focus of this study, it was difficult to grasp all of the practices occurring away from individual participants’ direct engagement with their Facebook profiles. Many of the practices that Mark et al. describe [153] were, indeed, occurring. However they were happening “offline” and were facilitated through a human infrastructure via Internet intermediaries. This study demonstrates that, simply observing content on Facebook does not encompass a full picture (or even part of a picture) of the dimensions of Internet engagements in Cuba (or anywhere else). That is not to say that Facebook use (or the desire to access Facebook) did not hold meaning for participants. Rather, there was a multitude of practices and factors interacting with the ways

that participants engaged with this version of Internet access that go beyond Facebook and individualistic human-to-machine engagements.

While participants spoke about the Internet as being a need and something that can have a dramatic impact, they also highlighted how constraints hampered their use of the WWW and how they are frustrated by the need to resolver. This duality of resolver (belief in the ability to make-do as well as the frustrations or sadness that come from the need to interact with the Internet in this way) is one of the threads that weaves this dissertation together. In the following chapter, I describe how participants collaborative configurations enacted through resolver shift and adapt with the introduction of a new form of WWW access: public WiFi hotspots.

CHAPTER 4

LOCATING THE INTERNET IN THE PARKS OF HAVANA

While conducting research with early adopters of the Internet, the Cuban government announced it would implement a new form of access for Cubans in the form of public WiFi hotspots. In this chapter, I focus on the appropriation of the Internet through a field investigation of public WiFi hotspots in Havana, Cuba, and examine the possibilities of Internet access these limited and expensive hotspots present to individuals, many of who are experiencing the Internet for the first time. Drawing on fieldwork conducted in 2015-2016, I underscore the reconfigurations that have resulted from this access, as evolving Internet users reconfigure their interactions with place, time, and individuals in their efforts to *locate the Internet*. I also discuss the implications my findings have for the design of Internet access interventions in Havana and in other low-resource environments across the world, as well as the broader implications for social computing across diverse geographies¹.

4.1 Introduction

Around 11.30 PM on a muggy evening in April 2016, Yuniel, a 26 year-old theology student, and his spouse, Lara, drive to *Habana Vieja*. “*She needs to fill out an online registration form for school,*” he says. Neither gets out of the car as Lara pulls out her iPhone and an ETECSA Internet card. Shifting glances between the card and the screen, she first enters a long string of numbers for her user name and repeats the process for the password. After waiting about a minute, a screen appears with a countdown clock, showing that 58 minutes remain. Lara enters some text and hits send. After another five minutes, the website has still not loaded. “*You’re wasting our minutes if you keep trying here,*” Yuniel tells her, “*The connection is too slow.*” Yuniel maneuvers the car through *Habana Vieja’s* crowded streets,

¹Findings from this study were published in 2017 at the CHI Conference [154].

past the capitol building, and into the *Galeano* neighborhood, home of the popular *Fe del Valle Park* WiFi hotspot. The ten minute drive between hotspots proves useless, however, as large crowds are overloading the router in this park as well. Two hours and four hotspots later, Yuniel and Lara are finally able to dispatch the web form by connecting to the Internet from a hotspot near *El Malecón*. As they start to head home, Yuniel says, “*We are very lucky... at least we have a car and don't have to search for the Internet on foot.*”

Since March 2015, the public squares of Havana have been transformed from places where people stroll and children play to places where crowds gather to try to connect to the Internet at all hours of the day and night. The transformation of these places are due to the introduction of approximately 200 public WiFi hotspots in local parks, squares, and streets [155]. Through interviews with 41 participants, participant observation, and fieldwork, my research examines the impact of the newly opened WiFi hotspots in Havana on the daily lives of participants, as they go about their efforts to *locate* the Internet.

In this chapter, I focus on the *reconfigurations* that occur in response to the introduction of the hotspots as individuals as individuals reconfigure their lives in diverse ways in order to accommodate the model of Internet access that these hotspots enable. First, having access to a physical space that is also online has shaped how the local Cuban people interact with this space. There is thus a reconfiguration of ‘space’ and ‘place’ that is occurring simultaneously. Second, given the limited and expensive access even in these public settings, users have to carefully prioritize their time while they are online and offline, so that their Internet needs are fulfilled affordably. Further, as these Cubans go online to connect with their families after long years of separation, they are finally in a position to try to regain communication with them and reconfigure these relationships.

This chapter makes the following contributions. First, my findings document this dynamic process by building on my prior research on increasing Internet access in Havana [156]. Second, capturing this transition as it unfolds helps us understand both online and offline constraints and affordances and how these impact Internet use and priorities, particu-

larly in the Cuban case. Third, although the specifics of Havana may materialize differently in other contexts, my study presents design and policy implications for other constrained environments that fall in the purview of the area of Human-Computer Interaction for Development (HCI4D). As services (*e.g.*, Facebook) developed in highly-connected contexts are increasingly adopted in socioeconomically disadvantaged communities, the nature of access by these new and evolving users must be considered. With this in mind, this chapter also provides implications for the social computing community, highlighting the need for it to engage with diversely connected geographies.

4.2 Related Work: Considering Space, Place, + WWW Access

Shared access computer centers, or telecenters, were one of the earliest and dominant approaches to providing connectivity, from Brazil to India and the Philippines [157, 158, 159]. Modeled as community centers or private businesses, socioeconomic development services were offered on these computers. While a large amount of funding was dedicated to these projects, the telecenter model was by-and-large a failure due to a number of reasons, including financial profitability, insufficient relevant content for user groups, social discrimination, limited digital literacy, and political barriers [158, 160, 161]. Despite these failures, public access continues to be relevant across geographies [162]. Public WiFi is increasingly provided by establishments, institutions and governments as a means to boost access in “developing” countries. More recently, as mobile Internet accelerated, groups have begun exploring ways to offer more affordable access to WWW services. Initiatives have explored zero-rated services, which provide “free” access to certain Internet services for users. These services have been critiqued as creating a “walled garden” version of the Internet, where available content is determined by corporations, not end users [163].

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services were offered on these computers. While a large amount of funding was dedicated to these projects, the telecenter model was by-and-large a failure due to a number of reasons, including financial profitability, insufficient relevant content for user groups, social discrimination, limited digital literacy, and political barriers [158, 160, 161]. However, public Internet access initiatives continue to be of relevance in underconnected regions. In a study of South African teenagers, Donner and Walton found that public access in libraries and cybercafes remains important (even with the addition of mobile data), serving as venues to do research, supported by helpful staff [162]. Nemer's ethnography in the favelas of Brazil highlighted the importance of mundane uses of technology in telecenters in the process of social empowerment of slum residents [164]. Notably, Burrell's research on usage of Internet cafes by non-elite youth in Accra points to the cafes providing a space to extend one's social network and resources online, an "indeterminate space" that is neither fully Ghanaian nor a totally new world [165]. Miller and Slater, in their ethnography of the Internet among Trinidadians, noted that the network became an expression of values and identities of being "naturally Trini," providing a global stage to enact Trini pride, cosmopolitanism, and freedom. The Internet served as a window to connect families over long distances [166]. Adding to this work, I point to the outward focus of the Internet in the WiFi hotspots, in the re-establishing and re-imagining of diasporic connections between Cuba and the U.S.

Despite the rise of prepaid Internet in emerging economies, cost of use remains high. The cost-consciousness of prepaid data users has been noted by Gitau et al. [121] and Mathur et al. [122] in Cape Town, Wyche et al. in Kenya [12], and Sambasivan et al. in India [123], pointing to the barriers and strategies in making use of network infrastructures. Tools to help manage and control data costs have been researched and deployed. Of note is SmartBrowse, a cost transparency tool, that led to increased online activity and a reduction in credit spent [167] and Flywheel, a compression tool for the Chrome browser, that reduces data size of web pages [168]. My research complements this space by providing an account

of how paid WiFi hotspots at slow speeds are optimized by participants, when the cost of access is a high fraction of incomes.

Public WiFi is increasingly provided by establishments, institutions and governments as a means to boost access in ‘developing’ countries. Express WiFi by Facebook [169] and Google Station [170] are large-scale deployments in rural and urban areas. However, research on public WiFi use is relatively scarce. Sambasivan and Aoki describe how imaginaries of public WiFi in India are shaped by media and prior technological cultures, leading to specific fears and values [171]. Hampton and Gupta, in their study of WiFi use in U.S. establishments, note that two types of use emerged in the public hotspots: true mobiles, pursuing productive or transactional activities in the hotspots, and place-makers, who viewed the cafes as sociable spaces [172]. Studying community wireless networks in New York City, Forlano describes the impact of the space on use, discussing spatial characteristics that matter in choosing a hotspot and the freedom to move about while using it [173]. As stated by Gaver, the design and physical attributes of space afford actions and behavior in place [174]. However, the widespread adoption of the Internet and mobile technology has altered the ways in which we think about the relationship between space and place [175]. My research connects with prior work on this topic in order to better understand the complexities embedded in my findings.

Drawing on Forlano’s work [176], I use the term “reconfigure” to describe the shifting actions and mentalities of participants since the hotspots were introduced. Barad says, “*Agency is not an attribute but the ongoing reconfigurings of the world*” [47]. Using this notion of agency, I highlight how participants actively and passively reconfigure their interactions in order to access the Internet and accomplish their targeted online activities. As Forlano describes, the interactions between people and WiFi networks have reconfigured attributes in physical space, making space a social product just as much as place [176]. My findings, however, move beyond the collective reconfiguration of space and place by highlighting how factors such as time and social practices play a crucial role in reconfiguration.

Reconfiguration, therefore, is a collaborative effort, once again highlighting how Internet engagements rely on and are mediated by a human infrastructure. Additionally, I note how both the nature of the access reconfigures the social, and how the social (or the people) reconfigure the nature of access.

This chapter thus contributes new knowledge to the understanding of public hotspots by examining their use in the context of parks and urban spaces. Specifically, I examine how the nature of access and the characteristics of hotspots influence adoption and use when they serve as the first experience of the Internet. Further, I call attention to the issues embedded in physical and digital spaces and places, specifically when the Internet is spread across a variety of networks.

4.3 Methods

My data comes from fieldwork conducted in Havana across two phases: April 2016, and July-August 2016. During this time I conducted in-depth, semi-structured interviews and participant/non-participant observation in multiple WiFi hotspots across Havana. The majority of my observations took place in three hotspots: the plaza of *Parque Fe del Valle*, *Las Rampas*, and *Parque Central*. My choice of hotspots was based on their popularity among interview participants. I also engaged in non-participant observation in ten other WiFi hotspots located around the city of Havana.

My semi-structured interviews were with 41 individuals – 24 females and 17 males, ranging in age from 18 to 54, who had experienced WiFi hotspots in Havana. All participants were born, raised, and are currently living in Cuba. I relied on referrals from contacts made during previous trips to Havana and used purposeful, snowball sampling to recruit initial participants who referred me to additional contacts [177]. To diversify my participant pool, I interviewed individuals who had connected at WiFi hotspots once to those who tried to connect almost daily. All participants had visited WiFi hotspots previously. I recruited participants until I felt that my data had reached the point of saturation [178].

Table 4.1: Chapter 4 Participants

Females	24
Males	17
Total	41

All interviews were conducted in Spanish at a location of the participants' choosing and lasted between 30 to 90 minutes. During the interviews, I asked participants about their experiences at the WiFi hotspots, their motivations for using the Internet, the activities they tried to engage in when connected, the perceived impact of use on their daily lives and relationships, and the differences they had experienced in their communities since the introduction of the hotspots. On several occasions, I accompanied participants to WiFi hotspots in order to participate in their process of locating the Internet.

I conducted inductive, iterative, thematic analysis on the interview and observation data collected in April 2016 [115]. After which, I returned for more fieldwork in June and July 2016. I should also note that I incorporated data collected from one of my committee members, David Nemer, during his fieldwork in December 2015-January 2016. After analyzing my data, I incorporated David's data and coded all the data as one unit.

4.4 Findings

In 2015, state actors added white, flat, rectangular WiFi routers around the city of Havana, converting squares, parks, and busy streets into hotspots that could contribute towards participants' aspirations of reconnecting with individuals and having access to global flows of information. Due to diverse, enmeshed factors, however, the experience of gaining online access is far more complicated than one might expect. I highlight these complexities below, describing how my participants pursue the Internet and highlighting the value they derive in the process. I first introduce the reader to the conditions one must meet for being able to go online. I then describe how the introduction of WiFi routers in public places has led to the reconfiguring of spaces and places, time, and relationships.

4.4.1 The Dynamics of Getting Online

In order to ground my findings related to reconfiguration, I now focus on the arduous process of *locating the Internet*, that starts before one actually enters a hotspot and includes identifying an Internet-enabled device, buying Internet time, and finding a strong enough connection.

Identifying an Internet-Enabled Device

Prior to getting online, one must identify an Internet-enabled device, such as a smartphone. Though mobile Internet is fast becoming popular worldwide [179], and particularly in ‘developing’ countries, finding a device in Havana can be prohibitively expensive. One student explained that the cost of a smartphone has made it impossible for her to purchase one:

“The smartphones here are very expensive... I have plans to buy myself one, but they cost a lot of money because they bring them from [the U.S.] and they sell them for a very high price... In reality, I can’t acquire one.” – Dayma (F, 19)

Dayma lives next to a hotspot, but her ability to get online depends on how long she can use her sister’s tablet. Dayma says that one of the biggest impediments to her connecting is not having her own device and that, “*I want my own way to connect. I can’t be taking my sister’s tablet away from her all the time.*” In Havana, electronic goods are sold at around a 240 percent markup [180]. According to participants, most Cubans purchase their devices from other individuals who have brought them to Havana from other countries. Even these devices, however, are resold at a 200 percent markup, prohibitively expensive in a country where the median salary is approximately USD 25 per month and variations are low given the political history [137].

Among smartphones, certain devices are viewed as offering a superior Internet experience than others. Though they might be more expensive to purchase, they also offer more

bang for the buck when it comes to accessing the Internet:

“The phone that is better connects faster and costs you less [Internet minutes] but there are phones that are of poor quality and they use up more time because there is more of a delay.” – Clara (F, 50)

There are tradeoffs in the process of locating the Internet, and people must make sense of these before they are able to take advantage of the public hotspots.

Buying Internet Time



Figure 4.1: People waiting in line to buy Internet Time at an ETECSA Store (Photo: M. Dye)

Once an Internet-enabled device has been procured, aspiring users must purchase an Internet scratch card at one of the ETECSA stores. Scratch cards have unique usernames and passwords and are sold for 2 CUC² per hour of time. Purchasing these cards takes money, time, and patience, since long and slow-moving lines were constantly present outside ETECSA stores. It would normally take 1.5-2 hours to make it into the store but there was no guarantee that cards would still be available when one’s turn came.

Individuals wanting to avoid long lines can purchase cards at WiFi hotspots from *tarjeteros*, who buy Internet cards from ETECSA and resell them for 3 CUC. Users may also

²One Cuban convertible peso (CUC) is equivalent to one U.S. dollar.

purchase an hour of Internet time for 1 CUC at *Connectify* ‘mini-hotspots’ [180]. Connectify is an application that turns computers into virtual routers. Individuals running Connectify mini-hotspots would connect to the WiFi hotspot with their ETECSA cards and share their Internet connection with others there. Connectify is an example of how participants are utilizing external technologies to bypass the prohibitive features of Internet access. Although Connectify connections are usually slower, they offer a feasible way to get online. This represents another element of *resolver*, which echoes an entrepreneurial mentality, as people take advantage of the limitations of this nature of access to make some extra money. Of importance in these cases, though, is the notion of collective entrepreneurship, as participants described how they work together and lean on one another to accomplish tasks.

Hotspot Hopping

Once participants have procured a device and purchased Internet minutes, they must locate themselves at one of Havana’s 28 state-sponsored hotspots. Over time, participants have become aware of the best times to visit these places - to save time and money, and optimize their Internet experience. Participants described “hotspot hopping”, that is, visiting multiple hotspots until a suitable connection could be found. Though Yuniel (in the introduction) considered himself lucky because he and Lara were able to drive around to different hotspots to locate a connection, others are not as fortunate. They have learned to adjust their daily routines so they can locate the Internet on foot, while optimizing for time, money, and connectivity. Isabella described how her practices have changed as a result of the *Fe del Valle* park near her house now having WiFi:

“I always walk through the square and connect to see if I can. If it’s too slow, I disconnect and I leave... sometimes I go looking for a better spot farther away from my house that has fewer people...”

– Isabella (F, 39)

Sara, a journalist, said that connecting to the Internet is important for her job. However, the connection at her office is often slower than at the hotspots, which means it takes her longer to finish certain tasks. Several times per week, Sara leaves work with her smartphone and tries to find a hotspot with good connectivity. To do this, she negotiates between the time of day and the space:

“It depends on the time, it depends on how many people you see grouped in that space. On Rampa [A street in Havana] it’s easier to connect at [the intersection of] 23 and P, further up... there is a lot of people. Below there are less... the speed is much faster for the connection. Here in Central Havana it’s terrible... very slow because it is the only WiFi point here.” – Sara (F, 27)

Sara shared that the first thing she checked for in a hotspot was how crowded it was, since this also indicated how slow the connection would be. Sara’s description of locating a connection at a hotspot, as well as the knowledge of which spots to try and when, was also the knowledge I developed when trying to get online in Havana. Hotspot hopping is common practice among participants and, along with having to secure a device and purchase Internet minutes, contributes to the arduousness of locating the Internet.

4.4.2 Reconfiguring Space + Place

As participants go through the process of locating the Internet, a type of reconfiguration is occurring in the spaces and places where connections are offered. I describe how the spaces that house WiFi routers and afford the opportunity to connect are being reconfigured, physically as well as in the minds of participants.

Overcrowding the Space

“Before, that park was only a park where you would see kids playing in the afternoon. Now from when you wake up until you go to sleep, all day that park is filled with people. It’s never empty.” – Dayma (F, 19)

In addition to state actors adding benches and cleaning up trash, one of the most visible changes that has occurred in these spaces is the large influx of people hoping to get online. Since public Internet access is only in specific, physical locations, individuals are tethered to these places if they want to get online, which often leads to overcrowding. Although these crowds may wane during early morning hours, according to what I've seen and heard, the WiFi hotspots are never empty, as Yenifer described:

"You see a multitude there, who can hardly talk with family members, because... WiFi is only in specific places... nowhere else." – Yenifer (F, 40)

Since the most affordable Internet access is geographically limited, Internet activity is bound to these locations, which has several consequences. Most obviously, when participants want to connect they are physically tied to one of the few WiFi hotspots around the city. For some individuals who live close to a hotspot, the location of their home has turned into an added convenience. Since Dayma lives around the corner from *Fe del Valle* Park, she can sometimes access the Internet from her balcony. However, participants who live or work farther away from hotspots connect less frequently than others. Because of the work involved in getting online and the distance she must travel to locate the nearest hotspot, Clara's experience with the Internet has been limited.

"Myself, I don't like [the WiFi hotspot] much. One day we tried to connect and we couldn't because there were many people... it made us work to connect so we disconnected." – Clara (F, 50)

Clara said she wanted to chat with her sister who lives in Spain but has not tried to connect again because she lives far away from the closest hotspot. The physical location of hotspots, therefore, adds another factor to the work it takes to get online, further complicating the perceptions that participants have of these places.

Reconfiguring Perceptions of Space and Place

The introduction of WiFi routers and the large crowds they have attracted have changed participants' perceptions of the spaces and places that now house Internet signals. Aymee, an English teacher, said that she views the park differently since she and her friends now have a different motivation to visit:

"Now, everything has changed... the place is no longer just a park in our eyes; now it has also become a place to go online." – Aymee (F, 26)

Because of the introduction of WiFi, these spaces hold new meaning for Aymee; they are now places where she (at times) has the opportunity to connect. However, the introduction of WiFi and the growing crowds it brings has not been met with positive reactions by all. For example, Carmen, a school teacher, said that in her view, the introduction of the Internet had compromised the social essence of such spaces:

"The Internet is killing the square. People used to talk to each other, look into each other's eyes, but now they only have eyes for their phones." – Carmen (F, 43)

Although the reconfiguration of these spaces and places is not always perceived as something positive, connecting to the Internet is now understood as the main reason for visiting these places. As a result of this change in perception, new social practices are forming in WiFi hotspots.

Reconfiguring Social Norms in Public Places

Prior to the introduction of WiFi, it was rare to see people lingering in these parks or plazas after dark. Now, this is considered socially acceptable behavior. Businesses located in hotspots do not ask people to move out of their doorways, front steps, or windowsills. I observed business owners and their clientele stepping around and over people who were trying to use WiFi and were crowding stairs and doorways leading to shops and restaurants.

Zamira, a 25 year-old English translator, told me that businesses understand that everyone wants to get online so “*they don’t usually get upset with them*” for crowding the space. In fact, some restaurants located in hotspots have shifted their seating arrangements to offer better connectivity. For example, during a visit to *Las Rampas*, I stopped at a restaurant with my family for lunch. The hostess immediately said, “*we have a table available by the window! You will get a much better connection there.*” On further inquiry, the hostess said that she now seats everyone near the window when possible because the WiFi signal is stronger there and she assumes that most clientele are eating there so they can also get online.

While it is now seen as socially acceptable to be in WiFi hotspots late into the night and to sit where signals are strongest, the introduction of WiFi has also created tension between new and existing social norms, particularly in relation to privacy. Forlano found that digital and physical spaces regulate behavior in different, sometimes conflicting, ways [176]. For example, her study found conflict and confusion surrounding appropriate behavior when using free WiFi outside of restaurants and cafs without buying food. In my findings, the tensions for participants were more complicated. For example, participants said they often wanted to discuss personal issues with loved ones on IMO, a video-calling application that uses less bandwidth than competing services. However, since WiFi places are often overcrowded, it is difficult (if not impossible) to find a semi-secluded spot that also has a strong-enough signal. Aymee told me that, since she has to go online in a public place, her “*privacy is really at risk.*”

In addition to feeling uncomfortable about having intimate conversations in public, participants also described feeling uncomfortable hearing the conversations of others. Rafael, a 26 year-old artist, added that, because of overcrowding leading to increased noise and slow connection speeds, people “*talk really loud*” on IMO and “*the whole park*” hears them. Different levels of intensity and intimacy were observed in these private conversations. Some people connected to their partners to discuss family issues, like Rosa, who

relayed her recent conversation in a WiFi hotspot with her partner, Juan:

“Juan, I know you are in Panama to provide us with a better life, but you need to be more present in your son’s life. He is already 3 and you haven’t visited him in 2 years, look at him (pointing phone camera to their son). He has grown so quickly.” – Rosa (F, 32)

Due to a loss of intimacy from separation, other participants challenged social norms regarding privacy and intimacy to greater degree. Dany, a bartender, was celebrating his fifth wedding anniversary and wanted to surprise his spouse, who was in Miami and who he had not seen for five months, with a strip tease in the middle of *Parque Central*:

“I copied this idea from someone who did the same in Las Rampas. I had this all arranged with my friends, the guy who held the phone while I stripped down is my brother, and the guys who played rhumba in the background are my friends... I know it is a lot of exposure and I might have made some people uncomfortable, including myself and the guys, but I can’t do this anywhere else, it has to be here, in a public space... It is all in the name of love.” – Dany (M, 29)

The strip tease sparked mixed reactions among the people who were present at the park. Some were entertained but others, like Lisa, a college student, did not find it appropriate:

“What a shameless person! He should do this in his own private space... like a hotel room, he can get Internet there.” – Lisa (F, 23)

Dany said he would have liked to strip for his spouse in a private place, but he could not afford to pay for a hotel room (and the additional fee for Internet access).

