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Analyzing Function and Potential in Cuba's El Paquete

A Postcolonial Approach

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Analyzing Function and Potential in Cuba's El Paquete: a Postcolonial Approach

*En analys av funktion och
utvecklingspotential för
Cubas El Paquete: en
Postkolonial Approach*

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Abstract

The dire state of Cuban internet connectivity has inspired local informal innovations. One such innovation is *El Paquete*, a weekly distribution of downloaded content spread through an informal network. Taking a postcolonial approach, I investigate through user experiences how this network operates in a resource-poor environment. This investigation articulates a model of *El Paquete* centered on social interactions, which inform the system's function but also shape *El Paquete*'s design and role in society. Based on this model, a set of speculative design exercises probe possibilities to streamline *El Paquete*'s compilation, involve consumer preferences in its design directions, or act as a disruption tolerant network. In uncovering the technical possibilities of *El Paquete*, these designs illuminate how its current design serves Cuban communities by embodying realities and limitations of Cuban society. *El Paquete*'s embodiment of informal innovation serves as a call to designers to continuously rethink development design processes, centering communities and their knowledge and technical practices.

Sammandrag

Det kritiska tillståndet för den kubanska internetanslutningen har inspirerat flertalet informella lokala innovationer. Ett exempel på en sådan innovation är El Paquete, vars lösning går ut på distribution av nedladdat innehåll som sprids veckovis genom ett informellt nätverk. Jag har undersökt hur detta nätverk fungerar i en resursfattig miljö genom att undersöka användarupplevelser ur ett postkolonialt perspektiv. I denna undersökning framförs en modell av El Paquete som inriktas på sociala interaktioner, vilket utgör systemets funktioner men som också formar El Paquete's design och samhällsroll. Baserat på denna modell undersöks möjligheterna till att effektivisera El Paquete's sammanställning, genom ett antal olika spekulativa designövningar som inkluderar konsumentpreferenser i designinriktning, eller som ett avbrottstolerant nätverk. Dessa design belyser hur dagens tekniska möjligheter med El Paquete är till nytta för kubanska samhällen genom förkroppsligandet av deras verklighet och begränsningar. El Paquete's förkroppsligande av informell innovation fungerar som en uppmaning till designers att kontinuerligt ompröva utvecklingen av designprocesser som fokuserar på samhällets kunskap och tekniska praxis.

Analyzing Function and Potential in Cuba's *El Paquete*: a Postcolonial Approach

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ABSTRACT

The dire state of Cuban internet connectivity has inspired local informal innovations. One such innovation is *El Paquete*, a weekly distribution of downloaded content spread through an informal network. Taking a postcolonial approach, I investigate through user experiences how this network operates in a resource-poor environment. This investigation articulates a model of *El Paquete* centered on social interactions, which inform the system's function but also shape *El Paquete*'s design and role in society. Based on this model, a set of speculative design exercises probe possibilities to streamline *El Paquete*'s compilation, involve consumer preferences in its design directions, or act as a disruption tolerant network. In uncovering the technical possibilities of *El Paquete*, these designs illuminate how its current design serves Cuban communities by embodying realities and limitations of Cuban society. *El Paquete*'s embodiment of informal innovation serves as a call to designers to continuously rethink development design processes, centering communities and their knowledge and technical practices.

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El Paquete; Cuba; resource-poor networking; ICT4D; Computing within limits; postcolonial computing; informal innovation.

INTRODUCTION

How should designers engage with users beyond the connected Western world? As designers have become more aware of both the need for and challenges of designing for underserved communities, the conversation about what design practices are effective, appropriate or responsible has gained traction, and various schools of thought have begun flourishing. ICT for

Development (ICT4D) departs from the standpoint that technology can play an instrumental role in social, political and economic development around the world, and investigates how specific technological applications can advance peoples' lives. Some scholars have questioned ICT4D's ethical premise as well as its tendency towards technocentrism[10]. The field of Computing within Limits intersects with ICT4D in its study of technological solutions within less-than-ideal contexts. However, where ICT4D hopes to surmount the contextual limits through technology, Computing within Limits argues for embracing these limits as design contexts, shaping technologies to work well within them[7]. The debates go beyond arguing the philosophy behind developing technology for non-Western contexts: another aspect that designers should address is the role of innovative practices originating from informal settings[8, 2]. These innovative practices force designers to confront their assumptions about the role of designer versus user: if the user autonomously develops technical solutions to their problems, designers must redefine their position within the design process.

