

## REPAIRING THE BROKEN CITY

Upper-class Brazilian outsiders have historically perceived favelas as the rotten side of their city.<sup>1</sup> They regard them as corrupted areas where nothing works. Drug cartels and police brutality disrupt favelas' social fabric, broken pipes leak, and stolen copper cables impede the smooth operation of favelas' infrastructure. Accordingly, they are keen to support policies that force evictions and increase the presence of police in the area. From afar, upper-class Brazilians misjudge favelas as being dangerous. Their distanced demonization of the "other side" reflects an elitist need to dehumanize lower-class inhabitants by delegitimizing their living spaces. I, instead, regard favelas as highly functioning environments, despite ongoing oppression, where residents rely on each other's acts of solidarity and care to create function out of dysfunction.

What does it mean to *care* for technology, as Steve Jackson (2014) asks us to envision the work of repair doing? What does it mean to *suffer* and become enraged with it in ways that aren't entirely comprehensible to one's self? Lara Houston (2017) addresses Jackson's question by claiming that *care* for technology means removing objects' wear and alleviating malfunction by replacing broken parts. Such work of *care* is clearly not settled at the point of design but is repeatedly negotiated through repair. Repair, as pointed out by Jackson and Houston, is approached in Science and Technology Studies (STS) scholarship as an intrinsically social-material process (work).

Users' thoughts on the motivations of technology's designers may seem fanciful. "Surely, they cannot be more evil than the government," uttered favela resident Tereza when using a keyboard. However, they offer an entirely new way of thinking about how technological failure forces itself to the forefront of imagination and comprehension. Large-scale breakdown may inspire a kind of fear and helplessness (any number of disaster movies will

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1. See Fernandes (2002) and Lemos (2017) for discourses on Brazilian favelas.

attest to this), but it is this small-scale frustration—a daily compounding of anger toward an incomprehensible *thing* that invisibly works for richer, better *others*—that provides us with a poignant and meaningful window into thinking about what technology does to us, and what we can do with it.

As Mike Davis (2006) notes in *Planet of Slums*, if the future of the city lies in the Global South and is characterized by severe legal, economic, and social precarity, we must theorize ways of living that render these conditions of ongoing uncertainty more manageable for future urban residents. Davis challenges us to understand how they *make do*, even if *getting ahead* is impossibly constrained. In response, in this chapter I examine how repair sustains the everyday Mundane Technological lives of the favela's inhabitants and how they attempt to liberate themselves from the oppression of infrastructural breakdown. Breakdown and failure are not deviations from upper-class normality, as upper-class Brazilians believe. Rather, I argue that breakdown and failure are how technology is most commonly encountered in everyday lives permeated with uncertainty. Instead of technological normalcy being marked by uninterrupted functionality—as in rich neighborhoods or developed countries—technological normalcy in favelas involves experiencing the continually dropping signal, the broken keyboard, and the easily scuffed and broken off-brand phone.

Infrastructural breakdown is not an exception to a “normal” state of continuity. Rather, it is the crucible in which the rhythms of everyday life must be forged. Susan Leigh Star (1999) notes that the normally invisible quality of working infrastructure becomes visible when it breaks, but such claims beg the question, “For whom does it become visible?” As I show in this chapter, it becomes visible to people who live in conditions of pervasive uncertainty. Favela residents are required to accumulate vernacular knowledge to simply get around in their everyday lives. They can't help but see infrastructure—not because it suddenly breaks down but because it permeates their lives. These people must grapple with breakdown in zones of informality such as the favela and Davis's city of the future. Studying how residents manage infrastructural breakdowns provides insight into the kinds of work, consciousness, people, and spaces that allow them to maintain a semblance of continuity against a background of built and experiential uncertainty. The interactions that we encounter at the level of the neighborhood and its individual residents deliver intimate insights that systems-level thinking can obscure. These insights, I will show, are crucial

to understanding how Mundane Technologies—especially communicative technologies described as “digital” and “new”—are taken up and appropriated in areas far from centers of technological and political power.

#### REPAIR AS MUNDANE TECHNOLOGY

In an environment like favelas—where pervasive uncertainty governs ordinary lives—it is even more critical that we understand how Mundane Technologies and acts of care hold together a semblance of continuity. Repair is one of these ongoing Mundane Technologies. As Steve Jackson notes, it is through repair that “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” (2014, 222). By adopting Jackson’s notion of repair, I deviate from progressive narratives that have been embedded in discourse surrounding technology in zones of informality, such as Nicholas Negroponte’s *One Laptop Per Child* (Ames 2019). Repair helps me think through how Mundane Technology slots into the continuance and ongoing maintenance of everyday life. This approach builds on studies of repair and maintenance work by different scholars, including Lara Houston (2017), Daniela Rosner and Morgan Ames (2014), David Edgerton (2011), and Douglas Harper (1987). They understand that repair is a social-material process of breakdown that is not predominantly material. Repair adds depth and nuance by showing the range of processes involved in decay, fracture, and failure that might otherwise dissolve into breakdown. These scholars also approach maintenance and repair as practices that emerge in everyday life and are shaped by material, infrastructural, gendered, political, and socioeconomic factors. It is impossible for designers to effectively script interactions ahead of time, especially since they are away, unaware, or disinterested of the site of repair.