4.4.3 Reconfiguring Time

In addition to issues of privacy in public places, participants consistently voiced concerns related to issues of time: the time it takes to find a connection, running out of Internet time

due to slow connection speeds, adjusting the time of their schedules to allot for visits to WiFi hotspots, and planning their online activities prior to connecting to save time. In this section, I describe how participants reconfigure time in an effort to locate the Internet in a meaningful way.

Reconfiguring Daily Schedules

For participants, part of the process of locating the Internet involved reconfiguring their personal time. The squares were overcrowded during lunch time and from 5PM to 8PM; visiting these places to connect was almost useless since the routers were overloaded and not accepting new connections. In order to overcome such limitations, participants adjusted their daily schedules and often visited the squares late at night or early in the morning. Some participants, such as Aymee, shifted their work schedules on specific days in order to visit hotspots during work hours to avoid the after-work rush.

“I think ahead, ‘I want to go online today so I have to leave work now. I should leave at 3, not at 5’... the organization of my life and my time management has changed.” – Aymee (F, 26)

On the days she wants to connect, Aymee’s time revolves around trying to get online. I learned about several individuals and groups shifting (or reconfiguring) the time of other activities to make time for going online. Participants also reconfigured schedules in response to the crowds wanting to get online (not necessarily to get online themselves). Pedro, a college student, has reconfigured his daily schedule to be able to earn extra money as a street vendor in the evenings at the *Fe del Valle* hotspot:

“In the day I work as a waiter and at night I come here to make extra cash. I can stay here almost all night long... there are people here 24 hours.” – Pedro (M, 19)

For Pedro, the introduction of WiFi and the nature of that access has afforded him more

opportunities to make money. Street vendors have discovered new business opportunities to sell pizza, guava pastries, and coffee to WiFi users by reconfiguring their schedules to take advantage of late-night crowds. Businesses have also adjusted their hours to accommodate the crowds that now occupy the hotspots late into the night. Some participants expressed frustration, stress, and concern regarding the need to reconfigure their daily schedules to get the best connection. However, those who are earning more as a result were pleased to have this opportunity.

Reconfiguring Time Online

Due to high costs and slow connection speeds, participants carefully configure/reconfigure how they spend their time online in order to optimize their experience. Claudia, an economist, said that the limited time she has online gives her “*fear and anxiety*” because of the activities she is unable to accomplish because she “*didn’t have the time*.” Claudia shared how she tries to manage her time at hotspots:

“I see that it is slow and I disconnect and leave. I am losing time and money. I leave and then later come back and try it again.” – Claudia (F, 24)

Similar to Claudia, Andre, a 31 year-old webmaster, said, “*the limitations that we have in this country affect [how I use the Internet]*”. Due to these limitations, Andre has to be cognizant of how he configures his online time, adding that his “*free time online is stressful*.” In response to constraints, participants have developed strategies to maximize their Internet minutes, as Aymee described:

“From the moment I enter the park I start getting online. As I cross the park, I’m online and I’m downloading. I have an app on my phone that downloads Facebook...I download Facebook completely, send and receive messages, photos, everything. I go offline and start reading what I got from Facebook.” –Aymee (F, 26)

Similar to Aymee, Rafael and Claudia have also found strategies to optimize their online time at hotspots. The couple plans its visits in advance by prioritizing the activities they want to do and dividing them between the two. Rafael equated this practice to sharing meals at a restaurant saying that he and Claudia “*each consume different content and then, after we disconnect, we tell each other how it tasted.*” These efforts point to creative solutions to problems, demonstrating how participants regularly act within a *resolver* ethos as a way to cope with constraints.

Participants viewed time limitations as prohibitive to the diversity of their Internet use. Rafael describes his efforts to optimize time as “*complicated*” because, when limited to one hour of slow Internet, “*you go concentrating on the things you have to do.*” The combination of slow speeds, high costs, and fear of spending too much money as a result of both, impacts participants because, as Veronica, a 23 year-old singer, told me, “*there is not time to explore.*” In this way, the nature of Internet access in Havana impacts the way that participants are reconfiguring their time online as well as their perceptions of the Internet. Participants said that they are limited to the activities they deem primary and are not afforded the time to explore new spaces online.

4.4.4 Reconfiguring Relationships

I now focus on how participants are reconfiguring their relationships with Cubans living in the diaspora, their relationships with local Cubans, and their virtual relationships in the process of locating the Internet in the WiFi hotspots.

Reconfiguring Relationships in Diaspora

What motivates participants to go through the extensive work required to connect to the Internet? As discussed in chapter 3, participants said they were driven by the desire to re-connect with family members they had long been separated from. Previously, Cuban and U.S. travel restrictions, lack of Internet access, cost of phone calls and unreliable

airmail practically prohibited communication between participants and members of the large Cuban diaspora abroad. Ana, a 31 year-old computer science professor, told me that hotspots in Havana are packed with people because using the Internet to try to reconnect with Cubans in the diaspora “*is a necessity*” since, previously, Cubans lacked the ability to be able to connect “*face-to-face*” with those who had immigrated.

“Wow, how hard it was before when someone left Cuba! People were separated; there was no email, no cell phones, no Facebook, nothing, none of those things existed. So I would stop seeing my family and I would pray to God that one day we would be together again. That’s so terrible! But now, okay, you’re separated but you keep seeing people’s photos. You may never again be able to touch that person, but he or she stays in your life, because you keep up with what they’re doing. In other words, relationships can be maintained, thanks in large measure to technology.”—Ana (F, 31)

Given the number of Cubans who have immigrated out of Cuba [181] and the communication and travel challenges, it is understandable that the potential to reconnect with loved ones motivates Internet use. Like Janet, a 26 year-old marketer, said, “*the phenomena of immigration... touches all [Cubans] very deeply.*” Now that she has the opportunity to reconnect with her friends and family abroad, Janet said, “*Facebook is the only way we stay in touch.*” All participants agreed that the most important affordance of the WiFi hotspots was the opportunity to reconnect with the Cuban diaspora.

Reconfiguring Local Relationships to Get Online

Even after users have gained access to the Internet, how do they find their way online, especially when time is of the essence and, despite being print literate, many are yet to acquire Internet literacy? Smyth et al. have discussed that when new technology adopters have the will, they find a way [36]. This describes another element of resolver, as participants,

motivated by their “will” to reconfigure distant relationships as well as their belief that they must (and can) overcome barriers in order to do so, reconfigure local relationships so others can help them accomplish their goal. Participants spoke of relying on others in their local community in order to resolve by gradually learn their way around IMO and Facebook to be able to reconnect with the Cuban diaspora. Dayma says that she tries to “*spend time with those who know more about the Internet so I can learn how to use it.*”

Monika, a visual artist, spoke to me the day after she connected at a WiFi hotspot for the first time. Previously, she would occasionally go to hotspots with Alexis, her husband, and have him send messages to her family on her behalf. When I spoke to Monika, she said that she had decided she wanted to learn to connect on her own to talk to her sister in Spain who she had not seen for eight years.

“So, now, I am going to learn, too, with Alexis who will teach me, because he has seen it more.” – Monika (F, 35)

When participants were not very familiar with the Internet, they would seek help from friends and/or family for navigating it, serving as another example of Internet intermediaries I highlighted in Chapter 3. Once again highlighting the collaborative configurations underpinning these engagements, we see how attempts to access the Internet involve collective endeavors. Tasha said she preferred to avoid the work involved in going online. Although she logs in to Facebook every few months, she said, “*I’d rather have a friend who knows what they are doing help me keep my account up-to-date.*” In this way, she has reconfigured her relationship with Veronica and turned her into her “*online manager.*” In fact, while talking with Tasha at a WiFi hotspot, she asked Veronica to update her Facebook profile picture for her. Veronica had already memorized Tasha’s Facebook password and said she knew the kind of photo Tasha would want. When asking Tasha if it made her uncomfortable to give Veronica access to her account, Tasha replied:

“I’d rather not have to go through the trouble of connecting myself. Plus, I trust Veronica.” – Tasha (F, 18)

Tasha said that she and Veronica “*have always been close*,” but giving Veronica access to her Facebook profile involved an additional layer of trust. Since she values, “*keeping up her profile*,” she must rely on Veronica in this way. Other participants spoke about sharing email and LinkedIn logins with friends (in Cuba and abroad). Participants referred to the process of locating the Internet as one that is driven by social motivations and achieved through collective means.

Reconfiguring Virtual Relationships

Due to the nature of access (particularly the constraints), participants spoke about reconfiguring online relationships based on the “virtual” actions of others. For instance, participants are charged differently depending on the size of their emails, however, many did not realize that initially. Yenifer spoke to me about her frustration regarding this discovery:

“*When I first got email, I got a photo from a friend in the U.S. It was like 2.5 megs... In my attempt to download it (I only had five pesos left on my account) my pesos were used and I couldn't download it. Now... I only open it when it is less than 100 KB. If it has more than that, I leave it there and don't open it.*”

— Yenifer (F, 40)

Yenifer added that there are people with whom she no longer communicates online because they often send her large image files that “*eat up*” her online minutes. This example demonstrates how the nature of access limits certain types of communication while enabling others. For example, Rafael and Claudia said they “*have removed friends and acquaintances*” on Facebook because these friends posted “*inappropriate*” items on their timelines. Since they are unable to connect to Facebook regularly, Rafael and Claudia said these posts will stay on their page until they are able to take them down. Rafael added, “*It is hard. I can control things I post, but I can't control what the other person is posting.*” On learning that there is a Facebook feature that allows one to review posts before they go online, Rafael said:

“We didn’t know that... we have a poor capability of knowing how to use [the Internet]... that keeps us from doing a lot of things online.” – Rafael (M, 26)

Similarly, Rafael said that he would like to share more of his artwork on Facebook but he does not have time to learn about how to protect his posts so that certain people see them and not others or how to protect his work from being stolen by others.

My findings also reveal that privacy concerns affected the frequency with which participants shared information online. Sara told me that her Facebook account was hacked but, since she did not have money to purchase more time, she did not find out about the hack until three weeks later. Since that incident, Sara has become extra careful about security on Facebook by posting less and not interacting with new people as much. These examples demonstrate how the nature of access influences participants to reconfigure not only their online relationships but also the frequency with which they communicate online. As evident in the above examples, the offline factors in Havana, as well as the design of the online services they can use, led to negative experiences for participants. However, the desire to connect and the aspirational value of the Internet motivates most to continue the pursuit of Internet in the parks and plazas of Havana.

4.5 Discussion

This chapter presents a qualitative study of public WiFi hotspots in Havana and how these facilitate Internet access for individuals, many of who are experiencing the Internet for the first time. Through fieldwork consisting of interviews and observations, I examine the way in which participants are integrating the Internet into their daily lives at these WiFi hotspots. In particular, I underlined the reconfigurations that have resulted from this access, as new and evolving Internet users reconfigure their interactions with space and place, time, and relationships in an effort to *locate the Internet*.

This chapter highlights the complex process that participants must undertake as they attempt to locate the WWW and the reconfigurations that occur along the way. Compared

to the previous chapter, I found similar collaborative configurations occurring among participants trying to access the WWW in the hotspots. However, unlike earlier findings, more people are now able to try to get online in Havana thanks to WiFi hotspots since individuals are no longer limited to places of work or school for WWW use. Participants still consider the current nature of access to be prohibitive. The physical locations of hotspots further complicate the process of getting online, also complicating participants' relationships with these spaces. Therefore, although I view (re)configurations as enactments of agency of agency [47], participants found the reconfigurations they must undertake to locate the Internet to be problematic.

Harrison and Dourish consider space the structure of the world; it is where we are located and events happen [182]. Once people start acting and valuing such space, it becomes place. In other words, space is the three-dimensional environment and place is a space with social meanings, norms, conventions, and cultural understandings. The addition of WiFi routers generated new affordances, thereby changing how participants value and act in these spaces. The perceptions of these parks, streets, and squares are being reconfigured since they are no longer "*just a park*"; they are now places that offer the possibility of connection with those who live outside of Cuba or open up new business opportunities. The nature of access at these new hotspots, simultaneously also creates several tensions as I described. Forlano, in her research on New York's WiFi hotspots, illuminated tensions that arose from digital and physical spaces regulating norms differently [176]. My findings highlight how these tensions are further complicated when large groups of people are limited to a few public spaces when wanting to connect. As a result of the convergence of two places (public parks and hotspots), the reconfiguration of social norms is not always smooth. For Dany, the WiFi hotspot afforded a way for him to do something intimate for his wife. However, that he was physically bound to a public park meant he had to do his strip tease in front of other individuals, many of who were not pleased. The overlap between privacy concerns and the desire to connect with loved ones created tensions between

contrasting social norms and expectations.

Participants also faced online privacy issues as they tried to go online at these hotspots. They mentioned not having the time to learn about privacy settings, particularly on Facebook. Indeed, social computing researchers have called for privacy policies that are easier to understand [183]. This inability to manage privacy controls meant that participants posted less and un-friended users because they were unsure how to protect their own profiles. While they spoke with a general optimism about the imagined potential of the Internet, the current process of locating the Internet is strenuous and provides participants with mere droplets of access to accomplish their online goals.

This chapter also extends literature on postcolonial computing by highlighting how participants engage in practices that are culturally located and power-laden. The workarounds to connect the only Cuban submarine cable to the Internet in Venezuela, and the effort to locate the Internet in Havana assert questions that challenge the global dynamics of power, wealth, and political influence that shape such cultural encounters. My work does not aim to solve a problem or make better design for “other” cultures, but I join Irani et al. by bringing a reality that should be central to design practice: *“seeing the ways that design is culturally specific should allow us to broaden the conversation about what other practices can count as good design”* [184].

In sections that follow, I discuss the implications my findings might have for the future of Internet access in Havana, given the pace at which the Cuban economy is opening itself up to external influence. I also discuss how my findings could inform the design of Internet access initiatives in similarly resource-constrained regions that are slowly but steadily working towards including more under- or un-connected individuals and communities to a global and connected network. Finally, I discuss the implications of my findings for researchers and designers in the social computing space.

Implications for Havana

Havana's WiFi hotspots provide my participants with a window into the experience of the full Internet, but simultaneously limit that experience due to costs involved. Given that the Cuban government attempts to provide equal access to services such as education and health care [Biddle2013], it is fair to hope that Internet access would follow suit. However, the current droplets of access that seep into hotspots are challenging to acquire and the participants must make the most of them. As more individuals attempt to get online in Havana, and given current practices of adoption, how might technology and policy be designed to support users in making the most of this limited access? How might existing designs be imported or suitably altered for Havana to work within constraints, values, and legal boundaries? These are the questions this chapter poses.

One example of an external service that has helped participants negotiate boundaries is Connectify. While not designed for Havana specifically, it directly contributes to bringing more Cubans online by allowing connections to be shared. Further, upon hearing about the popularity of Connectify in Havana, the company started the *Viva Hotspot* campaign, which allowed Cuban citizens to use premium features for free [185]. I see potential for other services to leverage this type of model to support Internet access for more individuals in the country.

In addition to technical services, the spaces and places from which users access the Internet also impact online experience. How might we better consider the spaces where individuals access the Internet? One example comes from two Cuban designers who recently unveiled plans for a "*modular system of urban furniture*" for WiFi hotspots [186]. The design, which has already received interest from the Cuban government, maximizes space while also providing more privacy, seating, shade and solar-powered charging stations. If incorporated into more hotspots, this creative solution could assist participants in providing a friendlier user experience.

I encourage further research like this to examine local practices so as to see how existing

technology might more suitably map to local contexts. However, researchers, companies, and others hoping to engage with Cuba need to consider the delicate, complicated area they are entering. For example, by studying more specifically how individuals negotiate the boundaries of legality in Cuba, external actors might be able to inform the design of services that are more effective in providing a meaningful, non-controversial, online experience.

Implications for Underconnected Communities

Cubans are by no means the only ones to have limited access to the Internet. Millions worldwide experience constrained Internet access due to infrastructural and cost limitations [179, 122, 167]. Although the specifics of Havana materialize differently in other contexts, several of these facets may apply in isolation to other cases as well.

Even when access points increased in Havana, the experience of the Internet was still limited by slow speeds and high costs of sessions. Although participants expressed a desire to more fully explore the “imagined” potential of the Internet [13], current barriers limited the diversity of online participation, as Veronica said, “there is no time to explore.” Such constraints mirror the conditions in several emerging economies. My findings point to how participants enacted notions of resolver, undertaking collaborative configurations through creative and resourceful means. For example, Rafael and Claudia selected which online activities they were going to accomplish ahead of time and divided them up between them. Constrained access environments like Havana’s call for software developers to build applications and services that perform well on slow networks and are respectful of bandwidth. When every byte has impact on an individual’s monetary balance, software design should be mindful of upstream and downstream data. Tools like Facebook Lite³, Opera Mini⁴, and Flywheel on Chrome⁵ are steps in the right direction for such constrained networks. Designers could also consider how applications and services can behave when connectivity is

³<https://www.facebook.com/lite/>

⁴<http://www.opera.com/mobile/mini>

⁵<https://goo.gl/crFQmr>

not ever-present. Caching and store-and-forward techniques can help individuals make use of software when offline and effectively stretch their experience of the Internet. Moreover, this calls for a perspective towards design and research that considers the collaborative nature of resolviendo activities, which I explore in more detail in the following section.

Implications for Social Computing

My findings present relevant takeaways for those working in the social computing space. SNSs are frequently designed with the assumption of constant connectivity. As more users try to access SNSs in constrained settings, designers and researchers might consider how social computing services could be leveraged to support constraints and situated online interactions (e.g. when access is limited to parks). As services like Facebook that have been developed in highly connected contexts are increasingly adopted in resource-constrained communities, the nature of access by these new and evolving users must be considered. I offer Havana as a case study to provide details of how a society that functions on extreme connectivity constraints attempts to navigate social computing technologies through the ethos of resolver.

How do the various spaces and places from which users access these online communities impact their experiences? In the case of Havana, participants are physically bound to public spaces when trying to use services like Facebook and IMO and this impacts the nature of their use. Further, my findings reveal the necessity of local workarounds and services like Connectify in order for participants to get online and to use services like Facebook. In the case of Aymee, she uses a separate application to download content from Facebook for offline viewing. By studying how these services are used and appropriated in specific contexts, social computing researchers and designers may be able to inform the design of more responsible designs of SNSs. Although it may not be as evident in more connected communities, all users are bound in some way to the physical space and places through which they access online communities. Further, all users reconfigure their interac-

tions (albeit some more obvious or extensive than others) as a result of their engagement with social computing technologies.

When Internet access is constrained, privacy considerations for social computing technologies must also expand. My findings show that privacy concerns motivated participants' reconfigurations with each category: space and place, time, and relationships. Since participants are physically tethered to particular spaces when wanting to get online and are limited in the amount of time they have to "explore," individuals reported that they limited themselves in the amount and types of activities they undertake online, including posting and interacting with others less frequently due to feeling like they had little control over their online profiles. A clearer, more accessible explanation of privacy settings on Facebook and other social media sites would assist in saving time and money while also helping to create a more engaging online experience. For example, participants could be given the option of receiving a text-based email explanation of privacy settings. This email should contain cost-saving strategies directly related to Facebook use in resource-constrained settings and should also be written in the local language.

In addition to privacy concerns, my findings show how participants reconfigured their local relationships, again, through Internet intermediaries. These practices increased and diversified through the introduction of hotspots, as more individuals in Havana began trying to connect to the Internet. Collaborative configurations included the sharing of Facebook, LinkedIn, and email passwords with others to negotiate time, money, and experience constraints. For example, Tasha relied on her friend Veronica to update Tasha's Facebook profile on a regular basis since Veronica was able to get online more frequently. In order to better support such practices, it would be helpful to have a feature on these and other similar services that allows users the option to assign others as "managers" for individual accounts (similar to the option that now exists for managers of Facebook pages). Such a feature would facilitate more control over profiles by allowing individuals to choose the aspects of their profiles others can edit and have access to while still being able to lever-

age the collective strategies of Internet access that have developed in Havana, as well as other contexts where intermediated access occurs frequently [40]. While these implications have been lifted from context-specific findings, I feel that they are relevant for many other communities outside of Havana. As more and more users get online, both in under- and highly-connected communities, it is critical that we consider the impacts of various technologies, the reconfigurations occurring at multiple levels, and how, as designers and researchers, we can support more desirable reconfigurations for and among users.

4.6 Conclusion

By investigating the rationed introduction of public Internet access in Havana, this chapter highlights both online *and* offline constraints and affordances and how these impact Internet use, priorities, and daily living. This chapter presents a portrait of a sociotechnical system in which there exists a tight feedback loop between technological affordances and social practices. I describe how, with the introduction of WiFi technology, there are physical and social impacts on the environment that transform the ways individuals interact with their surroundings. Further, through an examination of local practices, we see, once again, the centrality of collaborative efforts in Internet engagements.

In this chapter, I focus specifically on the physical factors that impact the nature of access as well as the reconfigurations that participants undertake in an attempt to meaningfully get online. However, this chapter also brought attention to the tensions and limitations interacting with this version of Internet access. In the chapters that follow, I present findings from my research on locally-designed information infrastructures that attempt to make up for the limiting uses of the WWW described in chapters 3 and 4.

CHAPTER 5

EL PAQUETE SEMANAL: THE WEEK'S INTERNET IN HAVANA

“In the end, everyone in Cuba is linked together through El Paquete. If someone tells you they’re not, it’s a lie.”—Javier (M, 28)

This chapter represents a shift in my research from a focus on access to the WWW to a focus on the local Internets that have evolved in Havana in response to the constraints described in the previous two studies. This chapter contributes a case study of *El Paquete Semanal* or “The Weekly Package”—the pervasive, offline internet in Havana. This chapter focuses most heavily on the human infrastructure that supports this offline internet, rendered visible through the lens of articulation work. By offering an in-depth perspective into these workings of El Paquete, I aim to challenge established notions of what an (or the) Internet “should” look like in more and less “developed” contexts. I highlight how El Paquete is a non-standardized and non-neutral internet, but still human-centered. I also offer an enriched understanding of how a collaboratively enacted, entirely offline internet can provide expansive information access to support leisure and livelihood, additionally serving as a locally relevant platform that affords local participation¹.