This thesis focuses on informal innovations that have substituted for regular Internet access in Cuba as a context where these debates about technology, limits, and the interaction between designer and innovative user are particularly salient. A range of political and economic factors have kept Cuba at one of the lowest rates of internet connectivity in the western hemisphere. Though statistics report the number of online Cubans jumping from 23.2 percent to 40.3 between 2011 and 2016, this jump is attributable mainly due to the increase in public WiFi hotspots offering expensive unreliable connections [9, 13]. Dissident scholars estimate only about a quarter of that figure to represent Internet users with more access than intermittent email, leaving a vast proportion of the population offline. Nevertheless, local innovations have led to community-driven alternatives to the internet, such as sophisticated peer-to-peer networks, or *El Paquete*, a USB-based file distribution system.

This thesis aims to investigate the social-technical principles that underpin *El Paquete*, in the hope of understanding how the system works now through ethnographic interviews, media reports and analyses of *El Paquete*'s contents. This investigation comprises both a model of the system as it currently works, as well as a series of speculative designs describing what *El Paquete* could evolve to.

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RELATED WORK

This section covers theories behind resource-poor networking and practical applications of disruption tolerant networking in development contexts as a backdrop for understanding possible interpretations of *El Paquete* within Internet networks. Subsequently, postcolonial computing as a design orientation is introduced as a concept that motivates the methods and design decisions made in this study. Finally, some of the more pertinent research surrounding Internet connectivity in Cuba, and the informal innovations to facilitate it, are brought up.

Resource-poor networking

In his vision of a sustainable internet, Barath Raghavan[27] proposes developing internet quines: internet infrastructures that have minimal reliance on external dependencies and are capable of sustaining and reproducing themselves. The characteristics of these systems are that they are "simple, locally reproducible, composed of local materials..., easily repairable, affordable and easily recyclable." Though the description of these quines delves into aspects of how such systems could operate, what they could enable and what specific existing technological solutions they could employ, the author concedes that many of these proposals do not as of yet have clear-cut technical answers. The paper suggests design implications but ultimately confines itself to a dependency analysis of the internet, leaving many questions about the practical implementation open. While Raghavan maintains an abstract position, Schmitt *et al.*[29] set forth a research agenda that echoes many of the ideas behind internet quines, motivated by measurements of internet connectivity in three resource-poor environments (the Za'atari refugee camp in Jordan; Macha, a village in Zambia where commercial network operators have considered expanding service is economically unviable; and San Cristobal, Guatemala, where mobile infrastructure is over-subscribed). Faced with the failures of official policy and top-down approaches, these environments could serve well with user-extensible, bottom-up infrastructures such as local cell networks, or "bring your own" infrastructure which distances itself from the specialized technology that currently defines networks. The authors view the studied environments as proxies of situations caused by catabolic collapse, a theoretical breakdown in human societies and their infrastructure. Rethinking Internet architectures for these environments could inspire technologies that can deal with current resource challenges but also continue to be operational within such collapse scenarios.

Disruption tolerant networks (DTNs)

Many networking protocols assume always-on connectivity with only intermittent failures and reasonable response times. These protocols fail in situations where nodes in the network are only intermittently connected, or where infrastructure cannot guarantee constant connection. Disruption tolerant networks (DTNs) are network architectures which redefine protocols and network functionalities to operate within these situations. DTNs have many applications in physically extreme settings, but have also been researched within the context of resource-poor communities. Pentland's[24] Daknet consists of a series of kiosks in remote villages, which can transmit

messages to a mobile access point installed on a public bus. In traveling between these kiosks and a hub with external internet access, the mobile access point enables messages to be transmitted to and from the various kiosks. The design demonstrated the value of DTNs in connecting rural settings in India and Cambodia for a low cost, shifting the agenda for technological investments away from telephone lines and towards internet connectivity. Ouoba *et al.*[20] argues the value of DTNs in Sub-Saharan Africa, proposing a system which opportunistically exploits human patterns of movement to transmit messages through the system. These variations in DTNs demonstrate how networks can be tuned towards specific use cases based on material realities.