Repair is a Mundane Technology that highlights the systemic instability and individual creativity that constitute workable technological systems in the favela. A concern with “making do” acknowledges that, while acts of creativity and small-scale works of repair knit together zones of informality and neglect, they are subject to the pervasive disruptions and disparities that long-term oppression, infrastructural neglect, and abandonment bring in their wake.

In the favela, residents struggle against these larger infrastructural breakdowns. They fight over land titles and the reliable provision of systems-level infrastructural services by the private sector and the government—all closely tied to legal recognition.<sup>2</sup> Instead of focusing on the broad sweep of legal recognition and its infrastructural consequences or on the difficulties of implementing large-scale technological projects within zones of uncertainty such as the favela, I focus on how Mundane Technologies work on a smaller, more personal level. I believe this approach is more suitable to understanding the intersecting scales of failure and reconstitution at play in small-scale technologies that saturate daily favela life. Previous writing by STS scholars on infrastructural systems focused on their large-scale constitution (Bijker, Hughes, and Pinch 1987), the affective and symbolic power of these grand technological systems (Nye 1996), and their consequences (Graham and Marvin 2001). I take a different tack here, directing my attention to technologies that historian David Arnold (2013)—recalling devices such as bicycles and sewing machines—calls “everyday technologies.” These technologies, such as mobile phones, keyboards, and wired internet, have been designed to fail over a short period of time and be replaced instead of fixed (Rosner and Ames 2014).

Why characterize repair here as a Mundane Technology? Repair, in the same way that I define Mundane Technology, is a way to appropriate enforced and colonial technological designs that weren’t made for places like favelas. Such appropriations come in forms of community unity, organization, and *luta* (fight and struggle). As Paulo Freire claims, these forms of appropriation are dangerous to the oppressors, because realization drives actions of liberation (2000, 141). Drawing inspiration from Arnold, I contend that technologies such as a keyboard and a mobile phone figure most prominently in the intimacies of everyday life. They are scattered throughout the background of daily work and domestic life and are more tightly entwined with everyday practices than large-scale systems that have drawn the interest of STS scholars. They are the digital artifacts that reach the oppressed and are appropriated daily to counteract breakdown. This isn’t to say that infrastructural systems have no place in the discussion; clearly,

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2. For more on informality (and the infrastructural breakdowns that characterize and color it) as a conceptual approach to the city, see Ananya Roy (2005). For more on the legal struggles concerning recognition and regularization of Brazilian favelas, see Joseli Macedo (2008) and Edesio Fernandes (2002) in Durand-Lasserve and Royston (2002).

such large-scale systems as reliable water, sanitation, and electricity matter tremendously to the experience of everyday life. However, looking at and through everyday technologies illuminates the affective and material intimacy and ordinariness that characterize the use of these devices and the fragile lives and systems they support.

#### REPAIRING THE KEYBOARD

QWERTY, the most common modern keyboard layout, is based on a design created for the US-American Sholes and Glidden typewriter to speed up typing by preventing jams. Regardless of its inefficiency and economic controversies, it remains in use on electronic keyboards due to the belief that alternatives fail to provide very significant advantages (Liebowitz and Margolis 1990). Although countries like France and Germany have changed the QWERTY layout to better match their languages, countries in the periphery of technology development import the US-American ASCII keyboard with very few changes. In Brazil, the standard ABNT and ABNT2 keyboards have just a few differences from the ASCII keyboard: the letter Ç has its own key and symbols such as ^ are rearranged.

People worldwide perennially ask the question, “Why are the keys arranged in the QWERTY layout and not in alphabetical order?” But in the Community Technology Centers (CTCs) in Vitória, this question is posed with frustration and even anger. Carla (forty-one years old) expressed her bitterness. “I’m trying to learn how to use this thing [computer] but it doesn’t make sense; I waste so much time to write [type] something because I can’t find the right letters [keys]. It gets in the way of learning this thing [computer]; I feel angry and unmotivated. But that’s okay because when I find the damn letter [key] I don’t push it, I punch it!” Worse than anger and frustration, a QWERTY keyboard could cause avoidance, as was the case with Regina (thirty-nine years old). “I don’t have the patience; if I have to write [type] something I ask my son Jadson to do so. He comes here and gets everything done quicker than me. I know that this way I won’t learn anything, but we have so many problems already. . . . Why can’t they make our lives easier and put this in alphabetical order?”

Ontologically, favela residents were accustomed to categorizing and organizing symbols in familiar ways, such as alphabetical and numerical order. Their preference for typical arrangements is why the QWERTY

layout frustrated them. Since typewriters have a long history in the Global North—where it was designed and developed to improve the efficiency of typing in English—US Americans became acclimated to a QWERTY layout before those in the Global South. Even when typewriters were translated for the Global South, those in wealthier areas transitioned to computer keyboards more smoothly (Freund 1982). They did not reach Southern peripheries such as favelas abundantly. Even as computers and mobile phones were becoming more accessible to favela residents, they retained a resistance to the unfamiliar keyboards. Their resistance was mainly caused by their lack of experience with typewriters and the decontextualized layout of the artifacts' keyboard. The letter keys were not the only issue in the Telecenter; the arrangement of the number keys was often contested by the users. João (seventeen years old) gestured to his keyboard, saying, “As you can see, I’m always on the phone and I’m used to these numbers [keys]. It starts up here with the number 1, and then goes down to 9 and then 0. Every time I have to write [type] my cellular [phone] on Face [Facebook], I have to do it two or three times because these numbers on the keyboard are upside-down.”