5.1 Introduction

Despite prohibitive access to the WWW in Havana, millions of Cubans still engage with digital content through an informal, pervasive, offline internet known as *El Paquete Semanal* or “The Weekly Package”. Every week, a new version of El Paquete (EP) becomes available, and includes a one terabyte (TB) collection of digital content that is distributed across Cuba on external hard drives, USBs, and CDs. This collection includes a variety of

¹Findings from this study were published in 2018 at the CHI Conference [187].

television, music, movies, apps, educational programs, YouTube videos, magazines, and news, and costs between between 2-5 CUC. EP also offers offline versions of popular websites in Cuba, such as Wikipedia and Revolico (an equivalent of Craigslist in the United States). Not formally sanctioned by the government, EP manages to facilitate offline access to local and international content regularly and affordably.

During the last decade, EP has emerged as the alternative network to both state-owned channels and the world wide web (WWW). Although the Cuban government is gradually increasing investments in WWW access efforts, at this time, direct WWW access remains limited and prohibitively expensive [118, 154, 188]. Additionally, state-owned media channels are limited in the content they provide. As such, this community-led information network is the primary medium by which Cubans receive and engage with local and international media, news, and entertainment. EP has even been recognized as the largest employer in Cuba [189]. It sustains both leisure and livelihoods. In this chapter, I contribute a case study of EP, highlighting the human infrastructure that supports this offline internet in a technologically, resource, and politically constrained environment. The human infrastructure of EP is rendered visible through the lens of articulation work, which is the continuous efforts required to bring together discontinuous elements—of organizations, professional practices, and technologies—into working configurations [190]. By offering an in-depth perspective into the human infrastructure that sustains and grows EP, I aim to challenge established notions of what an (or the) Internet “should” look like in more and less “developed” contexts. My research highlights how EP is a non-standardized and non-neutral internet, but still human-centered. I also offer an enriched understanding of how an entirely offline internet can provide expansive information access to support leisure and livelihood, additionally serving as a locally relevant platform that affords local participation.

I begin by situating this research in a body of related work that has examined offline Internets and human infrastructure from a human-computer interaction (HCI) perspective.

After describing my methods, I detail my findings regarding the human infrastructure of EP, unpacking the articulation work performed by three distinct groups of individuals: *Los Maestros* (The Masters), *Los Paqueteros* (The Packagers), and *La Gente* (The People). Finally, I discuss how the articulation work performed by these actors sustains and grows an offline information network amidst a unique sociopolitical context. Here I analyze the dynamics of information procurement and dissemination that have emerged through EP to create a *personalized, negotiated* internet, an *entertaining, informative* internet, and a *relevant, participatory* internet.

This chapter contributes to scholarship in the field of human-computer interaction (HCI) by emphasizing the human elements that support the existence and growth of an expansive information network. For the field of Computer-Supported Cooperative Work (CSCW), I strengthen prior research on the human infrastructure lens through my in-depth engagement with the articulation work that EP relies on. Finally, for the field of Information and Communication Technology and Development (ICTD), I extend a rich body of research on media-sharing practices and offline information networks with my case study of EP, as I highlight how its actors rely on it for leisure and livelihood, both generating and consuming locally relevant content.

5.2 Related Work: Offline Internets + Articulation Work

I now review research related to offline Internets, or information networks that are not digitally connected and operate in low-connectivity areas. EP operates as a highly sophisticated type of “sneakernet” [188], a network where information is passed around by hand. Prior work has examined similar researcher-led initiatives, such as DakNet [191], a kiosk system deployed in parts of rural Cambodia and India that used mechanical backhaul to provide services to users. Such offline information networks have been studied extensively in the field of ICTD in particular, with the goal of understanding how—and with what motivations—digital information is disseminated and consumed through offline connec-

tions [192]. Other ICTD research documents instances of individual actors in resource-constrained environments engaging in sophisticated information-sharing practices to acquire desired media [193, 53, 194, 36]. Key relevant contributions in this regard include Smyth et al.'s research, which found that a motivation for entertainment drives urban Indian users to overcome social, economic, and technical obstacles that come in the way of accessing, consuming, and sharing media [36]. In addition, Kumar and Rangaswamy's analysis of the media-sharing actor-network in urban India demonstrated how the presence of mediators and intermediaries resulted in the decentralization of piracy and gradual promotion of digital literacies [53]. Both studies highlighted the leisure-based motivations that drive increased technological literacy, thereby bringing to question the oft-held notion that ICT interventions in 'developing' contexts should focus on targeting more traditional development outcomes, a notion that Arora and Rangaswamy offer a valuable critique of [38]. I extend this rich body of research on media-sharing with my study of EP. I also contribute to research that has been conducted on EP by Cuban scholars [195, 196, 197]. My findings show that EP's information network does not only provide a mechanism for access of entertainment media; in the absence of other means of information exchange, it also serves as the primary source for news, educational content, software updates, and classifieds, among other things. This versatility has led to EP's gradual evolution into a large offline information network that is used by the vast majority of the population, not only the "invisible users" on the margins [144]. Today, EP is a community-driven, robust, information network kept alive by multiple actors who undertake a variety of tasks. My research highlights the ways in which these actors come together as the human infrastructure responsible for the sustenance and growth of EP.

My study of EP responds to Sambasivan and Smyth's [40] call for more work that explores human infrastructures as a network through articulation work. I consider articulation work to be a subset of configurations, taking inspiration from Balka and Wagner who employ configuration as a tool to make visible nuanced dimensions of appropriation

work [198]. Strauss defines articulation work as “first, the meshing of the often numerous tasks, clusters of tasks, and segments of the total arc. Second, the meshing of efforts of various unit-workers (individuals, departments, etc.). Third, the meshing of actors with their various types of work and implicated tasks” [199]. Building on Strauss’ definition, Suchman describes articulation work as the continuous efforts required to bring together discontinuous elements—of organizations, professional practices, and technologies—into working configurations [190]. My findings detail how articulation work is made up of the small and everyday tasks or non-instrumental practices typically taken for granted, even as they contribute towards the sustenance of larger systems or infrastructures [41]. Thus I employ articulation work as an analytical device to render visible the human infrastructure sustaining and growing the offline internet of EP. Exploring the tasks involved in procuring, organizing, distributing, customizing, and sharing EP, I aim to provide a rich understanding of the human infrastructure of EP and how the foundation of this system is *“constituted by the pattern of relationships of people, through various networks and social engagements”* [40]. I emphasize the community-building and long-term information infrastructure-building efforts involved in EP and how the human infrastructure serves as the network itself, facilitating an offline internet that tries to compensate for limited and expensive access to the WWW.

5.3 Methods

Although EP’s distribution network spans the entire country, my research focused on Havana, where EP originates every week. My data comes from fieldwork conducted in Havana across five phases (between December 2015 and July 2017). I conducted semi-structured interviews with 53 individuals—23 identified as females and 30 identified as males, ranging in age from 19 to 74 years old (see Table 1).

All participants were born, raised, and are living in Cuba. I relied on referrals from contacts made during previous travels to Havana and used purposeful, snowball sampling

Table 5.1: Chapter 5 Participants by Group

Group	Participants (53)
Los Maestros	1 male
Los Paqueteros	5 females, 11 males
La Gente	18 females, 18 males

to recruit initial participants who referred me to additional contacts [177]. All interviews were conducted in Spanish at locations of the participants' choosing and lasted from 30 to 90 minutes. During these interviews, I asked participants about their experiences as both distributors and/or consumers of EP and their motivations for purchasing, sharing, and consuming content. I also asked about the activities they undertook as they engaged with the network, the content, and one another. Although I did not compensate participants, when interviewing store-owners and distributors, I purchased components of EP to better understand the tasks undertaken for the curation and distribution of EP. Additionally, as is customary in this context, I shared content I purchased from EP with other participants.

In addition to interviews, I conducted participant observation by visiting, observing, and engaging in the places where EP is created, shared, and sold. I followed Paqueteros, visited EP stores, and purchased different components of EP. While waiting for my purchased content to download, I observed the ways in which various actors engaged with EP. I developed relationships with my participants and often re-visited EP stores multiple times, spending at least an hour in each EP store. I visited more than 30 stores and spent multiple hours in four stores in *Habana Vieja* and *Central Habana*. I also accompanied participants as they bought content from Paqueteros, shared content with friends, and appropriated this content in various ways. Throughout my fieldwork, I engaged with EP as a member of La Gente—buying content, recommending content to others, sharing content, asking for requests, and searching for ways of *resolviendo* when my own equipment did not work.

I conducted inductive, iterative, thematic analysis on the interview and observation data collected during my fieldwork [115]. After an initial coding pass through my findings, I



Figure 5.1: Locating a Paquete Store in Havana (Photo: J. Mangiameli)

then incorporated David Nemer's data from his fieldwork trips and identified themes related to research engaging human infrastructures [76, 40]. I re-coded the data with these themes in mind and identified the articulation work [199, 190] involved in supporting the human infrastructure of EP, focusing on the various efforts made by participants throughout the process of engaging with this system.

5.4 The Human Infrastructure of El Paquete

I now present my findings to highlight the *human infrastructure* of EP [40, 76], drawing attention to the intricate configurations (or *articulation work* [199, 190]) involved in sustaining and growing this information network on a daily basis. I organize my findings to focus on the contributions of the key actors in EP. These are *Los Maestros* (the masters),

Los Paqueteros (the packagers), and *La Gente* (the people). Below I describe each of their roles and perspectives, also detailing the labor they provide for the functioning of EP.

5.4.1 Los Maestros

On an evening in December 2015, Juanito, a 27-year-old casually dressed in board shorts and no shirt, is working in his apartment in Centro Havana. At first glance, his home appeared to be a typical Havana apartment, but a quick tour revealed a small, central room equipped with three AMD A4-series desktops with 21-inch Toshiba screens, one 24-inch Zenith television, and numerous hard drives and flash drives. This is the studio of one of the Maestros who compile the original editions of EP. Juanito manages his studio along with Marcos, his 24-year-old business partner, and Paola, his 22-year-old girlfriend. The team combines a variety of tasks and resources to compile the one TB of digital data required to release EP to the Cuban public on a weekly basis.

Compiling EP

Each week, a new EP is released to the Cuban people by Los Maestros, a select group of individuals who operate their own collectives or studios². Los Maestros and their studios organize the tasks of acquiring, compiling, and organizing the original one TB packages.

“I have different people bringing sections to me... I have one person downloading movies, another one taking care of music, and another one bringing TV shows. I organize the content, make sure there’s no pornography or anti-government stuff, and put everything in [EP]... and pass it on to Los Paqueteros.”—Juanito (M, 27)

To acquire this content, Juanito draws from a limited pool of people who have varying degrees of WWW access, such as dial-up connections at home, WiFi hotspots, and/or faster

²My research revealed that there are only three studios or lead maestros in Havana.

connections at university and government agencies. Although access to this type of information has been limited in the past, Los Maestros undertake small and large tasks to navigate various constraints so that millions of people are able to take advantage of the access that others have. In Juanito's studio, each member moves across various spaces that they have access to and knowledge of in order to acquire content. For example, Paola's job is to study the TV schedule and tell Juanito when a specific show is on so that he can digitize it. Juanito has a satellite dish installed in a fake water tower on his roof, which allows him to access this content at home and thereby stay ahead of the competition (the other Maestros).

Creating EP

Los Maestros' work goes beyond curating downloaded content and passing it along to Los Paqueteros; Maestros also produce and create new content for EP, mainly in the form of classifieds, journalistic pieces, and promotion of local content. Los Maestros do the work of advertisers and designers, promoting local businesses around Havana by designing digital posters, converting them into PDFs, and adding them to specific folders in EP (usually selected based on the audience they are trying to reach). Maestros also undertake the tasks of designing their own promotional flyers to advertise their services to Los Paqueteros and La Gente. They also work with various content creators in order to have their (the creators') media distributed on EP. In this role, Maestros serve as promoters for local artists and have also become local celebrities themselves:

"[The promoters] have a reputation... there's The Thunder, there's Abdel La Esencia, there are two or three of them that are the most famous. Then the artists themselves go and get promoted by them, because they know they are the ones who can distribute their music better."

—Osmany (M, 29)

Maestros who act as promoters search for new artists to add to EP. These Maestros

design the album covers, which typically contain their promoter name (*e.g.*, The Thunder), email address, and phone number so that individuals who wish to promote their work on EP can get in touch. When I downloaded music from local musicians who were being promoted through EP, I found that the album art included pictures of the Maestro who was promoting the music, not of the artists or the band. These promoters in the network serve as a new way for artists to launch their careers and access their fan base. During the summer of 2017, I attended the beach-front concert of a local, reggaeton artist who was made popular by EP. In fact, this artist was recommended to me several times by participants, who said that he was currently the most popular artist in Havana because of EP. As a result, Los Maestros make sure not only to include his music in EP, but also social media updates from him, including YouTube videos, Facebook live videos, and Twitter updates. Los Maestros monitor the most popular artists on social media and download any new content that comes out weekly. They also put their signature “marks” or logos on the videos and screenshots so that others can assign credit appropriately.

While this process of creating and gathering content may appear to be top-down, EP’s network is comprised of multiple overlapping matrices and the product is by no means a “one-size-fits-all.” The articulation work involved here is ongoing and active as actors mesh together various tasks and resources. Many individuals perform the labor of adding their content to EP along the way and engaging with other individuals in EP’s human network. As described below, content procurement does not cease when leaving the studios. With the evolution and increasing penetration of EP, content has begun to enter it at various points across the distribution network. Although there are main producers of content and there is a lot of overlap between versions, EP looks different depending on who is distributing it.

Maestros decide on the content that goes into EP based on content that has been popular in the past, what is popular online, and user requests delivered by Paqueteros. Each week Juanito, Paola, and Marcos (as well as other individuals who help them acquire content) deliver the digital parts of EP to Juanito’s studio by hand via USB drives, CDs, DVDs, and

hard drives. As Juanito mentioned above, Maestros “clean” the content they acquire by digitally editing it to remove illegal or controversial content, including pornography and content that may be deemed anti-government. Moreover, the content is edited to remove commercials and, at times, add subtitles. The Maestros then label the digital files and organize them in categories according to the media.

The Maestros and their studios serve as hubs within EP, compiling digital information that is later distributed throughout the network. Los Maestros rarely sell directly to consumers; instead, they sell the digital content to individuals called *Paqueteros*. Once the weekly EP is ready for distribution, individuals from the various studios physically deliver several external hard drives to Paqueteros across the country. For example, each week, Marcos flies from Havana to Santiago de Cuba, the second largest city in Cuba, to transport EP to Los Paqueteros in that part of the country.

5.4.2 Los Paqueteros

On a narrow street in Havana Vieja in 2017, I walk into a bottom-floor apartment with a blinking, rainbow-colored sign that read “OPEN.” Inside, the apartment’s front room has been converted into a store with a desk, couch, and a wall full of DVDs packaged in colorful paper envelopes. Ricardo, one of the shop owners, sits behind the desk scrolling through digital files on his Dell desktop computer as a middle-aged woman, Aileen, looks on. “*Copy me something good,*” she tells him, “*Whatever you recommend.*” Ricardo quickly navigates through several folders on his screen until he gets to the soap opera section. “*I’m going to put a soap opera on here for you that you’re going to like, just the first season,*” he tells her. “*If you don’t, just bring it back and we’ll find you something else.*” Aileen pulls out a USB stick from her purse and hands it to Ricardo who gets up from his chair to plug the USB into the computer tower on the floor behind his PC. As he begins to copy the files onto the USB, Aileen tells him that she has been having trouble with her phone. Ricardo tells her to come back later in the day and so he can help her install the latest software

update that just came out in the week's EP. "See," he tells me, "*I not only sell them content, I help people in my community with everything.*"



Figure 5.2: DVD Wall in an EP Store (Photo: M. Dye)

Los Maestros' studios sell EP for about 5 CUC to Los Paqueteros, who then distribute it across Cuba and sell it directly to stores and individuals. Through a variety of seemingly small and large tasks, the labors of Los Paqueteros fulfill a crucial role in stitching together the human infrastructure of EP. Moving across the large web of individuals, Paqueteros piece together various connections between Los Maestros, other Paqueteros, and La Gente through articulation work. Often, individuals who travel the country as part of their job (like bus and taxi drivers) serve as *mulas* (mules) and transport EP to multiple distributors across Cuba's twelve provinces. In Havana, I was told that Los Paqueteros used to deliver directly to EP stores as well as individual homes. Once EP became more structured and pervasive, Paqueteros began opening physical stores in Havana, a practice that has proliferated further more recently. Below I describe how individual Paqueteros distribute and curate EP.

Distributing EP

Carla wakes up each morning at 7am, grabs her freshly baked guava pies, and walks through the streets of Old Havana to sell them. This routine is only slightly different on Mondays,

when she stops at Bendito's studio to purchase EP and bring it home, where her husband, a DVD store owner, prepares USB flash drives containing EP, which Carla then distributes to her guava pie customers:

"I bring the [flash drive] with me. As I walk through these streets and do my normal job, I make some extra money selling EP. I basically sell it to my customers and friends. They already know me, and other Paqueteros don't come here, since it's already covered by me. There's a market base for everyone in Havana."—Carla (F, 26)

Bruno makes a living riding his (unlicensed) taxi bike in Centro Havana every afternoon, giving unofficial city tours to foreign tourists. He also takes advantage of the mobility of his job to bring EP to restaurant owners when he drops tourists off at these establishments. Bruno undertakes the tasks involved in procuring, compiling, and delivering personalized EP content for his clients:

"[Restaurant owners] want the EP with just music videos. Like, they want to plug this [flash drive] into their TV and have the music videos playing for them. They don't want to play with folders, settings or have to go through a computer. They want it simple, and that's how I deliver to them."—Bruno (M, 18)

Bruno's account is indicative of the reasons EP became popular. Since not everyone in Havana has a computer at home, people prefer to plug a USB flash drive into DVD players and stereos (that more people have access to) and simply browse the content. To facilitate this, Paqueteros tailor the delivery apparatus to the preferences and constraints of their clients, adding another layer of personalization to the weekly internet.

Curating EP

Although Los Paqueteros may seem to just be a part of this infrastructure that transfers information from Los Maestros to La Gente, they often took charge of customizing the versions of EP that they sold and shared with others. Due to the work they undertake, Los Paqueteros curate a type of personalized internet for people in Havana, combining multiple sources to create their own versions of EP based on their technical capabilities, their customers' preferences, the part of town they sell to, and their own personal tastes and values. Gabriella negotiates between her clients' preferences, social connections, and technical skills to piece together digital content from multiple sources:

“[La Gente] ask for all kinds of content, and I try to please them as much as I can. I go ‘hunting’ for shows and movies they want to watch. I talk to different Paqueteros and Maestros in order to find the right stuff... Once, I collected several [digital] ads from different restaurants because a costumer, who had just started renting out rooms, wanted to recommend places to eat to his guests.”—Gabriela (F, 29)

The quality of content that Paqueteros provide also depends on the equipment they have. This is often an issue of storage space. Although Maestros and Paqueteros have to delete the majority of EP each week to make space for the next version, they often keep copies of the most popular content, especially if it is part of a series that comes out weekly. Luis has only been working as a Paquetero for four months. He turned his small, one-bedroom apartment into an EP store so he could work from home and take care of his infant daughter. He cannot afford to purchase more server space, which affects the type of service he provides for his customers:

“There are different [EPs]. There are people who have a better business, they have more storage space so they already have a lot of movies, lots of series. They are able to create EP themselves, there are people who can put it together

and there are people who do not...But somewhere you will always hear, ‘this [content] came in his [EP] but not in mine’.”—Luis (M, 22)

Some Paqueteros mentioned that, due to their own limited skills, they did not tinker with EP or add content beyond what came to them from their Maestro. Yuniel is a former teacher who works at an EP store that is run out of a small, central room in the bottom floor of his boss's apartment. He shared:

“We are the receivers of the information but we do not configure it. In fact, it’s not my area. If I knew how to work with computers, I would edit it, but, I’m not too excited about that thing.”—Yuniel (M, 30)

Although Yuniel does not configure information, he does undertake other tasks to personalize EP for his customers. Similarly, other Paqueteros spoke about the work they do to ensure that their customers acquire the types of content they value. Ricardo and Teresa are neighbors who opened an EP store in Old Havana in early 2017. Sometimes, their customers request content that is not in their version of the EP. In those cases, Ricardo speaks to their Paquetero and requests that certain types of content be included in future. However, the Maestros and Paqueteros do not always include requested content (particularly if there is not a large demand). Ricardo often manually supplements his versions of EP with content that he thinks will be meaningful to his customers. This involves searching for content that people might request by “*knowing [his] clientèle*.” Sometimes, he walks around the city visiting other EP stores, searching for content that they may have acquired from other Maestros or Paqueteros.

Paqueteros also clean or censor EP, most often to ensure that their content is high-quality or that it does not contain overtly anti-government messages. At other times, censoring is due to personal beliefs or beliefs of customers. For example, Renier has been selling EP for six years and the majority of his 100 clients are Protestant. Renier shared that his religious views impact the way in which he compiles his version of EP:

“Sometimes I clean EP when it arrives. That is, I remove what I consider to be obscene things that are against the Christian theme. [My] EP comes from me and I do not like to distribute something with content that is not good. If there is something I do not approve of, I try to eliminate that section. It’s like censoring.”—Renier (M, 35)

Renier’s customers, therefore, receive an offline internet that is censored based on his sensitivities. Renier’s view is that he censors his material as an extra service for customers and, if they do not approve, they can find a different Paquetero with a different EP. Since Renier focuses on Christian customers, he says that he has to undertake extra work sometimes to make sure that Christian content is included in EP since, there are times, that Los Maestros do not include the Christian section:

“When I see that the Christian section is missing, I have to cover it. I usually have enough information. I look for books, I look for videos, according to what I get from friends, I organize aggregated information and I add it in the Christian section. I do this for my customers because they rely on me for that.”