Postcolonial Computing

Postcolonial computing, a concept proposed by Irani *et al.*[17], describes an orientation towards design practices that aims to understand the challenges of working within more global contexts of power imbalances, established hierarchies and cultural differences. Through specific examples drawn from ICT4D and case studies, the authors argue for some main aspects of a postcolonial orientation: a view of culture as generative and dynamically produced rather than bestowed upon individuals; an awareness that development programmes have often aligned with historical power and economic relations; an engagement with the realities of uneven economic relations between those involved within the design process; and a grappling with different models of knowledge generation and transmission amongst culture. Irani reframes the design process as one of engagement (with users or a design space), articulation (of requirements, or of a model of knowledge), and translation (of requirements into technology, or of knowledge from one domain to another). In casting the design process in these terms, the authors open the door to questioning current design paradigms and opening to alternative pathways of design. Susan Wyche[33] employs a postcolonial design approach to suggest how the local knowledge and expertise of Kenyan phone repairers could inform designs of phones appropriate to cell phone usage in the country. Wyche advocates for closely listening to voices usually absent from the technological design process, and contextualizes their proposals and commentary with ethnographic observations of the working lives and conditions of these repairers. Prompting her interviewees to draw designs of their ideal phones on paper, the author argues that they are "experts in innovation for the rural context", and demonstrates how patterns of features of these designs collectively respond to local circumstances. The paper argues that design processes should rethink some of the basic aspects of what a mobile phone is or should be in order for designs to be adopted in resource-limited scenarios, and advocates both for the inclusion of local expertise in the design process and for a greater support for the local design and production of technology. To Wyche, a postcolonial approach is not a singular solution to problems of power imbalances and design project failures, but it does pose a critique of conventional needs-based design methods and calls for alternative strategies.

Internet in Cuba

Most scholarship on Internet in Cuba has centered on the social and political impact of the internet and its limited access on the island, but slowly academia is following the press interest in Cubans' homegrown innovations to contend with the pressure. Motivated by the purported infrastructure improvements, such as the installation of a fibre-optic cable from Venezuela, Bischof *et al.*[5] conducted connectivity tests in Cuba to profile Cuba's access to the wider internet. The experiments demonstrated website traffic was still being routed through slower satellite connections, leading to slow page load times. Additionally, the researchers observed websites including adult content, financial services, or information about computer hardware would consistently fail retrieve SSL certificates. It is this slow, unreliable official internet connection that Dye studies the social aspect of in her study of WiFi hotspots in Havana. [13] Through ethnographic study of the hotspots in public parks in Havana - to most Cubans, the only form of accessible internet connection - Dye argues that the rise of this technology over the last five years has reconfigured public space, internet practices, and daily schedules in Cuban life. The author describes how users attempt to increase the probability of a successful connection by coming at off-peak hours around the clock, or hopping between various hotspots. Internet usage also is shaped by being in a public space, and having to contend with a difficult connection; these factors affect how Cubans engage with social media. Dye suggests applications should consider moving away from an assumption of always-on connections, and also asserts applications should consider privacy issues in settings where multiple people would want access to the same account or device within low-connectivity settings.

Though access to the world wide web has been gradually increasing over the last ten years, during that time Cubans have created homegrown alternatives. Pujol *et al.*[21] perform a first academic study on SNET, an extensive community-driven network that has evolved between individual computers in Havana. Originating from Local Area Networks set up for gaming and filesharing, the network has evolved to a city-wide network hosted on personal computers, measured by the authors to connect about 55,000 users. Beyond measuring the topology and technical specifics of the network, the authors describe how SNET features local versions of social networking sites, search engines, and open source hubs. SNET has no central authority, but moderators do disconnect users who break community standards, including hosting politically sensitive or adult content, or linking to the outside Internet.¹

El Paquete, the focus of this thesis, is a weekly compilation of data of about a terabyte which gets informally distributed throughout the island via in-person USB and hard drive exchanges. Though journalists have led the way in reporting on the system[32, 19, 22], scholars have begun ethnographically studying how various groups in Cuban society have taken advantage of the system. Astley[3] describes *El Paquete*'s role