CTC users questioned the intentions of technology designers, since they couldn’t understand why the numeric keys were arranged differently from the cell phones they used far more frequently. Tereza (thirty-two years old) noticed that her keyboard didn’t mirror the familiar arrangement used on voting ballots, saying that “even the government said that the keys on the electronic ballot are arranged like on the phones to make our lives easier, so why this [keyboard] is arranged this way? The technologists can’t be more evil than the government!” Favela residents were “invisible” to technology designers, as Jenna Burrell’s (2012) Ghanaian users were—designers ignored their cultural background and context when developing technologies. The ink on the keys was also an issue. Luis, the owner of Point LAN House, expressed his disappointment with the keyboards he bought for his computers, stating that “the letters are always fading away from the keys. My costumers complain a lot, but I don’t have the money to keep buying new ones. . . . I think they are made in China.”

Because users paid by the hour at LAN Houses, some believed that the owner erased the letters on purpose just so they would take longer to type, which made Luis lose some customers. Fatima (forty-nine years old) expressed just this sentiment, complaining, “I rather stay away from computers than to come here. I don’t think he [Luis] is being honest.” When used

daily, the ink on the keys quickly faded. The LAN House owners couldn't afford to constantly buy new keyboards, so their solution was to print small letters and glue them on the keys with clear tape. The Telecenter's Inclusion Agents also had to creatively repair their keyboards. Instead of doing it themselves, they invited frequent Telecenter users to help them out. Patrick claimed this act of reinvention was to help people feel a sense of agency. "This way they can gain some sort of ownership over the keyboard, play with it, understand their layout better, reflect on it, and repair it."

The Telecenter agents promoted two workshops where regular users printed the letters using their preferred font and size. Roberta (fifty-three years old) saw this as an opportunity to improve her typing since she couldn't see the original letters on the keys; she printed larger letters for the keyboard. During these workshops, users compared keyboards and noticed which keys were faded. These interactions led them to reflect on the Portuguese language and what the keyboard usage said about their community. Rafael (seventeen years old) noted, "I need to print the letters A, E, O, and S. I wonder if it's because Paula types on this keyboard and gossips about Ana Caroline all the time!" Paula (sixteen years old) protested and raised an intriguing question: "Maybe because most words we type have these letters. Look at our names; look at the name of the stores and places we go to here at Territory of Good. They all have these letters . . . multiple times."

Paula's statement in the workshop encouraged others to research the most-used letters. By no coincidence, they discovered that those letters were among the most frequently used in Portuguese. Rafael concluded that if they "ever find another faded key on any keyboard, it will likely be one of those [A, E, O, S]. Making our lives easier when guessing." The Telecenter users also proposed an alternative solution to the QWERTY keyboard: develop an alphabetic order layout. Neuza (twenty-seven years old) said, "I don't know why the keyboard is like this; God knows what is in the head of its designers. But if I were to design it, I'd put the keys in alphabetic order. Especially because the letters on the keys fade away. If they fade away, at least I'll have a better chance to guess where they are. . . . And then we can move slowly towards this weird format [QWERTY layout]." The workshop promoted what Paulo Freire believed: people engage with learning more enthusiastically when they study subjects and topics that relate to their own experiences.

The example of the keyboard illustrates how digital inequalities are driven by artifacts' material connection with other artifacts. The QWERTY

keyboard came from typewriters—an artifact developed in the Global North and West. In the context of the favelas of Brazil, the traditions and educational structures that demanded this standard present a barrier. In the context of personal computing, these material connections may be only a mild annoyance until frequent interactions render them commonplace. In the context of the CTCs—where an individual’s interaction with a computer may be less frequent—materialized assumptions can present a real problem, such as the belief that the QWERTY layout is appropriate. Ink wearing off the keys indicates that the durability of the keyboard’s material is also a concern. Tensions around keyboards reinforce that idea that computers are used differently in favelas. From the perspective of the individual, use of personal computers is less common than cell phones; from the perspective of a single keyboard, use is greater. While abstractions in high-level code may treat resources as if they are inexhaustible (Blanchette 2011), when introduced into the context of the favelas, this assumption can impede access to information and smooth functioning. Even with support for the specific artifacts of computation (i.e., the computers), use is still subject to the limitations imposed by the materiality of supporting infrastructures.

Researchers who studied alphabetic keyboards (see Granata et al. 2010; D. A. Norman and Fisher 1982) found they were considered inefficient because they slowed down typing speed, compared to a QWERTY keyboard. However, these studies deployed the alphabetic keyboard in northern contexts where people were already accustomed to the QWERTY layout. The alphabetic keyboard may not be the most efficient long-term solution for those in the favelas. For example, in the job market, favela residents would most likely encounter QWERTY layout keyboards. However, as mentioned by Neuza, developing an alphabetic keyboard along with typing courses would be a useful Mundane Technology to progressively introduce CTC users to the QWERTY keyboard. In other words, since some users were often discouraged to use the computers and the internet due to the barriers created by the QWERTY layout, using a temporary and more familiar artifact could alleviate resistance between CTC users and the technology.