—Renier (M, 35)

Paqueteros took pride in the services that they provided to their clients, particularly when personally customizing their content. Los Paqueteros tailor the content and delivery method of EP based on their customers’ preferences, budget, and technical resources. For example, Ricardo charges less for his content than other Paqueteros because he believes that his clients do not earn as much as the others’ and can not afford high rates. Additionally, he makes sure his less technologically-savvy customers know how to download and update their phone software (and often does this for no extra charge). When I asked him why he helps people in these ways, Ricardo replied, “*The only way people know about these things is in EP. There is no Internet. I bring it to them.*”

Los Paqueteros negotiate with customers, creating personalized EPs for individuals and groups. I interviewed Yuniel in his EP store and observed him as he patiently searched for

yet another movie for a 10 year-old customer who was trying to find one that his friends had not yet watched. “*This is the third time you’ve been in today,*” Yuniel told the boy, “*but don’t worry, if you don’t like that movie, come back and we’ll find one for you.*” Yuniel told me that he would not charge the boy extra, “*he only has enough for one movie so I’ll work with him to find the one that suits him, even if he has to download a few different ones.*”

Paqueteros are also involved in the job of producing content through the insertion of hyper-local ads as well as the promotion of local artists. Moises told me that, while the Maestros charge for promotion, he does not:

“I do not charge anything for promotion... not to those who start now. Those who start here are not charged anything. If they cannot go directly to [Los Maestros], they reach us here.”—Moises (M, 46)

Moises said that he viewed this as a service he could provide to members of his local community to support them in their endeavors. He added that he was going to continue working to improve EP because, “*it’s actually one of the only ways the people today can see things that they do not have access to.*” Other paqueteros were acted as internet Intermediaries for their clients by including ads for businesses.

5.4.3 La Gente

“EP is important for us because this is the way that people are able to entertain themselves. They can see shows, soap operas, documentaries, among other things. They can also learn about the news occurring in the rest of the world.”—Camilo (M, 26)

EP’s influence is clearly visible across Havana as La Gente (the people) engage with it on a regular basis. In addition to being the main consumers of content, La Gente (or the people) are also critical members of the human infrastructure as they engage with this EP and, thereby, other users through their own processes of articulation work. In this section,

I describe how La Gente appropriate, produce, and share EP content and the tasks involved and people collectively configure this version of the internet.

Appropriating EP

When individuals want to acquire content from EP, they purchase it from a Paquetero at a store or get it delivered to their home. Additionally, people often share content with one another for free. While foreign content (like TV shows, movies, music, and sports) is popular, more content has begun to emerge that originates in Cuba. EP is not simply access to foreign content, as Ricardo told me:

“Cuban films are sold a lot. Because here they do not see it until long after they are made, until they do the premiere. However, people now have access to these movies here, on EP.”—Ricardo (M, 53)

EP fills an important gap by facilitating an offline internet through which individuals can share content originating from Cuba, which was not possible previously. While prior work has primarily examined the leisure-driven engagements with informal media-sharing [33, 9], participants undertake various tasks to acquire content that was not leisure-based. Zamira visits multiple Paqueteros and asks friends in order to find educational content that is appropriate for her five year-old granddaughter. She also searches for “*items from Discovery*,” a phrase that alludes to content from the Discovery Channel but has evolved to mean any documentary film:

“It’s important for people to have a larger view of what is in the world. I love watching Los Discovery because it allows me to see what life is like for people all over the world. This is important for us here.”—Zamira (F, 74)

Like Zamira, several participants spoke to me about the importance of having content that “*expanded their views*,” speaking to the value of information access driving this system.

EP acts as more of an information medium than purely an entertainment service as Osmany described:

“[Los Maestros] are trying to expand more, not only the entertainment part but also the intellectual part... They try to reach people with multiple cultural ideas, who like different things... but so they can learn about current laws or about a specific career.”—Osmany (M, 29)

Much of the motivation to engage with EP comes from the fact that it is the main (and often only) source of information that comes from the WWW. For example, Javier said that EP is the only way that he and others can consume social media content, including informative YouTube videos adding that, *“all the information is on social networks through EP.”* As people search through EP, they mesh together various pieces of information to accomplish tasks that are important to them and create a version of the internet that suits their needs, as well as the needs and tastes of others. For example, participants spoke to me about using content from EP to enhance their work. Alexis works as both an artist and a pastor. When I attended one of his sermons in Havana, he showed a multimedia example to the audience that he had created using digital editing software. Alexis explained that he relies on EP for technology and multimedia tutorial videos in order to stay up to date with the latest in technology, but also to learn how to use technology he already owns. He also said that EP helps him communicate with his congregation by finding shared content that people in his community are familiar with.

Not only does the content in EP help in connecting to others and learning new skills, participants stressed the importance of engaging with EP to do any kind of buying, selling, or trading in Havana. For example, EP enables Cubans to interact with *Revolico*, the most popular classified website in Cuba, and—according to participants—one of the only ways for individuals to buy and sell items, find jobs, and advertise their businesses. Each week, Los Maestros download the most recent version of the entire *Revolico* website and include

this in EP. Luis pulled up the most recent PDFs of Revolico's webpages on his computer and walked me through the content:

"Everything is sold and bought on [Revolico EP]. From computers, cell phones, players, cameras, videos, air conditioners, everything. Here are the services that are provided. Buying and selling houses, trades, rentals, jobs, resumes."

—Luis (M, 22)

Since the majority of Cubans do not have affordable WWW access, EP is the primary way for individuals to engage with *Revolico*. La Gente who wish to advertise in *Revolico* write up an ad and ask friends with WWW access to post for them online. La Gente can then get access to the offline copies of the webpages on EP and contact the original posters over the phone. Individuals thus interact with the offline internet that EP facilitates. The value of being able to buy, sell, trade, and look for jobs through EP was repeated several times throughout my fieldwork by participants across the three groups.

Sharing EP

Although EP stores and distributors are not difficult to find in Havana, and EP content is considered affordable by most participants, many participants did not purchase content themselves. Instead, they relied on intermediaries to provide them with various pieces of content from EP. Yulia, a 19 year-old college student, told me that, "*everyone has to rely on everyone else. That's how we make-do.*" Individuals who purchase EP directly from stores or distributors often share content with their friends. Some participants have developed their own, informal distribution methods. Osmany has developed a collective strategy with his colleagues to maximize the content they receive from EP:

"At work, we have 4 or 5 computers where we copy EP weekly. Right now I have EP available from a month or so ago, because it's on that computer. I can copy what came out in EP this week or what came out in EP a month ago

connecting to the other. Among the workers, we collect 15 pesos a month and distribute EP through the work network.”—Osmany (M, 29)

Human components are central to the creation and maintenance of EP in Havana, as individuals engage with the sociotechnical system and one another to accomplish their information-seeking goals. Juan is a 24-year-old mechanic who receives EP from his friend, a Paquetero. This friend drops off an external hard drive with Juan every Thursday night, Juan downloads the entire EP, and the friend picks up the drive from Juan the next morning. He says that for people who are friends with distributors and “*in relationships of mutual trust*,” it is easier to procure EP. Juan does not need to leave his house nor own an external hard drive, since his friend drops the drive off every Thursday. Similarly, Yulia relies on her brother and young nephew to purchase content and share it with her. During my fieldwork, I regularly saw children in EP stores buying content for their siblings, parents, grandparents, and friends.

Publishing to EP

La Gente are also active in curating or creating content for EP, thereby reshaping the offline internet being delivered in Havana. For example, EP is viewed as an alternative to the state-owned press, allowing local journalists to turn to EP for publishing their content within Cuba, something that was previously not possible. I met with Maria Joaquina, a journalist and column writer for *Vistar Magazine*. This online magazine was designed for Cubans living outside of Cuba since the majority of people inside the country do not have a way to access this content online. However, as a result of EP, Maria said, the magazine is able to cater to audiences living in Cuba:

“EP is the most efficient and cost-effective way for us to publish our content. It affords new paths and opportunities for those who work with journalism. Before, the only opportunity was to work for the Government...now EP provides a different venue.”—Maria (F, 26)

My participants said that EP was a new avenue for this kind of information dissemination. Similar to how Maestros and Paqueteros choose content for EP and thereby have a say in what others consume, La Gente also influence the type of information that is available to other users, most often through advertisements or self-promotion. Currently, people are unable to advertise their businesses through formal media channels, like state-run Cuban television channels. Therefore, people turn to EP to advertise their businesses. Juliana pays 1 CUC per week to have her restaurant's flyer designed at the studio and distributed on EP:

“I started a new service at my business. I now deliver food in Centro and Old Havana and needed to promote the new service and the phone number. Food sales have increased substantially.”—Juliana (F, 43)

Although 1 CUC per week is not inexpensive (on average, it amounts to a day's wage), EP is seen as the most effective network through which to advertise to local audiences. For example, Juan, the mechanic, relies exclusively on Revolico webpages that are downloaded and published in EP to find the car parts he needs for his auto-restoration business. He told me that, without EP, he would not be able to run his business and would have to pick up other side jobs.

Some of the ways in which La Gente engage with the content are influenced by the large amount of content that comes in EP. Participants said that going through all the content each week could be overwhelming. For example, although Javier occasionally purchases parts of EP himself, he prefers to get it from one of his friends who buys the entire EP and sets aside content that Javier likes before dropping off her external hard-drive at his apartment. Javier said that he prefers this process because it is a lot of information to go through and his friend, “*already knows what [he] watches*”. Participants spoke about EP as a type of personalized internet. Similarly, Alexis does not buy EP in its entirety. Instead, he copies parts of EP from his neighbor, who buys select parts from a distributor.

“I don't have access to more [than what my neighbor buys]. I don't want to have it either because sometimes it's so much information that I lose my mind.

I'd rather see what my friend has already selected. I trust his taste.” —Alexis (M, 34)

Alexis said he feels more connected with the content because he is watching the same content as his neighbor. He said it is a luxury that his neighbor chooses his content because he does not have to go through the work of searching for relevant, meaningful content himself. Alexis also pulls out content from his EP that he thinks his wife and daughter will like. His daughter gets content from friends and, in turn, shares it with her parents. La Gente share content from EP that they find meaningful while also creating opportunities to collectively engage with that content. Javier said that he preferred to have content selected for him on EP. As mentioned previously, Los Maestros include social media content from popular celebrities in EP. Javier said he liked not having to search for this content himself because, “*it's a little stressful to have to search for what you want to see.*” Javier said that having content pre-selected from the internet was one of EP’s positive feature:

“The advantage we have is that it comes in EP [instead of having to search for it online]. It's a lot of information. If you don't like it, you don't have to see it. Even if they choose it for you.”—Javier (M, 28)

While relying on someone to choose your content may appear limiting, participants often spoke positively regarding that moderated aspect of EP, drawing parallels to the WWW. Even though he hopes for increased access to the WWW, Javier said, “*it would be difficult [in Cuba] to have constant connection to the Internet. Who knows? Maybe one day. Either way, I do not think I would stop using EP.*”

Similar to other participants, Alexis compared EP directly to the WWW:

“EP is like the Internet. The Internet is not a bad thing... There are people who misuse it, but it's not a bad thing... one good thing is that our Internet [EP] is filtered; you will not find negative content. Like pornography. Bad

things. Because the people in charge of distributing EP, they select what to put.”—Alexis (M, 34)

Participants referred to EP as a version of the WWW that was personalized for them and provided them with opportunities for different kinds of engagement. This human element of EP not only allows it to function, the process that individuals go through as they engage with this system also serves to reinforce connections, given the extent to which EP relies on social ties to operate.

5.5 Discussion

Sambasivan and Smyth proposed the human infrastructure lens to draw attention to the sociotechnical ties and linkages that constitute this infrastructure [40], adding, “*The lens of human infrastructure opens us up to the existing articulation work in ICT4D contexts.*” My research makes visible the human infrastructure of EP—a network distributed across Cuba that packages and brings digital information and media to its people, just like the WWW. I extend Sambasivan and Smyth’s human infrastructure lens by emphasizing the community-building and long-term information infrastructure-building efforts involved in EP, foregrounded through my focus on the articulation work performed by key EP stakeholders.

My findings highlighted, in particular, how articulation work plays a central role in sustaining and growing EP, offering a unique version of the internet where it would otherwise not exist. From Juanito’s building and maintaining a fake water tower to be able to download content from a satellite dish and Paola’s sitting in front of the television watching satellite TV so she can tell Juanito when a particular show is on for him to digitize it, there are small and large tasks the humans of EP engage in, reconciling multiple assumptions and constraints to sustain a thriving, expansive information network [200]. Below, I detail salient aspects of EP that are foregrounded when I focus on its human infrastructure and the articulation work that sustains and grows it. In these details, EP emerges as a provocative

example of an information system that challenges my notions of what an (or *the*) Internet “should” look like.

A Personalized, Negotiated Internet

The human infrastructure of EP mobilizes a personalized kind of Internet for its consumers. My participants described how they customized EP for others and how they preferred to engage with EP so it was customized for them. The fact that EP is held together by human links also means that the transactions are varied, non-standardized, and generally unpredictable. For example, Yuniel considers his customers’ price budget and age as he repeatedly helps him find the right movie for him and his friends, while only charging him for one. When interacting with La Gente, Yuniel negotiates prices, content, and delivery methods, among other factors, to provide an experience that suits each person’s needs. EP is thus adaptive, ongoing, and open-ended, and thereby nondeterministic. This unique, negotiated nature of EP differentiates it from a primarily hardwired, technological infrastructure.

Even as it strives to give people what they desire, personalization tests the notions of Internet neutrality, particularly when we consider the moderation that occurs throughout EP. A human process of selecting content means that certain individuals are in a position to decide what others have access to. For example, Camilo gets frustrated when he requests specific content that exists online but his Paquetero is not able to find it for him. Or, more explicitly, Renier censors his EP based on his religious beliefs and (what he assumes to be) the religious beliefs of his customers. Many participants appreciated these practices, speaking about how there was too much information in each EP for them to go through it all. Therefore, they viewed the sheer amount of content as limiting, preferring to get the partial content on EP that had been selected by someone else. Javier said that there was too much information for him to go through each week and, therefore, he relied on his friend to both acquire and assort the content she thought he would like. A technical limitation (the capacity of commonly available USB drives) has catalyzed the emergence

of human-mediated personalization. Even as participants value the personalized and collective elements that the human infrastructure of EP supports, they must depend on the choices that others make for them.

The case of EP also raises questions around what might be lost if the work that its actors are doing was automated, partially or entirely—a question that is increasingly concerning a large and growing community within HCI [201]. As systems move towards becoming more and more automated, my study illuminates aspects of the human infrastructure (such as personalization) that are not always replaceable by technology. This visibility, I argue, is just as important in places where Internet access is not constrained, such as in the case of Mechanical Turkers and Gig Workers, whose contributions are frequently made invisible [202, 203]. Through this enhanced visibility, we see that actors of EP not only engage with the material, tangible elements of the network, but are in constant negotiations with personal preferences and legal boundaries. These negotiations are continually feeding into a system that remains responsive and adaptive to a variety of use cases.

Although there are assets that the human infrastructure lens highlights, there are also limitations that it foregrounds. For example, the lack of automation may facilitate personalization, but this also means that individuals have to undertake a lot of work to support the network. For example, Renier shared that he is dependent on the content the Maestros and other Paqueteros choose to give him. If a Maestro like Juanito does not undertake the work of maintaining his satellite connection, the shows that he distributes across the country would not appear in the EP. A focus on the human infrastructure underscores the fragility of EP, demonstrating how dependent individuals are upon one another, and how dependent the system as a whole is on multiple human actors. Technological limitations, such as the lack of central servers hosting EP’s content, further imply that most participants have to delete the entire EP each week to make space on their servers for the next week’s version, thereby limiting the amount of content that is available at any one time.

An Entertaining, Informative Internet

In essence, what we see in EP is a replication of the media-sharing practices that prior ICTD research has highlighted. Just as the media distributors in New Delhi [204] offer content for financial gain or social recognition, so do the Paqueteros. Entertainment remains a key motivation for acquiring and engaging with new kinds of content for the consumers in Bangalore [36] just as it is for La Gente. Like the male Indian youth who wish to be better connected to the rest of the world through Facebook [9], so does Zamira who seeks out documentaries from other countries because it makes her feel “*more connected to the world.*” What is unique to the Cuban case, however, is that these media-sharing practices are not limited to certain users who are on the margins. They are far more pervasive than prior work highlights. Almost all Cubans’ information needs are targeted and met by EP, not merely those of users on the margins. The human infrastructure that consumes and distributes EP includes Cuban citizens from different parts of the Havana, with different jobs, ages, and skills. This highlights the unique sociopolitical conditions that EP thrives in, which have resulted in a prevalence of information scarcity and resource constraint. There is no other, superior, more expensive information network available to these Cubans (although the WiFi hotspots do provide a meager alternative), as is true in Bangalore and New Delhi.

Additionally, the practices involved in the configuration of EP are not limited to the dissemination and consumption of entertainment media alone. All kinds of information needs are targeted and met by EP, not just those that are entertainment-related (although they may have come first). This results in an engagement that touches many different aspects of human life. Several participants spoke about the importance of EP for acquiring educational information. Alexis uses tutorial videos to help him improve his multimedia abilities and, thereby, his artwork and the number of pieces he sells. Since EP is the main mechanism for individuals to engage with online content (albeit in offline form), it connects users with critical resources. As mentioned in the findings, EP is the primary way for

individuals in Havana to buy, sell, or trade goods, find employment, and learn new skills relevant to their jobs, like in the case of Juan, the mechanic who finds and sells auto parts exclusively through EP via offline versions of Revolico webpages, which allows him to sustain his own business.

A Relevant, Participatory Internet

My findings reveal how the human infrastructure of EP facilitates a relevant, participatory Internet. Many ICTD initiatives have focused on constructing information networks that are voice-based and/or local (*e.g.*, [205, 206, 207]), recognizing that the WWW may certainly have a draw, but not be high on relevance. With EP, we see a thriving example of an established, pervasive information network that relies significantly on locally relevant content. This forces us to question what value might be added through access to a WWW that largely represents a world far removed. In addition to content, delivery mechanisms of EP are also locally relevant. For example, access to the WWW in Havana is prohibitively expensive whereas EP is affordable for all, especially with price adjustments for certain individuals/groups. Moreover, since EP’s content is not openly in opposition to the Cuban government, it is viewed as a “safer” alternative than the WWW. For example, EP is regularly “cleaned” by Maestros and Paqueteros to remove content that the government disapproves of.

In addition to EP’s content and delivery methods being relevant for local consumption, it also contains locally sourced content. Los Maestros and Los Paqueteros recruit local talent and feature their work in EP. La Gente buy, sell, and trade items through EP in addition to promoting services and businesses. Consumers of EP do not engage with content passively; they also produce content that finds its way back into EP, like Maria who used EP to publish a digital version of her local magazine, offering an alternative to government-run media. Such engagements make EP a mélange of local and global content, emphasizing the participatory dimension of this Internet. Further, unlike other examples of Internet ac-

cess for resource-constrained regions (such as Facebook’s zero-rated services [163, 208]) content in EP is not limited to what one company or ISP provides.

There are forces limiting, however, what EP might include. Los Maestros, for example, act as gatekeepers; although it is in their best interest to provide their clientèle with content they desire, they make the final decision about what is included in the (original) EP every week. Throughout EP’s network, various individuals exercise control over what information is passed along (like Renier censoring his version of EP). Moreover, adding content to EP is easier for those who can pay for advertisements or promotions (or are well connected to Paqueteros or Maestros). As with all sociotechnical systems, there are power structures at play within EP—some have more control over content than others—as well as the power structures acting upon it. For example, the content in EP is not only determined by what people desire, but also by government regulations (such as no pornography or anti-government talk). Thus, while EP is relevant and participatory in ways that benefit the Cuban people, it does remain subject to the politics of information.

5.6 Conclusion

This chapter presented qualitative inquiry of the El Paquete information-sharing ecosystem in Havana, and how it acts as an Internet for the majority of Cubans. My research contributes to scholarship in HCI by emphasizing the key human infrastructural elements that support the sustenance and growth of an expansive information network. For the field of CSCW, I strengthen prior research on the human infrastructure lens through my in-depth engagement with the articulation work that EP’s operation relies on. These are the small and large everyday tasks that are not always visible in information networks but successfully make the EP more human-centered. Finally, for the field of ICTD, I extend a rich body of research on media-sharing practices and offline information networks with my case study of EP, as I highlight how its actors rely on it for leisure and livelihood, both generating and consuming locally relevant content. In the following chapter, I conclude

my research by focusing on another local information infrastructure, StreetNet, that operates quite differently from El Paquete as users must undertake configurations that involve attention to material elements that are regularly breaking-down.

CHAPTER 6

MAINTENANCE AND CARE OF STREETNET

“SNET is a mini-Internet, it’s just not as up-to-date as the Internet. We can chat, there’s new applications for PC, for phones, everything. We sell and buy things. This is perfect. Almost perfect. Imagine, we are on an island, and from the island, only a few have SNET. But hey, we are Cubans, it’s what we invented.”—Diego (M, 18)

While El Paquete serves as a pervasive offline Internet across the country, there is another, smaller information network operating in Havana that makes up another piece of the “Cuban Internet:” StreetNet (SNET). SNET is a community network (CN) that has grown organically during the past seven years, reaching tens of thousands of households across Havana. Through fieldwork conducted in 2016 and 2017, I investigate participants’ innovative strategies as they engage with a network where the material elements—cables, switches, nanos, and servers—are regularly breaking down. Drawing on maintenance and care scholarship, I present an in-depth investigation of SNET and my participants’ day-to-day efforts in maintaining it. In SNET, participants once again act through the ethos of *resolver*, as people collectively work with what they have to maintain and care for a network suited to their local context. This chapter contributes a unique perspective on how CNs are run locally and organically, outlining considerations for how interventions along these lines might be more suitably designed. I also complicate perspectives of innovation through a discussion of cultural ideologies and tensions underpinning maintenance and care (M&C) practices.

6.1 Introduction

Walking the streets of Havana, one need only look up to notice tangled cables running over roofs, balconies, and into windows. These cables are part of SNET, a CN that serves as an alternative to the Internet for thousands of users in Havana, connecting participating residents to one another, though not to the outside world.

As a distributed, grassroots network circumventing the need for direct, outside intervention from the government or commercial entities, SNET relies on thousands of volunteers to maintain its physical and digital infrastructures. Due to its ad-hoc nature, difficulty of finding new equipment, and scarcity of funds, the material elements of this system—cables, switches, nanos, and servers—are regularly breaking down. Building on Jackson’s work, I consider SNET from a “broken-world” perspective, taking breakdowns, rather than growth or progress, as the starting point to think through “the nature, use, and effects of information technology” ([56]:222). Based on fieldwork conducted in 2016 and 2017, I present data from in-depth interviews and participant observation to detail the workings of SNET, the ongoing, collective efforts required for its maintenance and care (M&C), as well as the values and motivations underpinning these practices.