¹These community standards reflect the "alegality" of these innovations: a ground of quiet coexistence has been found between SNET and the law, and the latter is determined not to give reason for a government crackdown.

in distributing Cuban music, noting how local musicians will try to use the system for promotional purposes, leading to a greater sense of collective identity both over shared culture and shared technological practice. Dye[12] generalizes these trends in her analysis of *El Paquete*, which focuses on the interaction of "la gente" (the people) with the system as a whole. In *El Paquete*'s inclusion of advertising, Dye sees a possibility for small local businesses to promote themselves. Ted Henken[15] draws a line between *El Paquete* and Cuban efforts in blogging and grassroots journalism. Henken labels these appropriations of digital technologies as *inventos digitales*, linking them to the concept of the Cuban *invento* - informal solutions deriving from the Cuban national spirit of creativity and problem-solving.

Most analyses of *El Paquete* focus on its role in particular societal trends. This paper aspires towards a more social-technical understanding of *El Paquete* as an informal networking design, both through a functional analysis of its current operation and through a series of speculative designs imagining how *El Paquete* could make its current experience more streamlined, or how it could resemble a bottom-up network. What are the specific components and processes that constitute *El Paquete*, and what do these constitutive elements reveal about the system's purpose?

METHODS

In order to illuminate user experience as a factor of Cuban internet connectivity, I conducted a series of approximately hour-long Skype interviews with individuals who have firsthand experience with being online in Cuba. The interviews followed a semi-structured approach in which I asked interviewees open-ended questions about the various systems of internet access on the island: the state-sanctioned internet hotspots; private satellite dish internet links; the homegrown intranet known in Havana as SNET; and the USB-based data exchange system known as *El Paquete*. As previous literature explored technical specifications[21], or anthropologically analyzed the role of these systems within Cuban society[15, 3], the aim of these interviews consisted of discussing people's personal attitudes with these systems. The conversations investigated why people were motivated to use particular systems, how they use these systems, and how current system designs helped or hindered user engagement. Handwritten notes and audio recordings documented the contents of each interview.

The notes and recordings of these interviews, together with journalistic reporting[32, 30, 22] on *El Paquete*, were qualitatively analyzed through a process of open coding to find common patterns in the data. Working inductively, these codes led to thematic groupings, from which I both establish an analytical model of *El Paquete* as well as find thematic commonalities in informants' sentiments towards the system, and its interactions with other Internet networks in Cuba. This process of open coding also uncovered common issues or sources of friction in people's experiences with systems' use and usability, leading to possible starting points in conducting a speculative design investigation.

With these specific starting points, and the information on the interactions between society and technology encapsulated by

my analytical model, I conducted a speculative design process which hoped to further the ideas that are already embedded in Cuba's technical practices. Here, the notion of speculative design does not suggest radical alternative futures, but instead critiques present function[4]. I created designs that explored the technical possibilities and limitations of *El Paquete* by adding, or altering, some of its software processes. These technical design explorations act as a commentary on the system's opportunities and drawbacks, and provoked questions about what values and limits were embedded within particular designs. These design efforts therefore did not aspire to be immediately testable and implementable in Cuba, but rather to uncover issues surrounding usability and sustainability within *El Paquete*'s context of limits.

Following the development of these designs, some informants were contacted again to solicit feedback on these designs. In lieu of a full user evaluation, informants could speak to their responses to potential directions *El Paquete* could take, and how these directions would affect them. At this stage, some informants could cross-reference to actual digital artefacts found in recent distributions of *El Paquete*; comparing design proposals to some digital evidence helped explain how ideas would fare or materialize within the informal context[23, 1].

RESULTS

The interview process and subsequent design process involved seventeen informants who had close personal ties to Cuba. Seven of these informants were in Cuba at the time of interviewing, connecting to Skype through a variety of internet configurations. The remaining ten were individuals who had been staying in Cuba for prolonged periods of time within the last six months, but who were currently in Europe. All but one of the informants had spent time outside of Cuba and could compare their experiences on the island with internet connectivity abroad. The group of informants skewed younger (between 18 and 45), and expressed various levels of initiative in navigating Cuba's internet landscape: some described themselves as "consumers" of digital connections, others had undertaken research and practical action for personal benefit, and some characterized their role in developing or maintaining digital connections as "proactive." While two informants described a high personal interest in ICT, most considered themselves as "average" or "typical" in their engagement with technology.