Such Mundane Technology—the process of reimagining the alphabetic keyboard—reminds us of Paulo Freire’s concept of “generative themes,” which involves encouraging people to bring in familiar experiences, situations, and relationships that can help them “codify the world” in a way



that speaks true to their reality. It is the oppressed perceiving “viable new alternatives” beyond the “limiting-situations.” In other words, one path to emancipation and humanization is to perceive oneself as an active agent of change and the world as a mutable entity (Blikstein 2008). In the fields of design and human-computer interaction, this Mundane Technology would be similar to what scholars call a “design for transient use”—a particular digital technology that is not a wholesale solution but rather a transitory means to a more permanent arrangement. In the case of Mundane Technologies, instead of having a designer develop a new layout for each step of the transient design process, favela residents would appropriate the keyboard. Next, they could progressively redesign the keyboard themselves toward the QWERTY layout while taking their time and working at their own pace. Taking this approach would benefit favela residents in two ways. First, it would account for human values in a principled and comprehensive manner throughout the process of “value-sensitive design.”<sup>3</sup> As DeAna Brown (2015) claims, this design process exposes the values embedded in the system by making them transparent to end users. Second, a design for transient use would foreground the expectation of the use of the Mundane Technology, ensuring that users were conscious of the implications that using the digital technology could have on their lives.

#### THE INTERNET OF THE OPPRESSED

The makeshift character of fundamental infrastructural services, such as electricity and water connections, reflects the recent and inefficient urbanization of favelas in Brazil as a whole (Custódio 2017; G. O. Lemos 2017; Perlman 2010). While the government did not forcibly remove favela residents during my fieldwork, it infrastructurally neglected them, because services such as water, electricity, and gas were never formally implemented in Territory of Good’s entirety. Antina von Schnitzler (2016) encountered a similar situation in post-apartheid South Africa; infrastructure of townships like Soweto became sites where citizenship was mediated and contested as local residents wrestled with the constraints imposed by infrastructure. Back in favelas, forced to turn to their own devices to ameliorate institutionalized neglect, inhabitants frequently acquired utilities illegally

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3. See Friedman (1996) for more on value-sensitive design.

through makeshift wire and pipe taps called *gatos* (cats). For this reason, although the Gueto, Games, and Point LAN Houses acquired their utilities through legal means, the *gatos* all around the favela affected the voltage running through the power lines to the LAN Houses. The fluctuating voltage damaged their computers, as Luis, the owner of Point Lan House, explained. “Changing light bulbs here is a frequent activity, but they are cheap; what really concerns me is how often the power supply units fry. Most of the time I don’t have the money to buy a new one right away, so I have to put the computers away until I can buy new power supply units.” Lisa, owner of the Gueto LAN House, echoed these sentiments. Like Luis, she blamed cheap power supply units rather than fluctuating voltage in the power lines, saying that “these power unit supplies are bad and fry all the time; they really hurt my business. I guess the ones I can afford are not good. I wish there were stronger and cheaper units.”

The irregular and makeshift infrastructure of favelas also impacted the willingness of companies to provide services to customers who lived there. Internet providers were unwilling to invest in the physical infrastructure necessary to deliver a reliable broadband connection. Favela residents like Fatima (forty-nine years old) were familiar with battling internet service providers (ISPs) to get a connection. “I called GVT [internet provider] and they told me that the outdoor internet box for Gurigica has been completely ‘taken’; thus, they can’t offer me an internet connection. . . . They suggested me to find a neighbor who has internet and share the connection with him because they won’t expand their box here.” Lisa and Luis contracted a 3 Mbps internet plan for their LAN Houses—the fastest option available to them. This connection, however, had to be shared with five or more computers. Lisa noted that the speed of their connection was not a trivial matter, given that Windows updates and security patches were *only* available online. “The users don’t complain too much because this is the only internet they can access. . . . The problem is when I have to make a security or Windows update. It takes forever to update every computer I have. It is dangerous because I have to stay in for the whole night and expensive since I have to pay for electricity.” Here, Lisa was alluding to the danger of running a business late night due to drug cartel activities. Although internet providers were responsible for maintaining their infrastructure in the favelas, they were not keen on improving it and making it more accessible.



Internet connectivity began to acquire the makeshift character common to other resources in the favela when residents struggled to overcome the arbitrary limitations imposed by the ISPs. Like electrical taps or strung-out cable television connections, the internet too had to be acquired and maintained in the face of institutional neglect. The internet was not the deeply embedded, easily available resource that teams who developed Windows updates imagined their users to possess. Residents like Rafael (seventeen years old) were sanguine about their situation. “[Internet providers] say they won’t improve their internet infrastructures because there aren’t enough costumers for them in the *morro* [hill], but it’s not true. . . . If you look out there, every light pole you will see [has] tons of blue cables going to every direction and every house. . . . We need more and better internet.”