After reviewing related work on CNs and M&C, I describe the methods I used to conduct this work. I then present data on how the network came into being, followed by a day-to-day perspective on cases of breakdown and repair, and individuals’ motivations underlying the establishment and maintenance of SNET. Finally, I discuss the implications and contributions of my findings, outlined below.

My research contributes to CN scholarship by leveraging a broken-world perspective to complicate prior assumptions around the affordances of CNs. SNET is a volunteer-led collaborative network that continues to evolve despite resource constraints and legal ambiguities. The elements that might normally threaten a network (repeated breakdowns, existing “illegally”) are part of the reality that SNET users live with on a regular basis. I

highlight the role of leisure as a driving force in shaping the M&C work in SNET, illuminating how practices draw on and shape community ties, while also fostering tensions. Further, I discuss power entanglements that caution against romanticizing the local nature of CNs.

I additionally contribute to a growing body of CSCW scholarship that aims to decenter both under-represented communities as well as traditional sites of innovation [209]. Through the lens of M&C, I complicate the view of technological innovation by uncovering the tensions between arduous work, cultural and individual values, rewarding outcomes, and moments of exclusion or unfair treatment. I situate my work within a place where, as participants described it, things are constantly breaking. This idea, combined with the notion that Cuba has been excluded from global flows of information due to prohibitive Internet access, intertwines with the cultural ethos of resolver, framing participants as “natural” inventors with the capacity to “make do” in any situation.

6.2 Related Work: Community Networks, Maintenance, + Care

Community Networks

The communities of CSCW and HCI have long been interested in CNs, crowdsourced infrastructures collaboratively built by individuals and groups who pool resources and coordinate efforts to provide digital services to members [210, 211, 212, 213]. CNs may use different technological organizations, including grassroots networks, wireless community networks, and alternative mesh networks [210]. Early work on CNs focused on community-oriented electronic bulletin boards, such as Community Memory, which began in the mid-1970s in Berkeley, CA, and is often considered to be the first CN [214]. In the early 2000s, the number of CNs increased, along with beliefs that they may serve as models for free, wireless, ubiquitous Internet [215, 216]. Current examples of CNs include guifi.net in Spain [212], Italy’s ninux.org [217], the Athens wireless metropolitan network of Greece [218], and FreiFunk in Germany [219]. Research among rural and under-connected com-

munities have explored CNs as a way to provide last-mile connectivity, including the San Andres community cellular network in the Philippines [220], WiLDNet in India [221], and Digital Tribal Village (DTV) in the U.S. [62]. CNs in remote regions often face additional hurdles including repeated breakdowns, lack of technical knowledge by end users, equipment theft, and weather exposure [221, 220].

While CNs have a DIY (“do it yourself”) ethos, many CNs need technical experts to deploy and manage equipment; a common problem is encouraging participation among non-technical experts [222, 220]. However, in rural India, Surana et al. found that local repair efforts by non-experts lead to new problems like damaged equipment [221]. Noting the limitations maintenance poses to the growth of a network, Jang et al. attempted to facilitate repairs by end-users in their work with a community cellular network in the Philippines [220].

Scholarship has celebrated the “liberating” attributes of CNs. Since the 1970s, “the euphoric hopes [CNs] inspired for more equity, participation, and civil society is typical of the technological optimism that has been identified as a characteristic of U.S. social thought, literature, and public debate” ([223]:291-2). Scholars have celebrated the decentralized structure and grassroots organizational style of CNs. De Filippi contrasts CNs to centralized network infrastructures owned by “powerful third parties” ([224]:3). Further, prior work has emphasized commitments to free speech and resistance to surveillance and repression as defining characteristics of CNs [224, 210, 219]. Although research celebrates the ad-hoc, decentralized, “by the users for the users,” model, most CNs operate with the assistance of third parties, including governments, universities, research centers, and/or corporations. For example, in their research on guifi.net, Baig et al. maintain that collaboration from lawyers and public administrators is crucial for the sustenance of the network [212]. My aim is not to downplay the contributions of other CNs; instead I contribute a case of a CN operating without formal assistance from any third party. In doing so, I tease apart both opportunities and tensions embedded in the maintenance and care of a CN within a

resource-constrained context.

Maintenance and Care

Scholars from the fields of CSCW and beyond have contributed rich, ethnographic accounts centered on the maintenance and care (M&C) of both material and social orders [78, 59, 225, 60, 69, 226]. Based on Star's foundational work [227], scholarship traditionally considers infrastructures to be invisible until they break. Both Latour [228] and Star and Bowker [229] position moments of breakdown as opportunities to explore hidden elements of the relationship between people and technology.

I draw on these perspectives, but rather than considering breakdowns as atypical [227, 228], I advocate for a re-conceptualization of breakdowns as normal [78, 230, 59, 56, 225]. Focusing on repair worlds in rural Namibia, Jackson et al. propose broken-world thinking, “a gestalt shift in our ways of thinking about sociotechnical system development that moves moments of maintenance and repair, rather than just moments of design and adoption, to the heart of CSCW thinking and practice” [59]:9). Broken-world thinking focuses on the ongoing labors, interests, and power underpinning the sociality of objects and their survival in the world [230]. This body of work situates repair as, “the subtle acts of care by which order and meaning in complex sociotechnical systems are maintained and transformed, human value is preserved and extended, and the complicated work of fitting to the varied circumstances of organizations, systems, and lives is accomplished” [56]:222). Moving beyond moments of fixing, maintenance scholarship considers the ongoing processes of labor and the range of interactions between people, technology, and actions resulting from breakdowns [225, 78]. Beyond keeping networks functional, M & C practices constitutes new sites of innovation [46, 59, 56, 57]. As I mentioned in Chatper 1, scholars have adopted a commitment to decenter sites of innovation through explorations of often overlooked practices [46, 56, 57]. A growing body of work examines M & C in resource-constrained contexts through the resourceful and creative ways communities implement, maintain, and

repair technological infrastructures and artifacts [58, 59, 60, 61, 62].

I focus on the care practices embedded in these innovative practices, demonstrating, again, the social reliance underpinning the configurations enacted through the ethos of *resolver*. Building on Mol [231] and de la Bellacasa [232], scholars have explored how socio-material practices are embedded within an ethics of care [56, 233, 57]. Tronto defines care as, “everything that we do to maintain, continue, and repair ‘our world’ so that we can live in it as well as possible. That world includes our bodies, our selves, and our environment, all of which we seek to interweave in a complex, life sustaining web” ([234]: 103). Jack and Jackson demonstrate how UNICEF logisticians simultaneously exercise care and control, traversing messy infrastructures in an effort to provide humanitarian aid [235]. Among makerspaces, Toombs et al. demonstrate caring for others was central to the sustenance of the space, contrary to the dominant neoliberal values of autonomy in makerspaces [226]. In contrast to universalist approaches, Mol et al. position care as a style of work that is locally situated in world of shifting tensions [231]. Rosner and Ames demonstrate how repair depends on context, arguing that community values, socioeconomic status, and gender impact both the ability and desire to engage in repair practices, challenging assumptions that repair leads to empowerment [225]. Focusing on disaster-relief efforts in Ecuador, Wong-Villacres et al. reveal how the particularities of place impact underlying values and the way care is enacted [236].

Care is an action that involves intervening [232], implies valuing [231], and “suggests enduring work that seeks improvement but does not necessarily succeed” ([237]:141). De la Bellacasa emphasizes that the term “care” holds different, sometimes conflicted, meanings and resulting practices may not be in the best interests of others [232]. Individuals act based on their understanding of how the world “should” be and these understandings are not always aligned. Mol et al. posit that a focus on care shifts our attention from people as rational actors with impartial judgements to the embodied practices requiring “attuned attentiveness and adaptive tinkering” [231]:15. This perspective, Jackson et al. argue,

moves us beyond instrumental or functional relations between people and materials and, instead, focuses on the relationship between actions and meanings [230].

In this chapter, I contribute a case where M&C practices constitute new sites of innovation and creativity, while also revealing the tensions underpinning this work. Through a focus on M&C within a network where materials are regularly breaking down, I reframe perceptions of participation in CNs while also complicating traditional notions of technical innovation.

6.3 Methods

My data comes from fieldwork I conducted in Havana, Cuba, across three phases: April 2016, July-August 2016, and June-July 2017. During this time, I conducted in-depth, semi-structured interviews with 46 individuals—15 identified as females and 31 identified as males—ranging in age from 18-65 (see Table 6.1). I relied on referrals from contacts made during previous fieldwork and used purposeful, snowball sampling to recruit participants who referred me to additional contacts [177]. I interviewed individuals who had been part of the original creation of SNET as well as users who joined the network as recently as 2017. I also spoke with users’ family members and neighbors who were involved in helping maintain the equipment.

Interviews were conducted in Spanish at a location of the participants’ choosing and lasted from 30 to 90 minutes. During interviews, I asked participants about their experiences with SNET, their motivations, the activities they engage with, and the perceived impact on their daily lives and relationships. I also asked about the work of maintaining the physical and digital infrastructure, and how social norms and moderation interact with their use of the network. Additionally, I conducted participant observation among seven different nodes located in neighborhoods across Havana, including two nodes from the center of the city, two nodes in the southeast, one in the northwest, one in the northeast, and one from the southwest. The majority of my research occurred in three nodes: SurNet, CumpleNet,

Table 6.1: Chapter 6 Participants and Corresponding Nodes and Roles

Node	Participants	Roles
AguaNet	4 females, 6 males	1 switch operator, 5 users, 4 family members
CentroNet	1 female, 3 males	1 subnode rep., 1 user, 2 family members
CorteNet	2 females, 2 males	1 subnode rep. & switch operator, 2 users, 1 family member
CumpleNet	3 females, 4 males	1 subnode rep., 2 users, 4 family members
GamerNet	2 females, 2 males	4 users
LinkNet	3 males	1 game admin & switch operator, 2 users
SurNet	3 females, 12 males	1 admin, 1 informal admin & online mod., 2 switch operators, 6 users, 5 family members

and LinkNet.

I often met with participants in their homes, observing and participating in SNET-related activities. Often, participants encouraged me to explore the site myself as they looked on and explained their experiences with the different aspects of SNET that I was currently viewing. I also created my own account on SNET and downloaded content and pages to provide a richer understanding of the activity on this network. In addition to online activities, I was also involved in the sociotechnical elements of maintenance and repair. My data also comes from online, follow-up interviews with select participants from 2016 to 2019, which allowed me to gain a more holistic picture of participants' experiences over time. It should be noted, however, the majority of my participants do not have regular access to the Internet; therefore, I was unable to conduct online interviews with most participants.

After my fieldwork trips in 2016, I conducted thematic analysis on the interview and observation data [115, 116]. I then returned to Havana to conduct additional fieldwork in June and July 2017. I then coded all of the data iteratively over several months. The data continually surfaced themes of M&C and, therefore, I focused analysis on the ongoing strategies, actions, and motivations underscoring these practices.

Along with my advisors, I thoroughly discussed and considered the potential risks to participants from conducting and publishing this work, especially since SNET is not officially sanctioned by the government and could be considered illegal. Participants assured me that the Cuban government is aware of SNET and has not attempted to disrupt it. SNET occupies a legal “gray” area along with other unofficial networks in Havana (like El Paquete

Semanal). In addition to recent academic work [238], SNET has received international media attention [239, 240, 241], with members of the network appearing on camera or in photographs [239]. I consulted with participants regarding the threat to them and the network from the publication of this data. None of my participants objected to the publication of this study; in fact, the majority encouraged me to publish findings to bring awareness to the network they have created. To further protect participants, and in accordance with my Institutional Review Board (IRB) protocol, I waived the documentation of consent. In addition to using pseudonyms for participants, I also use pseudonyms for nodes and neighborhoods.

6.4 Findings

I begin by offering a rich description of SNET including its organizational structure, the roles of human actors, the purpose of the network, and the conditions contributing to regular breakdowns within the network. I then describe specific instances of M&C through a focus on the ongoing configurations of four material elements of the network—cables, switches, nanos, and servers. Next, I unpack the collective strategies that have evolved in anticipation of regular breakdowns. I conclude with user motivations for engaging in regular M&C efforts. Along the way, I highlight how people individually and collectively care for the material elements as well as one another. I conclude with findings regarding the motivations that drive continual M&C work.

6.4.1 What is SNET?

“SNET is a mini Internet that we adapted to our conditions.” —Julio (M,35)

SNET is composed of nine core nodes, or *pillars*, connected to one another through fixed wireless links. Each pillar connects tens of individual nodes through long-range directional WiFi and each node brings in up to 200 users [238]. Individuals connect to local nodes through Ethernet cables connected to the house of a nearby user who manages a local

switch. Each of the nine pillars have names ending in “net,” like WiFiNet or MonsterNet, and nodes often name themselves according to their neighborhood. There is no central database of users and, since groups of people will often share one registered IP address, it is difficult to estimate the number of users. Some estimate 10-50,000 computers are connected [242].

The Evolution of the Gaming Network

In Havana in the mid 2000s, groups of friends began to meet in their homes to play video games, a practice more commonly known as local area network (LAN) parties [243]. The majority of these games were played on old, refurbished desktop computers that had to be transported from one house to another. Due to this labor-intensive process and the desire to play from home, people began experimenting with ways to connect computers among neighbors by stringing cables through windows, across balconies, and over rooftops. In a neighborhood south of the city center, Jordani, one of the informal admins of SurNet, began setting up a small network in 2002 at the age of 15.

“I first threw a cable from my house to my friends so we could game. Everyone said, you’re crazy, that can’t be done. Then, my neighbor next door said: I want it too. And so I was joining everyone’s wires until this started to form. In order to create this we had to make a thousand inventions.”—Jordani (M, 32)

Up until 2008, it was illegal for Cubans to own personal computers [244], meaning they had to find alternate ways to acquire necessary equipment. People had to create “inventions” to build and maintain the network, like Jordani, who experimented with copper wires, insulated cables, metal rods, and other found materials to build his own antenna. Although some SNET users have more technical knowledge due to education or vocation, most were unaware of how to set up, maintain, or repair the material elements of a CN. Many learned how to build their network by asking friends, tinkering with equipment, and reaching out to people outside of Cuba. After being connected to several neighbors for a few years, Jordani

and Mateo, who is now the current admin of SurNet, decided it was time to connect to a larger node. To do so, they had to find a way to extend their signal via WiFi.

“At first, we were lost in terms of WiFi and we figured it out on our own, testing how to go online, how to configure everything. We would ask someone who had Internet at work, ‘find this information for me, see what the server’s manual says, how we should do it, because this is new to us.’ They would tell us something but it wouldn’t work. We had to keep asking and experimenting until we were able to build the nodes.”—Mateo (M, 43)

As local nodes began to form, users searched for used equipment from businesses or the grey market, including computers, servers, cables, antennas, routers, and switches, in order to expand the network. Setting up individual nodes and the rest of SNET required experimentation and knowledge sharing among groups of people. Participants emphasized the independent, ad hoc manner in which they learned how to configure their equipment without relying on formal services. Antonio is the subnode representative of CorteNet, a more remote neighborhood on the outskirts of the city. Due to their location, Antonio and seven of his neighbors spent several years being connected only to one another through Ethernet cables but, after learning about how much SNET was growing, they decided to figure out a way to connect to the closest node, SurNet, which was 1.2 miles away.

“We went around asking questions, verifying information. I went back and forth on email with an IT friend that now lives in the U.S. He downloaded plans from the Internet and sent them to us. We created lots of inventions to build the antenna... we experimented a lot.” —Antonio (M,29)

Similar to the collaborative configurations evident in Chapters 3 and 4, Antonio relied on Internet intermediaries to help him acquire the technical knowledge needed to set up his antenna. Antonio told me that, in Havana , “we can’t just Google things every time we have



Figure 6.1: Antonio’s SNET Antenna (Photo: J. Mangiameli)

a problem like they do in other countries. We have to ask around, or have someone else Google it for us.”

Developing Roles and Rules

Around 2011, groups of nodes began developing processes for cooperatively maintaining their growing networks [238]. Since many nodes on SNET formed independently of one another, each area had to negotiate to determine who would be responsible for various tasks of their network. The governance structure evolved over time with each region deciding on roles and responsibilities among themselves. Mateo, one of the admins of SurNet, described how roles were chosen in his area:

“By the time we grew to 200 [people], we had to find a form of administration...we had a meeting with 150 people in which 10 stood out. Now [at higher-level meetings], those leaders represent our area and vote on our behalf.” —Mateo (M, 43)

Roles on SNET are determined by an individual’s physical location in the network, when

Table 6.2: Roles on SNET

Role	Responsibility
General	Manages one of the nine backbone pillars. Has final approval of the general rules. Manage the main servers hosting digital content. Approve new web pages.
Admin	Manages node, connected subnodes, node representatives, informal admins, & users. Manages technical infrastructure, assigns IP addresses to new users, & monitors user bandwidth. Hosts content on local servers. Often shares duties with informal admins who are not formally recognized by the generals.
Subnode Representative	Represent users at meetings. Manage equipment connecting the subnode to a main node.
Online Admin	Manages SNET webpages
Online Moderator	Moderates content & activity on webpages in coordination with online admins.
User	Manages their own equipment. Some also manage a switch in their home that connects nearby users to the local node.

they joined, the type of equipment they have access to, technical knowledge, a willingness to undertake the work involved, and, for more formal roles, authorization from an admin. I divided SNET roles into six categories (see Table 6.2); however, these roles often overlap, particularly since users are responsible for both the digital and technical infrastructure of the network.

The ability to join SNET is determined by several factors, including geographic location, social connections, and the ability to acquire and maintain the technical equipment. People must find a current user close to them who will allow them to physically connect to the network. Additionally, aspiring users must find an admin who is able to assign an IP address, which serves as their account. Admins have a limited number of IP addresses they are able to distribute to new users. Whenever admins give out an IP address to a new user, they are responsible for that user.

As nodes grew and interconnected, they often developed their own rules, which were reached by consensus among local admins and representatives. Once 30-40 people were connected to him, Jordani said, “*we had to create regulations to avoid problems, to maintain the infrastructure in case things were broken.*” Once the nine pillars were formed, the generals established the general rules of SNET along with penalties for rule violators, which include being banned from specific sites or being disconnected from SNET entirely from a period of an hour up to permanent bans for serious offenses. Although nodes can

choose whether or not to follow the general rules of SNET, if they go against the general rules, admins or generals may decide to cut off that node's connection to SNET.

Comparable to the strategies used in El Paquete, SNET has adopted strict policies banning content the government might deem controversial, including politics, religion, and pornography.

"Normally it's like that everywhere in Cuba, they don't let you talk about political issues anywhere. There may be times that someone on SNET says something they shouldn't, and admins sanction them, even to the point of banning them. They don't do it because they want to, but to avoid reprisal. There is no forum for politics or anything like that. Almost all are about culture, to make and share memes and things like that."—Enrique (M, 23)

Enrique's quote is indicative of broader cultural sentiments regarding a stated disinterest in politics [118]). Instead of viewing the need for self-censorship as limiting, some participants said this contributed to a friendlier environment. For example, Alejandro, a user from SurNet, said, “*you feel like entering in a good place because there is a strict discipline. Everyone respects one another. I have never had an offensive discussion in the four years I've been a member*”

SNET also prohibits nodes from connecting the network to the WWW to avoid appearing as if they are in competition with the government-run telecommunications company, ETECSA. As a result, all digital content is uploaded from pirated copies or designed and maintained by users and hosted on local servers. Therefore, in addition to building the physical infrastructure, users had to learn how to build the digital network, as Antonio explained, “*We're not programmers. We didn't know how to make web pages, so we had to ask around and tinker a lot.*”

As more users joined SNET, it evolved from a gaming network to a thriving “*mini-Internet*,” with digital sites and services mirroring websites on the WWW. Each pillar hosts its own portal, which includes *TeamSpeak*, a chat forum for communicating among users.

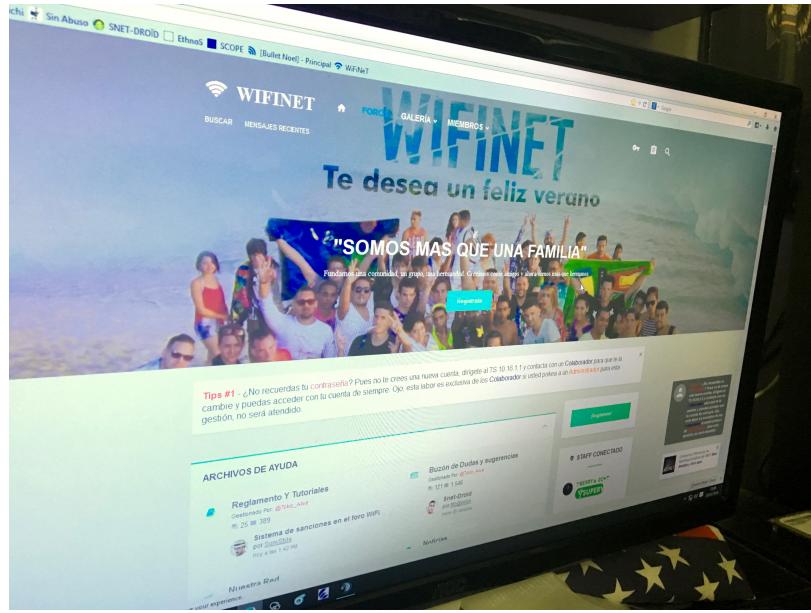


Figure 6.2: The WiFiNet Landing Page (Photo: M. Dye)

Users often used services like community forums, social networking sites (SNS), dating sites, classifieds, and content production communities. There are also sites that host copies of websites from the WWW, such as Wikipedia and Revolico, a Cuban Craigslist. A few users have Internet access in workplaces and will upload content from the WWW to SNET. In addition to content, people also share the latest software and operating systems.

6.4.2 Maintaining + Caring for SNET Equipment

“Maybe you have a technical service you can call to help with repairs. We don’t. We put in technology and maybe it works one day, but the next day it’s broken. So you have to learn how to fix it yourself.”—Idania (F, 26)

While the social, informational, and gaming aspects attract users to the network, I encountered a system where the majority of users’ participation involves maintaining both material and social elements. One of SNET’s rules is that each user is in charge of their own infrastructure, which includes acquiring and maintaining the equipment needed to connect to the network. In this section, I unpack participation on SNET through the M&C required to manage four material elements—cables, switches, nanos, and servers. Throughout, I

illuminate the ongoing, innovative sociotechnical M&C practices contributing to the sustenance of this network.