The results span two distinct methodological outcomes. Firstly, there is the analytical model of *El Paquete* derived from the qualitative analysis, detailing how *El Paquete* operates currently and what its role is within the Cuban Internet experience. The second part describes the speculative design proposals, the critiques they pose on the current state of *El Paquete*, and the feedback that these designs elicited from informants commenting on them.

A functional analysis of *El Paquete*

Figure 1 summarizes one source-to-destination "branch" of *El Paquete*, highlighting the different kinds of roles individual actors take on in this process and the data and hardware

interactions that occur along this chain. Each of these roles delineates its own set of technological and social interactions.

Manager

The manager is the central figure in a distribution of *El Paquete*. On a weekly basis, the manager compiles the data set that forms that week's *paquete*. The vast majority of the data is video media such as movies, series, and streamed television. However, the dataset also includes music, downloaded websites, mobile applications and their updates, and classified advertisements. Though the week-to-week contents of the dataset are relatively similar in makeup, compiling the set and organizing it into files and subcategories is a largely manual process requiring work each week. The competitive advantage of a distribution of *El Paquete* lies in this curation process: managers take pride in catering to their customers' needs and assembling the most up-to-date and wanted content.

Managers are highly computer-literate and have a personal internet connection at their disposal. Their technological setup features at least one computer at home, a satellite dish uplink to the internet,² and a sizeable amount of external hard drive storage. Their home office acts as a centralized hub of the entire operation; the manager usually carries out his business at his office, having individuals come to him rather than vice versa.

Downloaders

The volume of data required to compile *El Paquete* weekly has grown to the extent that managers subcontract other downloaders with particular sections of *El Paquete*. These downloaders specialize in particular content to collect: one person may be in charge of tracking the latest music trends, while another would be responsible for action movies, and series. These specializations reflect both the requests of the manager, who transmits to the downloaders what kind of content the consumers of *El Paquete* desire, as well as the personal interests of the individual. Each of the downloaders develops an individuated set of technical strategies depending on their specialization, which could include trawling torrent sites, using tools for screen capture or audio channeling to copy data from online sources such as television streams, video-sharing websites or online music players. Like the central manager, downloaders are expected to have high levels of technical literacy in order to keep their operation running smoothly. Generally speaking, they also have an (illicit) internet connection at home, though it is not unheard of that downloaders take advantage of internet connections at their workplace - universities, hotels, government offices. These downloaders will typically focus on content such as news websites, where each individual item to download does not take up an amount of data high enough to be flagged. Downloaders will regularly bring their content to the manager of a *paquete* distribution on a large external hard drive.

Distributors

El Paquete depends on a large number of intermediaries who physically move hard drives of data to new locations, where

²These connections are generally illegal; a common practice is to hide the hardware in a water tank on the roof of the home.