Cyber LAN House owner Gustavo was forced to search for information on computer networking himself, pointedly noting that this task challenged the well-worn institutionalized neglect the favela had always been subjected to. He said, “I can’t stay here and wait around. . . . The government is not interested in us, so I might as well do something about it [the internet]. The people here don’t have the time to learn about technology and internet, and since this is what I do, I decided to look for articles on Google and YouTube that could teach me how to do this [bring the internet to his community]. This is indeed another source of income for me but I also feel I’m doing some good for my community.” Following his crash course on computer networking, Gustavo subscribed to a faster internet connection through his uncle’s house located on the border of the favela, in a wealthier, better-serviced neighborhood at the base of the Jaburú hill. Gustavo used fifteen Linksys routers placed inside plastic boxes on the light poles and five hundred meters of Ethernet cable to connect his LAN House—and subscribers in the favela community. He charged them R\$35.00 (approximately US\$10.00) per month for a subscription and was working at maximum capacity. The price was still unaffordable to several residents—but was much cheaper than the average cost of R\$160.00 per month for a subscription from an internet provider. The persistent internet connection that the LAN House owners provided to the residents was vital to their information needs—even if it required a paid subscription. The Telecenters that

provided free access were over one mile away from those areas, and crossing territorial boundaries was not safe due to the armed conflict.

By centralizing technological availability, LAN Houses became a source of technological help and knowledge for the favela residents. The increasing affordability of technology created more first-time internet users. The LAN Houses drove this trend by providing a base for learning and maintenance. The government offered financing programs, such as *Computador para Todos* (Computer for Everyone), which made it easier for most people to buy a computer by letting them pay for it in monthly installments over four years. Games LAN House owner Ronald described the vital role his location played to guide this flood of new users.<sup>4</sup> “The problem is that they don’t know how to use it properly. People would come and ask me if I could fix their computers since I maintain the computers at my LAN House. I saw it as an opportunity to broaden my business. . . . Now I get computers with a thousand viruses, fried boards . . . and if it wasn’t for me they wouldn’t be able to fix their computers since I charge them a fair price and usually recycle boards.” LAN House operators like Ronald aggregated necessary technological knowledge through a combination of hands-on interaction and online videos and articles rather than formalized training or official certification.

In favelas, information about how to use a computer—much like knowing how to repair a computer or provision cable television—was cobbled together with little emphasis on broader technical skills or theoretical acumen. This piecemeal process of overcoming precarious conditions through improvisation, bricolage, and adjustments is known as *gambiarra*, widely used in Brazilian culture and usually linked to the popular phrase *jeitinho* (the Brazilian way).<sup>5</sup> Members of the upper class have deprecated both as

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4. Even this seemingly mundane ability—to pay for goods in monthly installments—is a fairly recent development, following decades of inflation and the introduction of a new currency; see Chana Joffe-Walt (2010).

5. This characteristic is attributed to the Brazilian people, mainly to the popular mass, who obtain advantages from interpersonal relationships. Sociologist Jessé de Souza points out in his book *A Elite Do Atraso* (The elite of backwardness) that this dominant self-image of Brazilian society is used as a legitimation tool for all “types of economic and political interests of the economic elite who rule the market” (2019, 30). “The capital of the cordial man is the capital of personal relationships, or what Roberto da Matta . . . would later call ‘the Brazilian way,’ a supreme

illegitimate. In response, scholars have worked to recognize *gambiarra* in an attempt to legitimize approaches from the peripheries. José Messias and Ivan Mussa (2020) define *gambiarra* as a decolonial technique, driven from precariousness, that joins accessible parts and items in complicated sets. From their perspective, *gambiarra* does not fulfill any ideal project; it simply occurs because these creative relationships are possible. In the same vein, Pamela C. M. Corrêa (2020) aligns this approach with creative expressions, intuitive designs, and the ability to adapt and subvert the predetermined use of objects of different natures. To her, *gambiarra* is similar to “technological disobedience”—a term coined by Cuban designer Ernesto Oroza (2016). Collectively, these scholars see *gambiarra* as a practice of repair and creative redesign. In this book, I continue their expansion of the term by including it in my framework of Mundane Technologies—in which acts of repair are avenues in the pursuit of liberation from prescribed oppressions. *Gambiarra* was often necessary in favelas because the infrastructure was severely strained in terms of durability and resilience: two characteristics that define the classic “large technical system” of Thomas P. Hughes (1987).

Microsoft assumes that the delivery of critical system updates will be easy because customers have access to a reliable internet connection, they can stay with their computers throughout the installation process without risking their lives, and power will remain on throughout the download. In the favelas, this imagining of the world and potential users of the systems falls far short of reality. As a result, the makers of these operating systems fail to account for such users and places, despite all their pretensions to global coverage. Because connective cables, personal security, and reliable electricity were all in short supply, the LAN House owners in the favelas not only fought an uphill battle against the most obvious and visible signs of infrastructural neglect and degradation—failing power, tangles of *gatos*, and *gambiarra*s—they *struggled* for them. In the process, they were forced to confront latent limitations within technological systems that impacted places and people deemed peripheral.

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nonsense unfortunately naturalized by repetition and used as an easy explanation in all corner bars in Brazil. Now, dear reader, whoever has access to important personal relationships is someone who already has economic capital or cultural capital in some form before” (32).