Cables

“If you look at the houses, you can see who is connected to [SNET] by following the cables from house to house to house. Up one wall, across a balcony, over the roof. From roof to roof to roof.” - Angel (M, 56)

When seeking out participants to interview, people often told me to “follow the cables,” noting that these artifacts would lead me to SNET users. The visible qualities of cables (mainly their colors) cause them to stand out against the often gray concrete landscapes. Although media outside of Cuba have described SNET as an “underground” network [239], cables strung across buildings, roofs, and streets lead to an increased visibility of users. Although cables may initially appear to be insignificant actors in the network, their materiality reinforces the collective reliance of users and dictates certain practices. As Jordani said, *“We have to do things this way because it’s a cable network, one user depends on another. If your cable breaks, everyone who is connected through you is affected.”*

Since cables have been designed for indoor use, they are particularly prone to break when placed outside, causing frequent disconnections from the network. In addition to the inconvenience of being disconnected, repairing or replacing cables involves re-enrolling nearby neighbors as peripheral participants in the network. Often, users must convince people who are not a part of SNET to allow them to run cables over roofs, across balconies, and through houses. When cables break, users need to access other people’s property to repair or replace cables, which may involve extra negotiations. During fieldwork, I met individuals that wanted to be members of SNET but could not convince their neighbors to let them run cables through their homes.

Although cables are cheaper and easier to find than other equipment, the work of restoring the connection due to breakdowns can be difficult, especially if other equipment is af-

fected. During a particularly rainy season, one of the cables on Ricardo's roof got a hole in it, causing water to run through the cable, into his apartment, and onto his computer console, damaging his computer and short-circuiting his setup. Ricardo was the connection point for two other users, who were also disconnected from SNET until Ricardo could repair his equipment. Luckily, a computer engineer from Ricardo's work assisted in salvaging and selling undamaged parts and purchasing a new console, a process which required several weeks.

The reliance on cables and people maintaining them often generates extra work for admins, particularly when users do not manage their equipment carefully. On an evening in 2016, I accompanied Mateo on his nightly stroll as he checked on his users and their equipment.

"I like to make sure everything is going OK and solve little repairs before they get worse. The other day a user called, 'hey, a bus went by and cut my cable.' It's really a pain in the neck. I go over there right away to fix that cable because it's an important connection. But sometimes a user who isn't a major connection point says, 'Hey, the cable split,' and they don't know how to install the network connector. Over here we don't know anything about IT, you know, cables, computers. And I say, 'just a minute, give me a little time, I'll go over to your place after I have dinner.'" —Mateo (M, 43)

Although some blamed breakdowns on mismanagement of equipment, there were other unpredictable factors that contributed to breakdowns, including equipment theft, wires being chewed by animals, or run over by vehicles. Mateo helps most of his users with repairs, but this involves additional work. As such, Mateo must prioritize the types of repairs he makes and when, negotiating between time available, users' technical capabilities, and the severity of the breakdown.

Switches

Switches¹ are equipment that connect multiple individuals to the rest of the network. Miguel and Carlos are next-door neighbors who live in adjacent, bottom-floor apartments close to the city center. Six months after connecting to their local SNET node, LinkNet, a lightning storm “fried” their switch. Several months later, the two found a nearby neighbor, Jonny, who also had a broken switch preventing him from connecting. Carlos and Miguel paid to fix the switch, and Jonny agreed to let them connect to SNET through him. However, Jonny moved the newly-repaired switch to the house of the user ahead of him in the network, replacing the switch that connected Carlos and Miguel to him with an older one. This increased Jonny’s connection speed, while causing Carlos and Miguel’s connection to lag, making it practically impossible to connect.

The two contacted their local admin, who held a meeting and decided that their money would be returned to purchase a new device. Miguel went through the work to find a switch for sale and the neighbors reconnected to SNET for a few days until being disconnected again. They went to talk with Jonny who told them their switch model was slowing the entire network. Miguel exchanged the switch again for a brand new one, however, Jonny said that their new switch was not compatible with his equipment. Their local admin suggested all parties meet again to resolve the issue however, Miguel and Carlos did not want to risk losing more time and money. They also had the feeling that they were unwanted in the network.

“It seems that it was not convenient for those higher up in the hierarchy that we were there, because we were not like other long-time users that they had listen to. We did not suit them and in the end we stayed out, well, we were kicked out.”—Carlos (M, 28)

Carlos and Miguel were newer users and did not carry as much social influence as others

¹Participants used the term “switch” to include both switches and routers.

and, therefore, Jonny did not risk as much by excluding them from the network. On SNET, there is no formal rule regarding moving a switch from one house to another, or trading out a switch to prioritize one's connection. However, there is the social norm of talking with the users who will be affected, or seeking permission from an admin. According to Miguel and Carlos, Jonny was able to make this decision without consequences because of his social connections and by blaming the problem on the technical failure of the switch. According to Miguel, "*I lost interest in connecting. You depend on many people ahead of you and if they don't want you to connect, then you're out.*"

Throughout my fieldwork, Miguel and Carlos underwent numerous moments of connection and disconnection to the network. They would often go long stretches without being connected to SNET. Despite these complications, in August 2017, both Miguel and Carlos were trying to re-connect to SNET through a neighbor a few blocks away, but had yet to find a way to manage the data loss that would occur from the length of cable required. Both said they would continue trying different solutions to reconnect. "*We make do with what we have,*" Carlos said, "*this is how things are in Cuba. Maybe one day we'll have access to the Internet. But I don't see that happening anytime soon.*"

Since switches connect many users to SNET, the M&C process is highly collaborative. I spoke to several users who described issues with switches breaking down or users not properly caring for the equipment. Some were more successful than Carlos and Miguel in negotiating new management configurations among their nodes. In a small node within AguaNet, Edel, a young switch operator, was not managing the equipment properly, according to the users who connected through him. In this case, however, the users did not go speak to an admin. They went directly to Edel (who was also their friend) and convinced him to let them move the switch to another user's house. One user, Yaritza, described the change as "*a mutiny*" but said, now, their connection is better maintained and Edel does not have to do the extra work required to manage the switch.

Nanos

Wired nodes require wireless bridges (or access points) to connect to nearby nodes, pieces of equipment that connect two wired nodes through a WiFi signal. Participants referred to wireless bridges as “nanos,” short for NanoStation, a popular wireless bridge model. Similar to cables, nanos are prone to weather damage when placed outside.

“We need to use what we can find. We Cubans are natural inventors. We use plastic containers to create houses for our nanos, that are normally used inside a house, to protect them. We have to constantly work at it. Our main node’s nano got fucked up by a lightning bolt. So, we had a meeting with all the users and negotiated a price that each node would pay based on the number of people to buy another device. There is a lot of unity in the network, because if one is affected, everyone is affected.” —Antonio (M, 29)

As CumpleNet’s subnode representative, Antonio is committed to caring for his neighborhood’s connection to SNET. To do so, Antonio must cooperate with others, including his parents and grandmother, who help him maintain the equipment when he is away from home. In some cases, the work undertaken during breakdowns creates stronger social relationships, or as Antonio said, “unity” due to the entangled web of relations within the network, but it also creates additional work. During a humid evening in July 2017, I was waiting to meet up with Mateo, the admin of SurNet, during one of their regular meetings. Arriving two hours late, Mateo pulled up to his apartment on a motorcycle with two boxes of equipment strapped to the seat. After apologizing for being late, he explained:

“I have to repair everything. The other day, the nano that connects us to a main node broke. I went over there, took down the nano and saw it was damaged. I had to get on Revolico on SNET. I called a man across town that had a repaired nano. We bought it, brought it here, put it together and it worked. But I wasted all day on that.” —Mateo (M, 43)

Managing technical breakdowns can be an arduous process. Throughout my fieldwork, Mateo mentioned that his work on SNET had created tensions within his marriage since he was dedicating so much time to it. While admins undertake much of the M&C work required to manage SNET, users also undergo a lot of effort to join and stay connected to the network. For example, Idiani and her brother, Jasiel, live in a neighborhood on the northeastern border of Havana. Both are active players of DOTA and initially connected to their local node, CorteNet, in 2016, by running a cable from their house to their next-door neighbor's, who managed the local nano. Convincing the neighbor to let them join was easy; however, the way he managed his equipment caused Idiani and Jasiel to frequently lose their connection:

“It appears this man didn’t know much about technology. He fried his nano once in a storm and, after, he would turn off all his equipment and the rest of us neighbors were left without a connection for hours many times.”—Idiani (F, 26)

Fearing equipment failure due to thunderstorms, Idiani’s neighbor regularly disconnected his equipment, which, in turn, disconnected the users who were connected through him. Idiani reported the situation to one of her good friends who happened to be a node admin in the area. Within a few days, the admin met with the neighbor and decided to move the nano to Idiani’s house. She now manages the nano along with the connection of 12 other users, including the former nano operator. Idiani said the neighbor accepted this change, adding, *“I do a much better job of taking care of the connection. We have technical issues sometimes but I don’t disconnect the equipment unless I have to. Now I can play DOTA with fewer interruptions.”*

Servers

Servers are important pieces of equipment within SNET for information storage and for monitoring the activity of users, particularly in relation to bandwidth usage, which is a

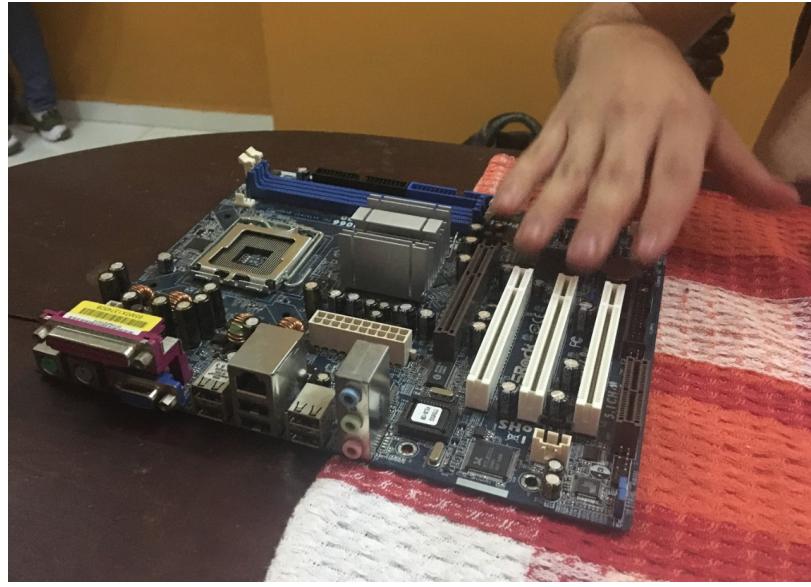


Figure 6.3: Pieces of Jordani’s broken server (Photo: M. Dye)

crucial due to the material limitations of the network.² Jordani explained, “*I configured [the server] to let me know when someone exceeds their traffic limit. When the bandwidth is saturated, that user gets automatically disconnected for a day.*” SNET is composed of reused and repurposed materials, which have to be carefully and artfully maintained.

“They are very old machines. These ports are no longer manufactured... For us to assemble this equipment we have to look for old plates, but these plates tend to be damaged because the manufacturers make them to last 5 years, no more, otherwise the capitalists would not survive... the one I have is 13 years-old and it has finally given out.”—Jordani (M, 32)

Changing material forms make technologies more difficult to repair [225] and, “corporate values in repair impact local repair worlds” ([245]:8). In Havana, people anticipated items breaking, partially because they believed technology had been designed to be replaced. One evening in July 2017, Jordani had pieces of his server spread across the kitchen floor. Jordani described how he works to make equipment last longer than it was designed to, emphasizing that Cubans have the skill of repairing and reusing broken things. Due to this

²See section 5.3.1 for an in depth description of the management of bandwidth.

breakdown, Yordani had monitor user activity manually: “*it’s really annoying to do it this way because it’s time I’m spending. My time.*” He explained maintaining SNET is like a second, full-time job, leading him to enroll the help of his spouse, Daylin, and other SNET users to help him collaboratively repair breakdowns. Daylin, a veterinarian, said, “*at first, I didn’t know anything but I learned how maintain computers to help Yordani. Now, I know a bit of everything.*” Even with the help of Daylin and others, Yordani said he is unable to do all the work himself and, for that, he relies on Mateo.

“The day Mateo leaves, I won’t have time for this because every five minutes someone will need help. The work he does, I can’t do it. There are people who don’t want to be an admin, because it’s a lot of work. But in the end it has tremendous power.”—Yordani (M, 32)

6.4.3 Anticipating Breakdowns

Due to regular breakdowns and the ongoing M&C work required, users have developed organizational strategies based on local conditions in an attempt to minimize breakdowns and subsequent work, three of which I describe in this section.

The Copy Schedule

As more users joined SNET, the network became overloaded, often making it difficult to connect. In response, nodes began implementing a “copy³ schedule,” rules dictating when particular activities are permissible.

“The main objective is the game. That’s why there are times to do certain activities. The game schedule is most of the time, from noon to 2 or 3 am. You can’t copy then because that has to go through a main node. It slows down the network and those who play would be affected.”—Madelin (F, 20)

³The term “copy” refers to uploading or downloading multimedia content.

Highlighting the network's leisure-based principles, the copy schedule prioritizes gaming during peak hours. Users are only allowed to download and upload content from the hours of 2 a.m. - noon (during which time gaming is prohibited). As opposed to other CNs that extol network neutrality as a virtue [246, 212], due to the technical limitations of the network, SNET users actively prioritize certain digital engagements over others. Node admins, like Jordani, are responsible for monitoring uploads and downloads, ensuring users adhere to the schedule to prevent network disruptions. In order to enforce the copy schedule and to penalize those who misuse bandwidth, administrators monitor the amount of bandwidth that users in their nodes consume. Julio, a user from CentroNet, explained, “*Those who manage servers have the power. If they detect you copying out of schedule, they may prohibit you for a day or longer.*” Indeed, the ownership and location of the servers did imbue those who managed them with a form of power, while also increasing the maintenance work required to manage and repair the equipment.

“*Nobody wants to be an admin; it’s a job for pleasure, not for money. Everyone wants to have the big A [on chat], from some points of view that’s very important. An admin has advantages that a user does not have. For example, with admin permission I can do what I want, without limits. I can copy outside the schedule.*”—Jordani (M, 32)

On chat forums, admins are designated by a red “A” next to their username, a feature Jordani refers to as a sign of privilege. In addition to preventing network breakdowns, the schedule serves as a small reward for admins, permitting them to upload and download multimedia content at all times of day. Although the schedule has assisted in managing bandwidth to a degree, as more users join, it does not always adequately prevent network breakdown. As a result, some admins have limited the number of new users they accept into their node for fear of overloading the servers.

“When There is Rain... There is No Network”

Due to its tropical climate and location in the Caribbean Sea, Cuba is prone to regular thunderstorms and hurricanes (especially during the rainy season from April-October). I conducted my fieldwork during the rainy season, which provided insights into the ways participants and the network interact with the weather. I observed users repeatedly collecting cables and routers so they would not be damaged during storms. Once a storm passed, individuals had to redistribute and connect equipment to reestablish their connection. Although I never saw it in formal rules, participants said users have agreed to suspend activities during storms due the disruptive nature of the weather.

“One of the rules is when there is rain everything is disconnected and there is no network... it’s a measure we take to protect the equipment. When I see that it’s going to rain, I call my grandmother and tell her to disconnect my equipment.”—Yaritza (F, 26)

Participants adjust their activities to adapt to the unpredictability of the weather. This requires enrolling the assistance of people that are not members of the network. Yaritza, for example, has taught her grandmother how to disconnect her desktop computer, cables, and other related equipment when there is a storm and Yartiza is not at home. The weather, therefore, requires people to forge relationships with non-users in an attempt to prevent further breakdowns. Similarly, Enrique taught his mom, Gloria, how to disconnect his equipment during rainstorms. As a result of caring for Enrique’s equipment, Gloria ended up becoming an active user.

“If this is so important that he calls me in a panic telling me to pull out the cables from the wall, I had to see for myself what it was all about. Now, there are days when I’m connected more than Enrique. It’s great. Look at what they’ve built. I’m very proud.”—Gloria (F, 47)

Gloria's interest started with a curiosity to see what her son and his friends had built (and why they were so concerned with protecting their equipment from storms). I had similar conversations with other mothers, fathers, and grandparents of SNET users around the city whose children and grandchildren had taught them how to disconnect equipment to preserve the connection to the network. Despite precautions, inclement weather continues to jeopardize the technical infrastructure, especially due to users forgetting or not being able to disconnect their equipment when away from home. This lead to the development of other strategies to better cope with regular breakdowns.

Establishing a Tax

Before SurNet was connected to SNET, the admins held meetings each time a major piece of equipment was damaged, often collecting money from node representatives to replace equipment that could not be repaired. However, this process became laborious. When SurNet grew to 150 members, Mateo and Jordani realized they needed to be better prepared:

“Every time equipment broke we had to stop everything 15, 20, 30, days, either trying to fix it or find a replacement. We realized it’s more feasible to have the money ready before equipment breaks. Then you don’t have to go looking for it because it’s impossible to find equipment...those things aren’t sold in stores. So if it appears at a good price, we buy it and save it. And when lightning strikes or something breaks, I’m ready.”—Jordani (M, 32)

Mateo and Jordani met with representatives from each node who agreed to collect a monthly tax from users (about 1 CUC per month) to sustain the network. In order to avoid SNET appearing like a business (which would make the network illegal), the regulations state that users cannot profit from the network. Jordani maintains a website tracking the funds collected and what they are used for, facilitating transparency and trust within his node, as users are able to see that their financial contributions assist in sustaining their network and that Jordani is not profiting from it.

In 2017, the generals adjusted SNET’s rules, requiring each user to pay a tax so that the network could be better managed overall. It took several months for Jordani and Mateo to reach an agreement with their general, who wanted to hold all the money SurNet collected so whenever new equipment was needed, Mateo or Jordani would have to request the money.

“Now I can’t say I won’t pay because it’s in the regulation and they’ll disconnect me. But we achieved an agreement . . . we only have to give them 10% of what we collect. Almost nothing. There are places that give 100%. With [the admins] we’ve always gotten along well, except for that point: the money. The truth is we don’t want to be disconnected. But it bothers me that I’ve created all this and another comes and controls it.”—Jordani (M, 32)

I found other instances of tensions resulting from implementation of the tax, including users that complained about SNET becoming a business as well as admins who abused the new regulation to charge incoming users to join their node. The decentralized, ad-hoc structure of SNET has led to different norms across nodes, revealing diverse values and ways of managing the network.

6.4.4 Motivations Underpinning Maintenance + Care

Participants are motivated to undertake M&C work for a variety of reasons, the first of which is the gaming aspect. SNET grew out of a desire to play digital games and the regulation maintains that “the game” is the ultimate purpose of the network. Participants described the ability to play games from their home as a luxury.

“I don’t want to sit on the curb in the heat paying lots of money for slow Internet. It’s disgraceful. To connect on SNET at home, that’s amazing, you know? It’s a change from what we had before. There are issues but really, it’s fantastic. We’ve done good work despite hassles. Imagine, we’re just regular people and look what we’ve built.”—Ronaldo (M, 27)

Ronaldo is referring to the WiFi hotspots opened by the Cuban government in 2015 [154]. Participants said they preferred using SNET because the hotspots were laborious, expensive, and too slow to meaningfully engage with the Internet. Osvaldo added: “*I find it uncomfortable going to a park to connect. I’ve done it very few times because it bothers me to have to connect in that way. I do not like it.*” Instead, participants turn to SNET to be able to use social networking sites, download music and movies, and search for information.

“*This is the only way for us to get closer to the Internet, which everyone wants.*

There are those who have Internet access and put things on pages [in SNET].

Then we all eat from there, so to speak.”—Jasiel (M, 23)

In addition to facilitating access to content from the WWW, SNET provides an avenue for people to create and share content, similar to other informal networks in Havana , like El Paquete Semanal [247]. Yamirka, a user from CentroNet, described SNET as, “*an alternative media platform within the Cuban space,*” highlighting how, increasingly, people are inserting original content into SNET. However, unlike El Paquete, SNET facilitates valuable real-time interaction with content and users. Simultaneously, participants said SNET did not quite measure up to having full access to the WWW. Yamirka described SNET as “*a fake Internet because it gives you a false illusion that you’re connected and you can see everything.*” However, participants regularly compared SNET to the WWW, often describing services and sites in terms of popular online platforms, like Enrique, who said SNET, “*is like Facebook, but with less people.*” While he enjoys downloading music and playing games, SNET also provides access to academic content and collaboration with other students.

“*In Cuba, students are at a disadvantage because we don’t have access to the Internet like you do. On SNET, I can get material from my buddies who live across town. I also find information for projects on the forums.*”—Enrique (M, 23)

SNET provides access to information, education resources, and classifieds. Antonio refurbishes old cars and, through SNET, he is able to purchase parts directly from home, saving him time and money. However, I often tried to connect to SNET with Antonio but, many times, either specific pages or the entire the network was inaccessible. Even if he is not able to get on SNET Antonio said, “*I still care for the equipment because I’m caring for everyone’s connection. I do it out of goodwill, I guess. It’s part of being a good neighbor... of being a good friend.*”

In addition to helping others care for equipment, participants spoke of the importance of social connections made through SNET. While the network fosters online communities, community groups on SNET host in-person meet-ups throughout the year.

“The most important thing about SNET is the relationship between all users.

It’s like a family. At the events, I meet people I’ve known for years on SNET but never in person. It was as if we’d known each other our whole lives.”—

Alejandro (M, 65)

Although users experience periods of disconnection from the virtual community due to continual breakdowns, they maintain contact with others by going to in-person events, which serve to reinforce their membership. Although SNET has thousands of users, the majority of the population in Havana is not connected. However, participants described M&C work as a way to increase access to a type of Internet in Havana, from which many can benefit. In fact, participants said there have been discussions with the Cuban government about making SNET legal.

“There’s talk of how to legalize [SNET]... The day they legalize it, it will be more flexible. We won’t have to take so much care with what’s said because the job of enforcing the rules will be on the government. This is a country where the control of all information has to be on the government... that’s how things are managed.”—Yordani (M, 32)

Many spoke with skepticism regarding both the legalization of SNET and whether widespread, in-home Internet access would ever be achieved in their lifetime. Until then, participants said they would have to keep experimenting, fixing, and collaborating.

“We all have to sacrifice and cooperate with everybody—it’s all or nothing. We all use it and depend on certain equipment. After so many problems and so much work, to just quit all of a sudden? No, when you’ve come so far, you can’t go back.”—Mateo (M, 43)

Although Mateo described M&C as arduous, he also said this work motivates his continued engagement with SNET. The desire for Internet and the cooperative engagement required continue to feed into a system that must be made and remade by thousands of volunteers, providing an innovative, adaptive mini-Internet particularly suited to Havana’s local context.