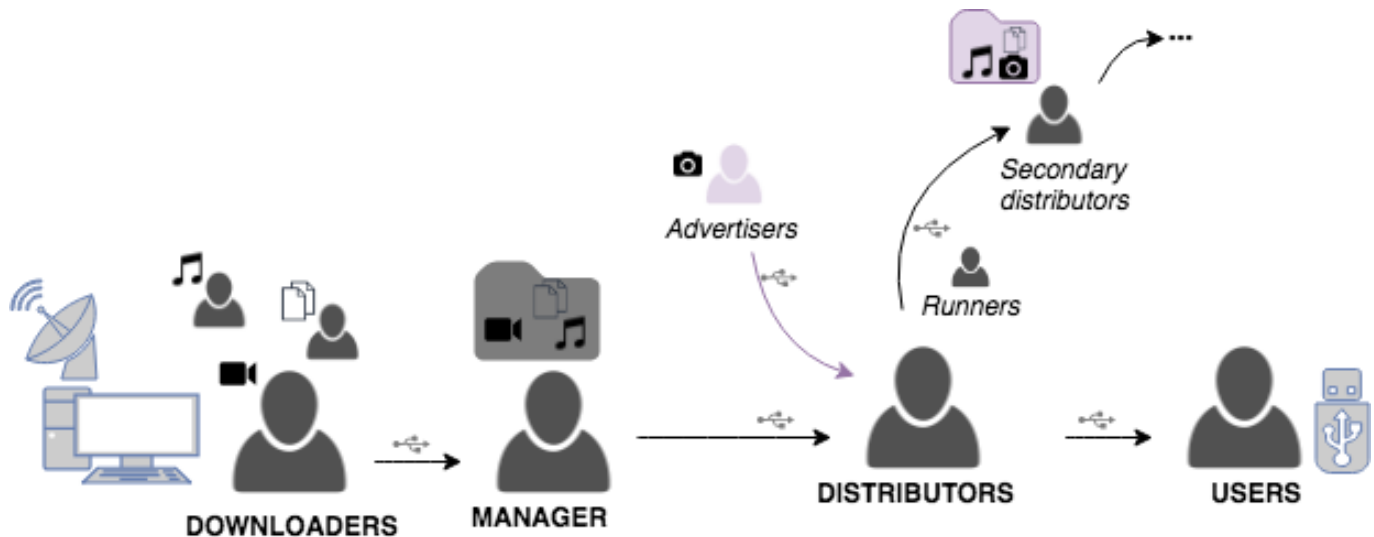


Figure 1. Analysis of *El Paquete*'s current roles and data exchanges

they interact directly with consumers. A set of distributors works closely with the manager, obtaining their copy of *El Paquete* in person at the manager's home office by copying it onto their external hard drive. This primary layer of distribution reflects a professional operation: distributors account for a particular geographical spread, and managers in search of expansion will send distributors on buses or planes across the island to further their product. The far reach of *El Paquete*, however, depends on the dataset being copied from these distributors to other distributors in a network that is increasingly less coordinated. Distributors will alter the contents or makeup of *El Paquete* through adding local content, adding local advertisers, and removing content that might be regionally specific or not perceived as interesting by their customer base.

Consumers

The end users are on average the least technologically literate actors in this chain. They will either obtain *El Paquete* by heading to the distributor's office (usually a phone or computer repair store) with their own hard drive or by the distributor coming to their home.³ Consumers can choose to buy either the entire dataset or selected portions for a reduced price.⁴ In this latter scenario, the distributor usually opens the folder and selects and copies the files over while the consumer looks over their shoulder.

Secondary actors

The chain of actors described above represents the most direct, uncorrupted route between content in *El Paquete* traveling from source to destination. With the growth of the distribution network, additional roles have started growing that enable the smooth distribution of *El Paquete*, yet which are not essential

³Mobile and computer repair forms a good legal front for distributors of *El Paquete*: it is included in the list of professions that the Cuban government grants official recognition for the self-employed, and it does not raise suspicion to have high volumes of hardware traveling to and from the store.

⁴The full *El Paquete* would cost \$2-3, which is about 10 percent of the average monthly salary in Cuba.

to the enterprise as a whole. Local advertisers, for example, both account for some of the content found within a weekly distribution in the form of pictures or videos, but have also collaborated with distributors to infiltrate "normal" content with advertisements: prepending or overlaying advertisements with video files, filling file metadata with branded labels (e.g. having song names prepended with the name of a business) or placing advertisements within folders of popular items. Distributors collaborate with advertisers to provide regionally specific advertising content, leading to whole networks of content creation adjacent to and depending on the central backbone of *El Paquete*'s distribution.

Another major yet unofficial role in the overall distribution is that of the runners in the system. Informally employed, runners do not alter the dataset but simply move hard drives with *El Paquete* between distributors.⁵ These runners do more than ensure data connectivity between affiliated distributors; often, their routes will feature a detour past their own homes where they can copy *El Paquete*, from where another informal distribution canal opens up. The ubiquity of *El Paquete* is attributable in part to this kind of "leaky" transmission; the informal design of the system as a whole accounts for these kinds of transgressions in order to reach a larger audience.