## MOBILE MUNDANE TECHNOLOGY

Infrastructural neglect also manifested within seemingly intangible wireless communications networks. Mobile phone carriers did not provide satisfactory signal coverage in the favelas. This neglect led to constant complaints from the residents, especially because the innocuous act of walking around with a valuable cell phone to search for a signal to complete a call was an extremely dangerous activity. Shootouts from the intense drug war were happening throughout my fieldwork. Fernanda (sixteen years old) talked about how she negotiated this dangerous situation. “My smartphone has no bars up in here [at the top of the hill], my calls are never completed, and it is really hard to communicate with people from here. I don’t even know [why] I pay for this thing. When I need to make urgent calls, I try to go to Bairro da Penha, forcing me to walk through Hermínio Blackman Ave. You know that avenue is known as the Gaza Strip of Vitória, right?” Ironically, the hill where the favelas were located was also known as the Morro da Antena (Hill of the Tower) because of the eponymous cell phone tower located at its peak. Yet, as Rodrigo (twenty-one years old) noted, despite its lack of utility for the favela residents, he saw it as a hopeful symbol. “I come up here on the hill almost every week. I guess that’s one way to move up in life. I never went up this crazy thing [cell phone tower] but I look at it and see that there’s still more to achieve. It gives me hope.”

Fernanda and Rodrigo’s frustrations about connectivity, even in the ironic shadow of a cell tower, was symptomatic of infrastructural biases. As it turned out, there were structural reasons why customers in the peripheral neighborhoods of Vitória (or in the legally unrecognized favela) had significantly more difficulty completing calls than residents in wealthier neighborhoods. During fieldwork, the major cell phone carriers—VIVO, owned by Spain’s Telefónica, and TIM, the Brazilian subsidiary of Italy’s Telecom Italia Mobile—came under investigation by state prosecutors in Espírito Santo for enforcing social segregation within their networks. Anatel, Brazil’s national telecommunications agency, noted that these phone carriers had a blocking rate (the percentage of calls not allowed into the system) in marginalized neighborhoods that was significantly higher than 5 percent, the maximum allowable rate set by the agency. Anatel reported that “users . . . were being discriminated against in relation to the enjoyment

of the carriers' network service, i.e., the blocking rate was much higher in some peripheral neighborhoods within Vitória, while in others this rate was negligible" (Campos 2012).<sup>6</sup>

LAN House owners, however industrious or entrepreneurial, cannot alone fix institutionally enforced infrastructural discrimination. I don't believe that the LAN House owners' clever fixes and ongoing small-scale repairs formed an enduring solution to a much larger problem of neglect. Rather, their informal patches helped favela residents forge a pleasurable, useful technological life *within* a zone of institutionalized infrastructural neglect. That is, LAN Houses were hardly a curative for greater ills. They did, however, encourage residents to carve out areas of small, ordinary pleasures within the anxiety and uncertainty that defined their daily lives. They could experience the pleasure of talking to friends on their phones or looking up sports scores on the internet—small-scale pleasures, to be sure, but still meaningful.

The most widely used smartphones in the favelas were called *xinglings* (Nemer 2018c). These phones were only really "smart" when Wi-Fi was available, since the carriers' infrastructural choices segregated the favela users from consistent wireless service and data packages were relatively unaffordable.<sup>7</sup> Some *xinglings* were smuggled into the favelas by people related to the drug cartel and sold on the informal market. While this smuggling may be seen as illegal and amoral, it can be reframed as an act of techno-political liberation, as Lilly Nguyen (2016) claims. To her, smuggling phones in the Global South is a strategy for breaking into global techno-culture for those located along the margins of global modernity. The cartel had a deal with the sellers, who gave 30 percent of sales to the traffickers in exchange for protection. The sellers were naturally secretive about the origins of the smartphones, making it difficult to verify their exact origins or sales. However, Rafael, a former informal-market seller, mentioned that the *xinglings*

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6. The blocking rate is the percentage of calls that are not allowed into the system, generally the percentage busy but may also include messages and forced disconnects.

7. *Xingling* is used to refer to Chinese imitation and pirated brands, such as HiPhone, Galaxia, and Lumiax. Lara Houston (2017) notes the use of Chinese phones by Ugandans, which were called "clone" phones: beneath housings of "Nokla" or "Snoy Ericsson" (*sic*) devices, screens and parts are rarely standardized.

were smuggled in from China through Paraguay—a very well-known route of traffic of counterfeit goods made in China.

The *xinglings* came only with a charger and lacked a warranty and guarantee of working condition. The constant power outages in the favelas often damaged the poor-quality chargers and sometimes ruined the smartphones. Favela residents felt neglected since they did not have the money to repeatedly buy new chargers. Hence, the activity of sharing cables and power cords affected group formations and power relations, as mentioned by Beto (fourteen years old): “Here, we purchase *xinglings* in the back alleys or in the neighborhood market. If you’re lucky it comes with a charger and that’s it. . . . The charger lasts a week. I bought the USB cable separately and now everyone wants to go to the Telecenter with me so they can transfer the photos to the computer and upload them on Face [Facebook]. I’ve got tons of friends and respect now. I’m even picked first to play soccer.”