6.5 Discussion

In 2012, Jackson et al. proposed a thought experiment for CSCW, asking researchers to imagine a recessionary informatics through broken-world thinking, focusing on the ways communities “organize to sustain, manage, re-purpose, or simply live with that they have” ([59]:1). Building on their work, I contribute a story of innovation within a broken world, illuminated through participants’ practices of M&C for material and human elements of SNET. In the following sections, I first describe how my findings contribute a richer understanding of the qualities and outcomes of CNs. Then, I contribute to CSCW scholarship committed to decentering sites of innovation, complicating perspectives on innovation among underresourced communities through a discussion of cultural perspectives and tensions underpinning ongoing interactions with the network.

Community Networks in a Broken World

In this section, I contribute to CN scholarship leveraging a broken-world perspective, complicating prior assumptions around the affordances of CNs. First, I highlight the role of leisure as a driving force in shaping the M&C work in SNET. Second, I illuminate how this M&C work draws on and shapes community ties, while also fostering tensions. Finally, I discuss power entanglements that caution against indulging in romanticizing the local nature of CNs.

Emergent ICTD research has emphasized the role of aspirations in shaping technology adoption and use [248, 249], and prior work has also highlighted the importance of non-instrumental gains that individuals and communities derive from technology use [250]. I confirm these findings for CNs throughout my study, where I found that participants were motivated to undertake M&C work out of a desire for gaming, like with the copy schedule. A common challenge among CNs is to motivate people to find value in CNs, and educating users to maintain the equipment [221, 220, 222]. I argue that these efforts might be more successful if they prioritized non-instrumental uses of CNs that align with the aspirations of their users. I agree with Nemer's argument for paying attention to non-instrumental technology use in his study of social media use in Brazilian favelas [41]. Being in greater alignment with users' desired outcomes is also likely to result in sustained engagement around the CN in question.

My findings highlight how SNET is maintained through collaborative acts of care. Moments of breakdown reinforced the reliance on social connections, revealing how SNET depended on shared values of collaboration, cooperation, and interpersonal support [226]. Not all actors engaged in this M&C work were equipped with technical knowledge. For example, parents and grandparents regularly disconnect equipment during storms because they cared about SNET users, namely their children and grandchildren. Care contributes to ideas of responsibility and commitment, motivating individuals to undertake M&C in the assistance of others, like Antonio who maintains his neighborhood connection because it is

“part of being a good friend.”

Breakdowns in SNET were not only material, they were also social, complicating my perception of positive community outcomes resulting from CN engagements. As Heuts and Mol discuss, tensions may arise as tomato farmers choose among taste, appearance, and feel in their valuation of tomatoes [237]. In SNET too, participants must choose ways of caring, like Mateo, who tries to balance the time available, the level of repair required, and the importance of the breakdown. As a result of these decisions, certain people are disconnected for longer periods or completely, as in the case of Miguel and Carlos. CN scholarship has advocated for formalized management guidelines to ensure sustainability, fair treatment, and scalability [212]. While the M&C demonstrated by individuals was not standardized, building clear guidelines into when and how people must care diminishes their autonomy to make locally appropriate decisions. As recommended in prior scholarship on invisible work [251, 72], making these interactions more visible or standardized may jeopardize what makes these acts of care so successful.

Examining M&C work also complicates egalitarian notions of decentralized, sociotechnical infrastructures, surfacing power tensions embedded within engagements [56]. Although SNET facilitate access to digital services where it would otherwise not exist, moments of breakdown also highlight tensions from varying positions of power—from neighbors who can prohibit users from stringing cables through their balconies to admins whose management styles impact the experience of others. Mohan and Stokke have discussed, for such cases, the tendency to romanticize “the local,” thereby downplaying social inequalities and power relations that my study brought to light [252]. Although CNs have been said to facilitate more inclusive access [213, 253], my findings demonstrate how certain users have been excluded from the network. Further, SNET is not widely available to people in Havana due to many reasons—cost of equipment, distance from the nearest node, limited router slots and IP addresses, as well as unwillingness by some admins to connect new users.

Not only are there power structures at play within the network, there are power structures acting upon it as well. Prior work describes user autonomy as a distinctive feature of CNs, emphasizing a commitment to free speech and resistance to surveillance and repression [213, 212, 219]. Although some CNs may seek to enable individuals to challenge preexisting power structures [254], SNET members actively avoid challenging the Cuban government by banning activity that may be considered subversive, thereby sacrificing user autonomy for network autonomy. Due to the labor involved, participants did not view network autonomy positively; instead, they would much rather have the government assist in these endeavors. Similar to instrumental arguments for technology use, overly positivist framing of CNs as “sites of grassroots mobilisation and resistance” ([252]:263) risks ignoring power asymmetries entangled in these networks, as well as participants’ desire to have more assistance from formal structures in the maintenance of this system.

In sum, my study of SNET—a CN in operation without external intervention—highlights that there are several benefits that CNs afford for communities that are unconnected or under-connected. However, there are also tensions that surfaced, suggesting factors that might be considered in CN-based interventions. First, interventions should prioritize users’ desired outcomes over instrumentally-driven designs. Second, if researchers and practitioners wish to encourage more participation and community-ownership among appropriators, this must be accompanied by a careful attention to the increased labor and potential power imbalances, which may not be as visible without a focused attention on the ongoing M&C required to sustain such systems.

The Broken World as a Site of Innovation

My findings contribute to complicating the notion of innovation through a broken-world perspective. I simultaneously advocate for a legitimization of M&C practices as innovative, while also questioning dominant perspectives of innovation that reinforce a universalist, progressive framing of sociotechnical engagements. I join with other scholars who

advocate for a consideration of M&C practices as innovative to decenter traditional sites of innovation [46, 56, 57]. My research extends a growing body of work on M&C—within and beyond the field of CSCW—focused on populations that have previously been overlooked in scholarship.

The term “innovation” is taken to imply assumptions of positive change. Discourses around innovation have been located within capitalist notions of linear progress, preoccupied with “speculative extraction of future economic value” ([232]:694). By contrast, M&C work is locally situated in worlds of shifting tensions [231], where breakdowns, not progress, are considered the norm. By viewing broken worlds as sites of innovation, I complicate the dominant paradigm of innovation as linear and progressive-driven. My focus on M&C reveals innovative practices—supported by participants who regularly spoke of themselves as inventors, making do with the materials they had to rework social and technical configurations. For example, there was Antonio, who built “houses” to protect his nanos, or Yordani, who configured his server to notify him when users had violated the copy schedule. In her study on Facebook use in India, Kumar highlighted how socioeconomically disadvantaged youth operated within a culture of *jugaad*, “innovative and improvised solutions that arise as workarounds or shortcuts in response to the scarcity of resources” ([9]:4). My participants spoke analogously of Cubans as natural inventors, showcasing the culture of *resolver*, as they made-do in the face of breakdowns, limited equipment, and exclusion from Internet access. Bandura argues, “among the mechanisms of personal agency, none is more central or pervasive than people’s beliefs about their capabilities to exercise control over events that affect their lives” ([255]:1175). Engaging in M&C reinforced participants’ confidence in their own abilities, as they exercised agency at an individual and collective level to drive innovative, experimental practices.

In sum, ongoing tinkering and experimentation enables a network that provides a form of Internet for thousands of people. However, lest I romanticize the M&C required, I also note how, in addition to accepting breakdowns as normal, my participants considered

this work to be arduous—like Miguel and Carlos, who spent months trying to reconnect to SNET, or Antonio, who said he has to constantly work on SNET due to continuous breakdowns. Further, although users emphasized the collaborative nature of the network, they also recognized the power tensions within it, and their feelings of exclusion from the WWW. While I join with others in advocating for increased scholarship attending to innovative, local practices by under-researched communities, I also caution against glamorizing these efforts and/or those who participate in them.

6.6 Conclusion

This chapter presents an investigation of the daily practices of M&C within SNET—a CN in the city of Havana, Cuba. I highlight how, through M&C, Cuban citizens have appropriated, built, and reworked technologies to develop a network uniquely suited to their context, while also grappling with tensions arising from these ongoing efforts. My findings demonstrate the inherently collaborative nature of M&C work and the resulting technological innovations as participants care for multiple elements of the network, as well as the underlying values that motivate these engagements. By adopting a broken-world perspective [56, 59], I uncover the opportunities and conflicts present in a sociotechnical system that must be made and remade on a regular basis. All infrastructures contain inherent vulnerabilities that require continuous maintenance, which often remains invisible [78, 72]. Similarly, SNET is maintained within a delicate balance as individuals negotiate between multiple elements, however, these practices are highly participatory and visible. While the broken world in which SNET operates may seem extreme, it is indicative of the ways in which all technological engagements, and resulting innovations, are entangled within complex webs of potentially conflicting values, emotions, and aspirations.

CHAPTER 7

CONCLUSION

In the previous chapters, I describe how the imagined potentials of the WWW collide with the realities of constraints, and how participants collaboratively negotiate and configure multiple sociotechnical elements through the ethos of *resolver*. I unpack the tensions and opportunities that result through these processes and how they shape the wider sociotechnical systems that emerge in Havana. I began this dissertation posing the following research questions: How do people configure the Internet in Havana? What is the Internet that is produced and how do participants experience this sociotechnical system? In the sections that follow, I address these questions based on the data presented in the proceeding chapters. I conclude with open questions that emerge from my findings and suggest directions for future research.

7.1 Collaborative Configurations

In the introduction to this dissertation, I describe how utopian hopes for the WWW have become intertwined with development narratives, reinforcing assumptions regarding the individualistic, equalizing, and democratizing nature of the Internet and ICTs. These narratives have been globally perpetuated through policies, institutions, and the media, extending a linear connectivity development model whereby, eventually, every person on the globe will be connected to the WWW. Although scholars have critiqued these perspectives, dominant approaches to design and technical interventions presume individualistic, consumer-driven Internet engagements, which are reflected in a variety of ways, including how social media platforms are designed to the ways that cell phones are built. These narratives also frame research approaches and perspectives about the interaction between people and Internet technologies.

As WWW access initiatives increase, including pressures on under-connected countries to provide access for their citizens, these narratives of the WWW seep into the local vernacular and imaginary. In Havana, participants spoke about how Cuba, as a country, is “isolated” and “behind,” saying that the Cubans “need” Internet access to “catch up” with the rest of the world. For example, in Chapter 3, Gertrudes describes Cuba as an “underdeveloped country” due to the U.S. embargo and “poor” technology. Participants said the lack of information access has hampered Cuba’s development, amplifying their sense that they are isolated from the rest of the world. Echoing the sentiments of other participants, Alysa spoke about the *need* for all Cubans to have access to the Internet so that they understand “*how the world actually is.*” At the same time as participants described limitations and anxieties, they also discussed the intelligence and ingenuity that Cubans bring to Internet engagements, as well as their everyday lives. In Havana, the values reflected in global narratives bump up against limiting realities, imagined potentials of the WWW, and local values. How do participants contend with their desires, abilities, material scarcities, and opportunities? Through the ethos of *resolver*: the belief that they must *work together*, through struggles and triumphs in small, inventive ways.

Resolver is inherently collaborative as people collectively configure various elements in the pursuit of digital activities that they find meaningful. Through collaborative configurations, people undertake small and large tasks, which is an element of *resolver* - the small, everyday tasks that may (or may not) lead to larger outcomes. One way that people collaborate to form and engage with the Internet is through Internet intermediaries, whereby individuals rely on others to help them accomplish digital activities. Many participants depended on social contacts to maintain their online presence, such as Alysa in Chapter 3, who tagged her friends in pictures so that the photos would appear on their pages. In another example, Vincente described how he relied on a friend in the U.S. to help him set up a GoFundMe page to support his son’s band. Relatedly, Samara worked with me via email to find information on graduate programs and scholarships for a master’s program

she was hoping to pursue. In this way, individuals lean on collaborative configurations to engage with the Internet in ways that go beyond survival to encompass broader aspirations and goals.

Participants also depended on others to configure versions of the Internet on their behalf. When engaging with EP, we see that participants are limited to the content that has been selected for them by others. However, instead of viewing this pre-selected content as limiting, several participants preferred to only get partial contents of EP that had been selected for them by someone else. For example, Javier says that there is too much information for him to go through each week and, therefore, he prefers to depend on his friend to both acquire the information and select content that she thinks he will enjoy. People also rely on collaborative efforts to help them configure technology. In Chapter 5, Ricardo describes how he helps his EP clients update their phone software. These collaborations have also facilitated inventive technical configurations, as people lean on others to acquire the knowledge needed to pursue technical engagements. Comparably, in Chapter 6, in order to be able to set up his node's SNET antenna, Antonio contacted a friend in the U.S. via email asking him to send instructions.

The individualistic narratives surrounding the Internet as an avenue for human development and progress conveniently ignore the infrastructures that make the Internet possible [24]. Throughout this dissertation, I highlight the human infrastructures underpinning Internet engagements in Havana, drawing attention to the collaborative configurations enacted among participants. Lee and colleagues describe how the human infrastructure achieves collective action by making peoples' relationship to the whole infrastructure (in their case cyberinfrastructure) invisible and irrelevant, dissolving the need for distributed teams [76]. However, in Havana, we see a very seamful Internet, which results in a human infrastructure more visible than infrastructures have previously been conceived. Additionally, people are well aware of their relationship to the wider infrastructure, as well as their dependence on others.

Through the ethos of *resolver*, people were acutely aware of their role in maintaining the Internet through a variety of distributed tasks. They were also aware of their reliance on a multitude of other human actors. Participants could not only rely on formal and informal Internet providers (e.g. ISPs, ETECSA, EP paqueteros, or SNET admins) to provide them with a seamless version of the Internet. Instead, if they were to engage with the Internet, they had to lean on one another, acknowledging that the Internet produced was not (by traditional standards) seamless. While these efforts often require a lot of work, participants spoke about how these actions served to reinforce social connections and an increased sense of community. In Chapter 6, Alejandro described the outcomes of being a part of SNET: “*working together to interconnect makes you more human, it makes you more part of a community, makes you more of a neighbor. That’s why I say that [SNET] important and necessary.*” This work demonstrates how engagements with the “Cuban Internet” are deeply relational. Instead of consisting of an individual’s relationship to a wider infrastructure or to technical components, Internet engagements encompass relationships to one another and to one another’s actions, which do not and, in fact, *cannot* occur in isolation. The visibility and awareness of the human infrastructure facilitates different types of engagements that may or may not have been available had people only had traditional access to the WWW.

The quotidian configurations of the Internet in Cuba transform traditional perspectives of the Internet as a consumer-driven, individualistic space. Due to the political and material conditions in Havana, there is a different approach of valuing and meaning that occurs throughout the processes involved in Internet engagements. *Resolver* provides a way of looking at how the navigation and the maintenance of the Internet in Havana is occurring through interconnected actions that resist an individualistic framing of digital engagements and the Internet, more broadly. What type of sociotechnical system results out of these collaborative configurations driven through *resolver*? I address this in the following section, where I describe the type of Internet that has emerged in Havana.

7.2 The “Cuban Internet”

What type of internet has been produced in Havana? In Chapter 1, I describe the internet in Havana as a thorny object to define. Throughout the data presented in this dissertation, people simultaneously refer to the WWW, EP, and SNET as “the internet.” Although I’ve divided these sociotechnical systems into separate categories for the sake of analysis, they are not independent of themselves as people move within and across the seams of these networks to approximate a version of the internet that suits their goals. The human infrastructure acts as an avenue for configurations, as participants move across and within the seams of these systems, negotiating between people, technology, constraints, opportunities, and values. Throughout the process of producing the internet in Havana people “wrestle with many infrastructures’ limitations and possibilities” ([45]:5) in their efforts to work towards moments of alignment, thereby producing a “Cuban Internet,” which consists of both limited access to the WWW as well as local information networks, including EP and SNET. As a result of the collaborative configurations described above, the “Cuban Internet” that emerges is one that is locally situated, not primarily hardwired, and human-centered.

Since the configuration of the internet involves collective configurations that often occur away from a screen, this internet is not limited to digital engagements. Participants plan out the activities they hope to accomplish online prior to going to the WiFi hotspots, often by writing out their activities on paper. Often, people divide up these activities between them, such as Rafael and Claudia who split up online activities prior to visiting WiFi hotspots and then, after leaving, they *“tell each other how it tasted.”* Returning to the example of Vincente in Chapter 3, his friend not only set up and managed the GoFundMe page, she also collected the money raised and found another person who was traveling to Havana to hand-deliver the funds to Vincente. In the study of Wifi hotspots in Chapter 4, the places and spaces through which people have to move to engage with the WWW impact the nature of use, from the people in the parks, to the seating and shaded spots available. Participants

must contend with and negotiate between all of these elements, once again highlighting how configuring the internet is a locally situated task that often occurs away from direct digital engagements. Although the “Cuban Internet” may be one that is mainly engaged with “offline,” participants’ are finding ways to include local content with the wider flows of information. As access to the WWW has increased in Havana, albeit incrementally, more diverse content has been included in both EP and SNET. Further, as more local content is included in EP (e.g. Cuban musicians becoming famous by being included in EP), this content is, in turn, being placed on the WWW (e.g. Cuban-produced music videos on YouTube).

I described the “Cuban Internet” as human-centered because of the human connections driving, sustaining, and being reinforced through this internet. While there is desire for access to information and entertainment (which are valuable pursuits in their own right), participants are also motivated through their desire for personal connections. For example, participants persist through limiting access to WiFi hotspots for one primary purpose: to connect with family and friends outside of Cuba. However, people are also motivated through the human connections produced through the collaborative configurations, such as Alejandro, whom I mentioned in the previous section. People aspired to connect to those outside of Cuba but also to those in their local communities, whereby collaborative configuration served to reinforce their social connections.

Another element of this human-centered internet involves the ways that people engage with material and social elements with care, or the ongoing interactions that contribute to supporting both individual and community well-being [237, 256]. In Chapter 6, I focused specifically on the care that participants exhibit in the maintenance of material and social elements of SNET. However, the notion of care is also embedded within the *resolver* ethos, evident throughout the other chapters in this dissertation. Participants described *resolver* as an understanding that “*everyone must persevere together*,” as Idiani said. In doing so, people exhibit care for one another through an acceptance that everyone needs one another

in order to survive. Participants described ways that they undertake extra configurations to facilitate digital engagements for others. In Chapter 3, Alysa describes how she posts and tags photos for friends on Facebook that are unable to update their own pages. While the work that people have to undertake is at times laborious, participants view these efforts more positively when they serve to help others. For example, Ricardo, in Chapter 5, undertakes extra work to help his clients because, “*there is no internet*” so he “*bring[s] it to them.*” Participants spoke about making sacrifices on behalf of others, recognizing the shared state of scarcity and limitations within which they operate, such as Mateo, who said that “*we all have to sacrifice.*”

However, this human-centered and human-mediated internet is not without its limitations or problematic elements. In addition to creating extra work for participants, the collaborative configurations occurring through the human infrastructure also call attention to elements of power acting within and upon the internet in Havana. Scholars have framed technical appropriation as a negotiation of power [44] and how collective acts of agency require negotiations between communal values and group power relations [50, 51]. Through the lens of collaborative configuration, these perspectives of power become apparent in the configuration of the internet in Havana. Since the “Cuban Internet” relies on human mediation, participants are in constant negotiation between those who have access to resources and those who do not. Similar to other participants, Dayma, in Chapter 4, uses her sister’s tablet when trying to get online because she does not have her own tablet or smartphone. She says she does not want to take away her sister’s device all the time, so she limits the amount of time she spends online. In Chapter 5, there were times that Renier’s EP provider did not include the Christian section (which was of primary importance to his clients) and, therefore, Renier had to “make up the difference” by undertaking extra configurations to piece together content and create his own Christian section. In Chapter 6, I provided examples of individuals who were excluded from the network because of their reliance on others. Relying on others to access and engage with the internet, therefore, resulted in

less-than-ideal outcomes for certain participants.

In addition to negotiations of power occurring among people, there are also structures of power influencing the way participants undertake collaborative configurations. While the WWW has been described as a liberating force, capable of challenging pre-existing power structures [254], participants actively avoid challenging the Cuban government by engaging in self-censorship on the WWW and in local networks. Participants did not describe the WWW as a place for free speech or user autonomy. Instead, the activities they found meaningful involved connecting with others, accessing information, and participating in leisure-based activities. In order to protect themselves and their internet, people banned activity that may be considered subversive, thereby sacrificing user autonomy for network autonomy. Participants described these actions as “normal,” exhibiting the internalized nature of self-censorship that underpins life in the country.

Through a perspective of situated agency, Fabienne Peter argues that the acts of marginalized individuals may be misconstrued as acts of submission, when, instead, they are subtle strategies of resistance, capable of enacting wider change [257]. Similarly, in Havana, since collaborative configurations operate within government regulations that require censorship, these efforts may be perceived as submissive acts. Instead, I would argue that they represent intuitive and innovative forms of subtle resistance to the limiting forms of information, communication, and WWW access that have been provided for them. Without outside interventions by institutions or professional designers, participants have worked towards developing thriving information networks that have succeeded due to the intimate knowledge present within the human infrastructure in Havana (e.g. how to avoid retribution). *Resolver* is a form of resistance, but not one intended to place people at risk of getting in trouble with the government. In other words, moving through an ethos of *resolver*, participants find ways to cope within their current situation while constructing versions of the internet that are not overtly controversial but still provide them with meaningful digital engagements that were previously unavailable.

The need to self-censor *was* viewed as limiting, but not because of a desire to speak out against the government. Instead, participants spoke about the extra work generated from needing to censor content. In EP, maestros and paqueteros had to undertake extra work to “clean” the content. Similarly, in SNET, due to the labor involved in monitoring user behavior, participants did not view network autonomy positively; instead, many would rather have the Cuban government assist in these endeavors. Akin to instrumental arguments for technology use, overly positivist framing of community networks or alternate Internets as “sites of grassroots mobilisation and resistance” ([252]:263) risks ignoring power asymmetries entangled in these networks, as well as participants’ desire to have more assistance from formal structures in the maintenance of their sociotechnical systems. In the following section, I unpack how *resolver* contributes to complicating traditional perspectives regarding the value of innovation, describing the core tenant underpinning *resolver*: innovation driven by necessity.