As I observed in the CTCs, the *xinglings* were shared among groups of three or four friends because not everyone could afford their own. Usually, each member of the group would contribute to the *xingling* experience; one person would bring the smartphone, another would supply the USB cable, and a third would donate a charger. When offline, favela residents used the *xingling* mainly as media devices, utilizing the camera, music, and video players rather than the phone itself. They challenged the technological prescriptions designed by *xingling* designers the same way, as stated by Morgan Ames (2019). Children in her research in Paraguay appropriated their One Laptop Per Child computers as media devices, becoming adept at finding workarounds to watch videos and listen to music rather than writing software—the imagined goal of MIT professors like Nicholas Negroponte. Favela residents perceived the *xinglings* as an extension of CTCs, because both offered a wireless hotspot. In the Telecenters, residents were able to connect to Vitória OnLine, an open and free wireless network maintained by the City of Vitória, which was also accessible in several public places such as municipal parks and city government buildings. In the LAN Houses, users had to pay a fee of R\$2.00 (approximately US\$0.75) per hour. Although the devices were ostensibly mobile, residents’ access to the internet was still bound to such centers. CTCs not only provided a place for users to lend their cables and cords; they also promoted social dynamics such as becoming hangouts for young people. Teenage girls, for example, went in groups to the bathroom to take selfies so they could share



them later on Facebook (the bathroom had a big mirror that allowed them to capture a larger group).

When using *xinglings* to go online, users mostly chatted on Facebook Messenger and played Facebook games. However, they did not directly upload photo content to Facebook from their *xinglings*. For example, the smartphone that the young women mentioned above used to take selfies had several photos of different people. Technically, they could use the *xingling* to sign in to their Facebook accounts and upload photos directly. However, they preferred to upload to the CTCs' computers so they could choose the best photos and distribute them faster and more easily. For example, Mariana (sixteen years old) mentioned that she preferred to use Facebook on the computer since it offered a better experience than on her mobile phone.

I can't use it [*xingling*] the way I want. Like on the screen, most of the websites turn into English in the mobile version. I like to use the computer because on the phone it doesn't work quite right. It is not easy to use the phone . . . all these terms that I don't understand. I have lots of difficulties in downloading stuff from the internet: music, photos, videos.

Downloading content from the internet worked similarly. *Xingling* users first downloaded music or videos to the CTCs' computer to ensure the files were not corrupted. Then they transferred them to their smartphones through a USB cable, as described by Roni (eighteen years old). "I come [to the Telecenter] to transfer songs to my smartphone. Music is everything in my life. It sets me free, like when I read a book. The music goes well according to my mood, but everything in life is music. Car noise is music, tin banging is music. . . . Music is like a world where there's no prejudice and judgment, and the smartphone is like the spaceship that takes me there." Since walking around in the favelas was risky, users tried to download as much content as they could in one sitting. Teens like Roni would try to download as many episodes of a television series or songs in an album as possible, so they could experience the joy that the entertainment brought to daily life.

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As Roni mentioned, his *xingling* allowed him to be in a place where he felt comfortable. Smartphones were as valuable as rare gems in the favelas. Their users attained bargaining power because they could exchange their *xinglings* for pretty much any good they desired.

Cell phones are the most democratic kind of money here in the favela; they're worth a lot and everyone needs one. I can buy one in the back alley . . . talk to everyone . . . and then if I want to buy something else, I just trade it for something else. The other day I was crazy about a bike I saw. What did I do? I didn't think twice and offered my cell phone . . . the trade was fair. This cell phone will still come back to me. (Fernanda, sixteen years old)

Smartphones also gave favela residents a sense of social inclusion, because they felt emboldened to cross social boundaries when they possessed such a device. Marcos (twenty-one years old) was one of the few informants that owned a non-*xingling* phone—he had a Samsung Galaxy S3 and proudly mentioned, “I got the phone from my mom. This smartphone makes me empowered, because I can just go around to Praia do Canto or Jardim da Penha [rich neighborhoods] and not worrying [about] being judged as poor or *favelado*. When I went to the mall the other day, I had my cell phone in my hands the whole time; it felt like it worked as a key and was opening every door I was walking through.”

#### MUNDANE TECHNOLOGY: RESISTANCE AS REPAIR

When thinking about forms of difference, a backdrop of legal informality and persistent precarity lends itself to the notion of the favela's infrastructure. But what can we learn from these snapshots of Mundane Technology in a zone of continual infrastructural neglect? If not always functional and reliable, how do infrastructural objects and systems acquire meaning through people's everyday lives and practices? What kinds of character can be attached to an infrastructure that is blatantly visible to the people who live with it? How do we think of systems and technologies that cannot be rendered an invisible part of the landscape, as is common in the developed world? In short, how do people find liberation from oppression through acts of repair?

*Xingling* mobile phones strikingly illustrate the multiple meanings that emerge across differing scales of technological systems. While the larger, systems-level picture is one of segregation and oppression by the major wireless carriers, within areas of the city delimited by their inability to receive calls, the smuggled *xingling* smartphones are an intimate part of everyday life. They are affectionately described by their users as doors leading to other, perhaps better, places. *Xinglings* act as a doorway into global technoculture rather than out of sociotechnical limitations (Nguyen 2016). Favela

residents retain a deep appreciation for devices embedded within everyday life, even as they remain aware of the broader picture of technological neglect. These two competing perspectives challenge us to consider why affective attachment at this more intimate level does not negate the breakdowns and failures broadly occurring within the system: residents adopt strategies to render livable the extremely inequitable and uncertain technological environments they find themselves in.

The shared *xingling*—unlike the dystopian and individualistic smartphone experience that Hollywood movies such as *Her* envision—fosters a communal sociality in favelas that emerges from conditions of technological unevenness. Friends gather at the CTCs—one brings a charger, another the data cable, and a third the *xingling* itself—to load data onto and off the phone. In the interlocutors' accounts, the *wired*, material connectors of USB cords bridged to a more joyous and richer social life. *Xinglings* also retain exchange value within the favela by being tradable for other goods and acting as a source of confidence to traverse spaces outside the favela. Returning to Jackson's (2014) concept of repair, through these stories surrounding the mobile phone we can begin to see the outlines of what an "act of care" could look like in the pursuit of liberation. Liberatory care involves a deeply affective and affectionate relationship with what those things *do*, despite everything. Accordingly, Mundane Technologies like appropriations of *xinglings* find themselves embedded within favela residents' social circles and ongoing existence.

The intimate frustration that favela residents experienced with the QWERTY keyboard—and the bodily means by which users displayed these frustrations, punching the keys with force—illustrated a deeply felt relationship with technology. The *pain* of technological failure—of this most basic of devices failing in ways that render it incomprehensible to its users—has yet to be taken up in studies of infrastructure. Here in the LAN Houses and Telecenters of the favela, there is less sublimation of the self and a stronger awareness of just how closely entwined the wider breakdown within the environment is with one's own experience of a particular technology—even as unremarkable one as a keyboard. Just as the durability of the keyboard posed issues, the durability and resilience of digital infrastructure also produce moments of pain and elation in the form of small breakthroughs. This digital infrastructure is always interwoven with the social infrastructure of the neighborhood.

Looking at CTCs such as Telecenters and LAN Houses—and how they draw patched-together and piecemeal communications infrastructure into a node—gives us more technological negotiations to think through. These negotiations are certain to become the bedrock on which Davis's (2006) envisioned cities of the future will be built. The LAN Houses in the favelas are affected by how others use illegal taps of electricity and telephone lines to maintain their piecemeal technological connections. These connections are acknowledged by the authorities and utility providers only as a drain on resources, rather than an indication of an unmet need. The owners of the LAN Houses maintain some semblance of stability by utilizing a mix of personal relations, informally acquired knowledge, and cheap parts. Here, infrastructure is not *invisible* when rendered normal, as previous understandings of infrastructure (Star 1999) would lead us to believe. Within everyday favela practices, the internet and electrical infrastructure remain constantly in sight. They are always in need of care to successfully support everyday use and practice. This constant attention to the deficiencies of the built environment and the fixes acquired through means outside of legal or traditional avenues are its own stabilizing force.

I believe that this stability is, paradoxically, always contingent and in flux. It depends on the whims of relatives, the (not always sensible) will of utility companies, and the skills of LAN House owners. The infrastructural stability of the LAN Houses' internet and electrical connectivity must be constantly and visibly *produced*. This is qualitatively different from how maintenance is typically conceptualized. Instead of working to keep a system of technologies functioning at an acceptable level or a standardized ideal, maintenance is a constant struggle to *bring forth*—to ensure that relatively reliable power and stable connections exist at all.

This is not to say that top-down systemic infrastructural intervention would solve the problem of oppression in the favelas. These communities have been historically marginalized by decades of social segregation and neglect from the state government and private sector. This neglect does not lend itself to easy solutions. Infrastructural improvements, after all, are the bread and butter of politicians who show up in the favelas seeking the vote during election season, promising things like cable cars to facilitate the transportation of local residents.<sup>8</sup> Waiting for decent infrastructure to

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8. The project of cable cars in the favelas of Vitória was announced to the local residents in October 2012, but as of the time of writing nothing was done. For a news article about the project, see Gildo Loyola (2012).

be delivered from outside may fall too easily into the category of utopian promises. Even if such promises came true, they would likely fail since they wouldn't bring favela residents into decision-making roles, and any attempt to liberate the oppressed "without their reflective participation in the act of liberation is to treat them as objects that must be saved from a burning building" (P. Freire 2000, 65).

While repair has been framed as a process of promoting political action and improving environmental awareness in repair clinics in the Silicon Valley (Jackson 2014; Jack, Chen, and Jackson 2017; Ahmed, Jackson, and Rifat 2015), repair was approached in favelas as a critically necessary process—an act to survive and perhaps thrive. Though Steve Jackson (2014) states that repair fills a moment of hope when bridges from old worlds to new worlds are built, in the favelas this hope is a transient hope—a hope that the beginnings of a desirable life, cobbled together from what the favela has to offer, can approximate the comfort and stability that mark the upper class. Favela residents must develop practices of and rely on their repair work, since what infrastructure offers them is constant breakdown—another forsaken promise. Hence, instead of thinking of such repair work as merely *gatos* or *gambiarra*s (or adopting the overtly political understanding of them as hacking in the zone of the hackerspace), I imagine this Mundane Technology as a quiet kind of *caring*.