7.3 *Resolver*: Innovation from Necessity

Throughout my fieldwork, I regularly heard the colloquial Cuban phrase, “*if necessity is the mother of invention, Fidel Castro is the father.*” Participants’ collaborative configurations reinforced the *resolver* ethos underpinning the cultural identity of Cubans as “natural” innovators, capable of “*doing much more with technology than the average PC user out in the world,*” as Gavin said in Chapter 3. Although innovation can operate in any human context, historically, innovation has been considered “legitimate” when it occurs in certain ways and among certain people (typically in the design of new artifacts by elite, white men). As mentioned in Chapter 1, scholars have contributed towards decentering innovation through a broadened perspective of the type of work considered innovative as well *who* is considered an innovator. My findings support prior arguments demonstrating how innovation occurs as much in the articulation of a technical object as in its design [denis2015maintenancestudies] and how this innovation is located in sites far away from

where these objects were originally designed. This work reveals how innovation is a human process, which can happen in the creation of an artifact, but also in its use and re-configuration. While *resolver* is similar to other cultural ideologies of making do (like *jugaad*), because of the sociocultural context of Havana, *resolver* hinges on notions of social reciprocity and collaboration. Therefore, not only are internet engagements in Havana relational, innovation, in this sense, is relational, too. In practice, the relational, collaborative elements of innovation in Havana reinforce community solidarity as well as collective pride in the ability to resourcefully re-purpose and configure technical elements towards a distinct sociotechnical network.

However, at the same time that participants communicate awe and pride in their innovative practices, they also describe frustrations and discouragement at the *need* to *resolver*. These innovative, collaborative practices remind participants' that they *have* to interact with the internet in this way, reinforcing the feelings that they have been isolated and excluded from the global WWW. While I draw on scholarship in CSCW and ICTD that seeks to decenter sites of innovation, I agree with Lilly Irani's argument that the move to decenter innovation still renders the definition of innovation as unproblematic. Instead, Irani says that, "we should examine innovation as a process of the recognition of value rather than granting it concreteness it does not have in practice" ([68]:191). While showing the creativity and resourcefulness of communities that must make-do, scholars have also noted the tensions present from the need to be inventive [62, 61, 68]. Nemer and Chirumamilla uncover how repair practices in Brazilian favelas demonstrate ingenuity and creativity, while also foregrounding the systemic instability and wider exclusion of individuals in this community [69]. Similarly, Irani describes how feelings of melancholy accompany *jugaad* in India, whereby resourceful and creative practices also serve to mark "a lack" that led to the practices in the first place [68]. In his work with Digital Tribal Village (DTV) in Native American lands, Christian Sandvig demonstrates how participants downplay technological innovations that make DTV appear different from traditional WWW access models [62].

They aspire to create a network that was as close to the WWW as possible because they want equal opportunities to WWW access. Sandvig describes this as appropriation towards parity: “you will design a system that is as different as it has to be so that you can be the same” ([62]:192).

My participants also regularly valorize elements of both EP and SNET that mirror the WWW, such as highlighting social networking sites on SNET that looked similar to Facebook. Unlike Sandvig’s participants, however, participants do not downplay their innovative practices. Instead, they speak about their configurations with ambivalence: simultaneously describing awe and wonder in their accomplishments alongside frustration and discouragement, saying their achievements remind them how they lacked affordable and useful access to the WWW. Currently, WiFi hotspots in Havana are slow, expensive, and limited to a few public spaces, a model of WWW access that some, such as Ronaldo in Chapter 6, describe as “*disgraceful*.” Participants communicated beliefs that, in countries outside of Cuba, WWW access was pervasive, affordable, and easily maintained. In Chapter 6, Enrique told me that students in Cuba are “*at a disadvantage because we do not have access to the Internet like you*.” Although Enrique had never been to the U.S., he was adamant that I had reliable, high-speed access to the WWW, unlike people in Cuba. Participants said they had to undertake collaborative configurations in this way because “*this is how things are in Cuba*.” Therefore, acting through an ethos of *resolver* serves not only to remind participants of their lack of access to the WWW but also a sense of “lack” in the wider sense, from food shortages to basic resources. Participants are well-equipped to appropriate and configure the internet in Havana because of the years of experience they have had *resolviendo* throughout all aspects of life, from acquiring food to accessing basic resources. Therefore, However, while the ”internet” that has emerged in Havana is innovative, is “innovation,” in this sense, a positive thing?

Glamorizing these configurations as innovative, therefore, runs the risk of fetishizing and othering these communities, while also ignoring the power structures acting upon and

embedded within these practices. As Christian Sandvig cautions, “there is a danger in cherishing the adaptability of the oppressed, who must adapt by necessity because they have no other choice” ([62]:193). If we consider Amartya Sen’s vision of the goal of development as expanding people’s abilities to choose [19, 22], then we see that, in Havana, participants feel limited by their ability to choose which types of internet they have access to and how they are able to engage with them. My participants aspire to be able to choose their access to the WWW, instead of having to collaboratively configure multiple elements of the internet because there is no alternative (regardless of how innovative their practices are).

These configurations occur within hegemonic structures that reinforce narratives of a “need” for WWW access in order to “catch up” to the rest of the world while, at the same time, limiting the ways in which participants are able to engage in ways they find meaningful. For example, in Chapter 6, Jordani said that the technology he uses for SNET has been designed by capitalists in order to breakdown. The fact that participants felt that they could only approximate a version of the internet (instead of having widespread access to the WWW) reinforced the notions that they must make-do with what they have, accepting that the internet produced, while novel and inventive, does not truly encompass everything they desire. Further, participants view innovation as efforts that were required in order to survive but not as actions that will inevitably lead to overall change within their local society. Therefore, at the same time as people describe their work as innovative, they also were keen to remind me of the structural limitations within which they move and operate. These structural limitations recursively reinforce the ingenuity and resourcefulness of Cubans, such as Enrique (one of my SNET participants) who said, *“even I was surprised that we Cubans had built SNET because, with the lack of resources we have, it is very difficult. And we have really done a very good job.”* Similar to the idea of *resolver*, the collaborative configurations and resulting innovations contain seemingly juxtaposed realities as participants celebrate their agency while also grappling with feelings of frustration and exclusion.

Crucially, while people described feelings of collective agency through *resolver*, they also spoke about how they did not have a choice but to engage with the internet in these ways. Therefore, while arguing that local configurations are innovative and capable of providing lessons for other contexts, we need to pay attention to the ways that people are constructing meaning and value from these practices, instead of reducing them to practices that are valuable simply because researchers label them as “innovative.”

7.4 Open Questions + Future Research Directions

In this section, I propose open questions with the hope that other scholars will join me in continuing to explore the complex elements embedded within the interaction between people and internet technologies. Specifically, I outline three open questions that correspond to my conclusions above, as well as my overall body of work. While I do not provide answers for these questions, I pose them as a way to lay the groundwork for future explorations in the fields of CSCW, ICTD, and beyond.

How might we expand our understanding of digital engagements from individualistic to collective?

Traditional design models tend to assume an individualistic engagement (both with devices and platforms). Instead, in Havana, engagements with internet technologies hinge on collaboration as people share devices, collaborate to maintain their online accounts, and tailor digital content and engagements for others. In Chapter 4, I offer some implications for design in relation to the ongoing collaborative activities present in my data in the social computing space, such as having a feature on Facebook or LinkedIn that would allow people the option to assign others as managers for individual accounts (analogous to the option that now exists for managers of Facebook pages). Such a feature would facilitate more control over profiles by allowing individuals to choose the aspects of their profiles others can edit and have access to. Similarly, handheld devices (e.g. phones and tablets)

could facilitate shared use by allowing multiple profiles on one device (a feature already available on computers). Features akin to these would facilitate the use of digital services and devices by supporting the collective strategies of internet access that have developed in Havana, as well as other contexts where intermediated access occurs frequently [40].

In addition to examples of ways that platforms might support these practices, I think that this question also requires a move beyond design implications to reconsider perceptions of how people collectively engage with the internet and sociotechnical systems more broadly. CSCW scholarship has studied ways that people use the WWW in order to collaborate. What changes when, *if* people want to use the internet, they *have* to collaborate?

The locally designed Internets (EP and SNET) are sustained by a human infrastructure, which require people to act collectively if they want to engage with these networks. While *resolver* encompasses the capability for each person to configure elements in their own ways, it is embedded within the *need* for these practices to be collaborative. These collaborative efforts were seen as beneficial and also limiting. For example, in EP, several participants said they preferred to have others select content for them. But, when it came to others having to manage the Facebook pages, there were mixed feelings (such as Samara, in Chapter 3, who said the need to rely on Tony to manage her Facebook page, “*leaves a bad taste in my mouth.*”) As mentioned in Chapter 1, scholarship has argued for the need to shift our perspectives on human agency from individualistic to collective. I think this also involves a shift for from thinking about the WWW in an individualistic manner towards a deeper engagement with the way that the WWW is engaged with and produced through collaborative endeavours. The *resolver* ethos that drives the need to collectively rely on others produces community solidarity, while also generating stress. Future work might explore the social reciprocity that underpins and is reinforced through collective WWW engagements. In addition to focusing on both opportunities and tensions embedded in these engagements, future work in this space might also delve more deeply into how various aspects of peoples’ identities interplay with technology collaboration in resource

and politically constrained settings. For example, ICTD work in other resource-constrained contexts such as India has highlighted how users have to rely on technical intermediaries to overcome access barriers due to their gender (e.g. women were less prone to own technology) [77]. In Havana, future work could examine the way that collaborative configurations intersect with issues of gender and race in this space.

Where is the “human” in the infrastructure?

The collaborative configurations occurring in Havana demonstrate how people are not only dependent on one another for digital engagements, it makes visible how sociotechnical systems are dependant on people to function. By this I mean that, if we take the internet to be locally constituted through collaborative configurations occurring through the human infrastructure, and if we take the human infrastructure to be a process, then we can surmise that these ongoing configurations shape the type of internet that is produced, regardless of where it occurs. How might we more critically consider the human infrastructures and collaborative configurations that underpin sociotechnical systems across diverse contexts?

As Miller and Slater [14], Burrell [7], and others have argued, the internet is locally produced in each locale, as universes of different social and technical possibility evolve around internet practices. How might we better understand the people and efforts that contribute towards producing the multiple “internets” they encounter? In Havana, the foundation of the internet is *“constituted by the pattern of relationships of people, through various networks and social engagements”* [77] or a human infrastructure. Although it may not be as visible as it is in Havana, the WWW also relies on a human infrastructure. As a starting place, this requires empirical work focused on the collaborative configurations occurring throughout diverse locations, which is critical for understanding the type of internet that is produced and the ways people are experiencing these sociotechnical networks.

Further, as systems move towards becoming more and more automated, how might we consider the engagements with information through systems heavily mediated by a

more visible human infrastructure? In Havana, the human infrastructure facilitated different types of engagements that may or may not have been available had people only had traditional access to the WWW. In EP, for example, actors are in constant negotiations with one another, personal preferences, legal boundaries, and technical affordances and constraints. These negotiations are continually feeding into a system that remains responsive and adaptive to a variety of use cases in ways that more hardwired systems may not. For example, participants undertook efforts that demonstrated care for others. In Chapter 5, I described how some Paqueteros charge clients differently based on their current circumstances or sensitively suggest particular content due to a knowledge of that person's situation. The fact that Paqueteros have personal relationships with their clients facilitates these types of engagements. In Chapter 6, I described how Mateo regularly visits users in his node to help them solve large and small technical issues. People not only *resolver* to accomplish activities that are meaningful to them, they also collaborate towards overcoming problems in order to help others. While increased automation may make networks such as EP more manageable from an accuracy or curation standpoint, it also may sacrifice the empathy and care involved in these interactions, particularly when these engagements are mediated by someone with whom a participant has a personal relationship.

As WWW access initiatives continue, and as more actors become involved (including governments, researchers, institutions, and companies such as Google and Facebook), it is critical that we ask what type of internet are we perpetuating? Is simply bringing everyone online an act of inclusion? Although people may interact with and configure the WWW differently across different geographies, we cannot forget that the terms, policies, and designs are still set by a small group of elites. The fields of ICTD and CSCW are well poised to further explore this phenomenon drawing on long-standing concerns in both fields. For example, CSCW has a history in examining the often “invisible” labor that constitutes sociotechnical systems [227], and ICTD work brings our attention to the ongoing interactions of people in the appropriation and configuration of the WWW in local,

non-Western contexts. How can these bodies of scholarship inform each other towards a better understanding of inclusive, participatory internet access initiatives (and the WWW more broadly)? And, how might both fields more actively consider the plethora of actors and collaborative (often mundane) engagements that go into the Internet? These questions warrant future research that bridges both the fields of ICTD and CSCW.

How might we responsibly frame “innovation”?

While bringing an attention to the innovative practices that participants enact in the configuration of the internet in Havana, it is also important to attend to the problematic elements entangled in scholarly efforts to “legitimize” repair practices through an innovation frame. While researchers have advocated for a consideration of ”making do” practices as innovative [56, 57, 258], Lucy Suchman draws our attention to the ways that, “projects to reclaim creativity, invention and the like might themselves be reproductive of a specific, cultural, and historical preoccupation with these particular values” ([46]:1690). Suchman encourages us to question the value placed on innovation itself, asking, “must those not presently identified as creative be shown in fact to be inventors in order to be fully recognized?” ([46]:1690). Along with CSCW work seeking to decenter sites of innovation, ICTD scholarship has made efforts to move away from top-down, prescriptive notions of technical interventions, framing people in “developing” contexts as individuals with diverse aspirations and agencies capable of influencing sociotechnical change [9, 61]. Related work seeks to reframe traditional perspectives of human agency [63, 9], recognizing peoples’ capabilities to enact sociotechnical change as well as supporting their right in choosing lives that they have reason to value [19]. In relation to the *resolver* ethos, work on cultural ideologies of “doing more with less” have also sought to reframe perspectives of communities that have traditionally been at the receiving end of development initiatives. In her book on *kanju* in Africa, Dayo Olopade seeks to share the creative, yet often hidden, triumphs of local practices in order to respond to, “the depressing top-level narratives that have held

the region back” ([66]:7). Olopade argues that informal arrangements undertaken through *kanju* sometimes achieve better results than development initiatives from governments and formal institutions. Correspondingly, grassroots innovation through *jugaad* has been celebrated for the ingenuity exhibited by people who are able to meet their needs in conditions of scarcity [259].

While I support these perspectives, it is also important to consider the potential risks involved, particularly as grassroots innovation becomes increasingly tied to development initiatives. As anthropologist Ravinder Kaur argues, “*jugaad* stories function as ideology; they renarrate the creativity of the poor as promises and hope and mobility despite inequality”([260]:315 quoted in [68].) Similarly, I envision a potentially problematic trajectory for *resolver* (as well as cultural ideologies elsewhere) if attached to traditional perspectives of innovation, whereby “the poor” are not only able, but expected, to work hard in order to improve their circumstances. While *resolver* implies creativity and agency, it is intimately linked to the need to *luchar* (struggle). Among participants, feelings of pride in their *resolver* practices exist in tandem with feelings of frustration and even sadness. Incorporating innovative but necessary practices into perspectives of human development runs the risk of putting the onus on individuals to “make-do” with what they have, thereby avoiding a critique of the national and global structures of power that impact the way that people move towards leading lives they have reason to value.

Further, in an effort to avoid paternalistic approaches towards scholarship and design, researchers within ICTD have sought to draw on lessons learned from these resourceful, sustainable practices and apply them to “developed” contexts. For example, understanding the human infrastructure and resulting “ingenious and resourceful” practices in underconnected contexts, Sambasivan and Smyth argue, could prove to be a productive formulation for design ([40]:8). This move is essential, especially due to development initiatives that have adopted a paternalistic approach by attempting to introduce technical solutions (that have been designed in highly connected contexts) into “developing” countries in an effort

to meet the needs of the “world’s poor.” In this dissertation, I, too, have argued for a consideration of these practices in Havana as a way to reconsider designs elsewhere. However, accompanying this move, I would also encourage future work to ask: who benefits from the translation of local practices?

As noted in Chapter 6, de la Bellacasa argues that discourses around innovation have been located within capitalist notions of linear progress, preoccupied with “speculative extraction of future economic value” ([232]:694). Comparably, Irani highlights how, under the guise of innovation, notions of inclusion, care, and empathy have been appropriated by development initiatives with an preoccupation on turning local, innovative practices into productions of economic value [68]. For example, the book, *Jugaad Innovation*, frames stories of *jugaad* as lessons for Western companies meant to drive innovation and growth to help them succeed in a “hypercompetitive world” [261]. Although it has not been as widely explored or written about as *jugaad*, the *resolver* ethos has begun to draw the attention of American press and corporations. Increasingly, American media outlets have marveled at the unique, inventive ways Cubans work within constraints, citing lessons that should be used for revenue-generating purposes [262, 263]. For example, a *USA Today* article describes Cubans as, “bristling with underused skills, innovation, and an entrepreneurial spirit that could burst into the tech world *if* given the right tools and political climate” ([263]:1, emphasis my own). In another example, the American company, J. Walter Intelligence, released a report from a 10-day research study in Havana in which foreign companies are encouraged to “pay close attention” to the ways Cubans are innovating because companies will “want to be involved in those new advances and innovations” so that they can “apply [Cubans’] skills and knowledge to the things we’re trying to build” [264].

As researchers and designers, we must be aware of how we are framing local practices, lest we reduce such practices to strategies that are valuable only from the perspective of their potential to generate economic value (which is particularly troublesome when this value is intended for people other than those who are engaged in these configurations). Not

only is it problematic for foreign companies to try profit from these innovative efforts; by framing *resolver* in this way, local ways ways of knowing, acting, and being in the world are reframed and subsumed within dominant, pre-existing structures. This serves to reinforce the oppressive structures that contribute to participants' need to be innovative in the first place. While participants exhibit resourcefulness and inventiveness through collaborative efforts (and find value in these practices), these occur through acts of struggle. Therefore, while arguing that local configurations are innovative and capable of providing lessons for other contexts, we must simultaneously be careful not to reduce them to practices that are valuable simply because "we" deem them as "innovative." Future research must critically examine the assumptions surrounding the positive benefits of innovation, particularly when framed within Western ideals of progress. Moreover, future work might focus on the ways that people themselves derive meaning from such practices in order to reframe dominating perspectives that perpetuate positivists narratives of grassroots innovation while ignoring the local struggles and experiences of those who participate in these practices out of necessity.

7.5 Future Work in Cuba

Moving forward, I will continue to study the evolving nature of the internet in Havana, both Government-sponsored versions of access to the WWW as well as changes in local networks. Since finishing data collection for this dissertation, the Cuban government has introduced two new methods of WWW access: in-home WWW trials and 3G access on mobile devices. Although participants have described these services as limiting, I have also noticed that some participants are online more frequently than they were when I started this work. For example, Alysa accesses the WWW at the home of her in-laws who now have WWW access in their home. However, the majority of my participants are still online infrequently, if at all.

Additionally, as mentioned in Chapter 2, Havana is currently experiencing a period

of increased scarcity, which impacts the ways people are able to engage with the WWW (particularly due to financial constraints and the need to spend more time *resolviendo* basic necessities). Many participants maintain contact with me through internet intermediaries that relay messages back and forth on our behalf. In regards to EP, as more Paquetero stores have opened in Havana they have begun to offer diversified and specialized services. For example, certain EP stores now focus specifically on gaming and also provide a space where clients can try out games and play together. Also, since finishing my work on EP, I have heard about a more “underground” alternative that has emerged in Havana called “El Paketito” (“The Little Packet”). Supposedly, this more clandestine version has emerged in response to the increasing self-censorship on EP. The emergence of additional alternative networks in Havana provides possibilities for future work regarding issues of grassroots innovation, self-censorship, and beyond.

In regards to SNET, in late 2018, some participants reported to me that SNET has “split” into two separate networks due to disagreements among generals and admins regarding taxes and illegal connections to the WWW. However, participants also said that perhaps the “breakup” will be good for the network by allowing them to resolve some of their disagreements with the hope that, one day, the network will reunite. I plan to study how these changes impact the human infrastructure of the internet in Havana, as well as the subsequent collaborative configurations that people undertake. In addition to studying the evolving configurations that underpin the internet in Havana, my future research directions involve conducting cross-cultural comparisons of internet configurations among communities facing a variety of constraints, particularly among communities living in contexts that are considered “highly connected” (e.g. the U.S.).

7.6 Closing Thoughts

The ethos of *resolver* has become integral to the experience and structuring of the internet in Havana, contributing to the causes and conditions that are necessary when attempting to

understand the shape that the internet takes in people's everyday lives. A common phrase I heard during fieldwork was, "Ay *que ver*" (We'll have to see). While participants communicated a desire for increased WWW access, they also described how promises of change or improvement in Cuba happen slowly, if ever. Through a *resolver* mentality, participants conveyed a cautious optimism about what *might* be, grounded in the reality of what currently *is*. Individuals used *resolver* as a way to both cope with their current realities and to attempt to rise above them, accompanied with a realization that they may only be able to succeed in small, incremental ways.

My work demonstrates how the internet is not a disconnected, disembodied space to be appropriated or naturalized for Havana; rather, we see how the internet emerges as a continuous, relational process that is embedded within preexisting worlds and practices, producing both opportunities as well as tensions. In addition to individualistic narratives of the WWW, access initiatives often assume a linear connectivity development model whereby, eventually, every person on the globe will be connected to the WWW. However, when considering internet engagements through the lens of *resolver* acting through the human infrastructure, we see how internet appropriation is not a fixed, accomplished task. Instead, it is a process, involving negotiations between shifting technologies, relationships, values, and environments. In other words, internet appropriation is never "done," regardless of the level of connectivity or location in which it occurs. Changes along social, economic, political, cultural, and technical dimensions regularly impact the ways all people engage with the Internet. As a result, we are all in constant negotiations with multiple elements. How are people interacting and coping within these changes and processes in ways that they find meaningful? How do these actions feed into the sociotechnical system overall and whose values are reflected?

Based on the findings from this dissertation, I argue that, in order to move towards answering these questions, we must consider the collective efforts (or configurations) required and the people (or human infrastructures) that contribute to the appropriation and

configuration of the internet. Further, if people are unable to engage with the Internet in ways that hold meaning for them *unless* they rely on others (as is the case in Havana) this calls for future work to explore *how* people are collaboratively acting on and within these versions of the Internet. Future work requires an reorientation towards Internet appropriation that considers collaborative configurations and motivations enacted among groups of individuals, with a particular attention to both the tensions and opportunities that result.

Technology is not delivered one-size-fits-all. Across diverse contexts, people must configure various elements as they appropriate and adapt technology to the circumstances of their lives. When technology is adopted in places away from where it was originally designed, this provides opportunities to explore how these practices challenge our assumptions regarding the interplay between people and the internet. With increasing efforts to bring more people online, as well as the pervading positivist narratives that accompany Internet access initiatives, more work is needed that considers Internet appropriation from a variety of practices, perspectives, and values. Only then can we begin to move towards sociotechnical systems that are more inclusive, diverse, and considerate of the ways people choose to lead lives they have reason to value.

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