The model in practice

Attributing the various components of the network of *El Paquete* to people speaks to one of the key features of the network: it is people taking on different roles, instead of technical infrastructure. The network is anchored on one end by downloaders with internet connections, but is untethered and fluid on the other. People can assume roles officially or unofficially, functioning as an end user in the eyes of one distribution, but being perceived as a main distributor in their small town. Others might find a casual involvement as a runner in the system

⁵Cuba knows a strong informal economy[25]; these *paquete* runs would be made in between odd jobs such as driving a bicycle taxi, hustling tourists, or the like.

to evolve into a full assistant of a distributor. These levels of fluidity do not deny an underlying robustness to the system: one male 35-year-old informant who had worked as a distributor stated, "at the end of the day, people still show up to get their movies for the week, and they get them."

The role of El Paquete within Cuba's internet situation

Informants characterized *El Paquete* as the primary source for media on the island. A 26-year old male informant explained, "you can't use the real internet for downloading or streaming because it's too slow and fails." SNET, the Havana community-run street network has fast connection speeds, and on a weekly basis *El Paquete*'s contents are hosted somewhere on the network. However, SNET is limited in geographic reach, and even within Havana, it is still viewed as an expensive and difficult pursuit as it requires investing in the equipment and configuring it yourself. A 32-year old female informant described the users of SNET as "still mostly gamers and nerds who have the time and interest in setting that up;" though Pujol[21] registers a diversity of users posting on the online job board, informants theorized these posts indicated someone posting through someone's connection, or having a friend who was willing to help with the process of setting up SNET.⁶ In summary, SNET requires some level of capital, technical knowledge (personal or through your network), and an urban location to be accessed; *El Paquete*'s mechanism based on simple operations between individuals stretches its reach to more rural areas and less technically literate users. Official internet sources, such as the WiFi hotspots, are required to be able to communicate with those outside of Cuba through video calling apps like IMO, but these connections pose many difficulties in use for less technically proficient users[13, 30]. One informant described her relatives' experiences: "It's kind of a simple system, but that's what makes it so possible [to use]. My grandmother needs help from friends to call me on the WiFi hotspot, and even then it sometimes goes wrong. But *El Paquete*, she just goes to her guy, gets her shows and she can watch them on her tv." Ease of use, the built-in social component and the ability to transfer large files have made *El Paquete* crucial to many Cubans' digital connections.

Hybrid approaches to connectivity

El Paquete's current setup consists of a one-way flow of data. A common usage pattern developed by mobile applications and advertisers is to distribute digitally through *El Paquete*, but conduct subsequent user interactions through SMS instead of internet connections. One informant pointed out an app put out by a tattoo parlor in Havana, through which they could display their work, and which automatically reverted to text message when attempted to contact. Apps like that occasionally update through internet connections, but more often than not are updated through new versions arriving on *El Paquete*. *El Paquete* is therefore not a singular alternative to the internet, but can also act as a component in a more hybridized, interactive social-digital network.

⁶SNET is both too user-involved and legally questionable that it is not feasible for users to delegate the work of setting up a connection to an untrusted third party.

Speculative design on *El Paquete*

As it stands now, *El Paquete* is a product of the informal interactions upon which it relies: in hardware, software, and social contribution, it is deeply entwined with the realities of Cuban life. Beyond viewing the system as a document of Cuban realities, it is possible to approach the ethnographic data from a designer's perspective and pinpoint specific design interventions which could augment the capabilities of the system in minor yet significant ways. Figure 2 synthesizes these design proposals, projecting them onto the original model to demonstrate what aspect of the chain they would affect.

normaliza.bat: Streamlining the compilation of El Paquete

Currently, the manual aspects of compiling and curating files creates variations in *El Paquete* from week to week. Though some folders would stay the same, media separated by genre might be organized differently and file naming conventions are inconsistent. The first speculative design I developed consisted of a Windows script, "normaliza.bat" that performed two actions. Given a target folder, it first standardizes the naming conventions of playable media files. Then, it compares the folder's file structure to a reference folder (last week's *El Paquete* distribution) and attempts to fix the former to resemble the latter as much as possible, by creating folders and moving files it finds in both folders to their proper place. The script currently uses a set of basic heuristics to identify filenaming conventions, and can be modified by anyone with some scripting knowledge. This level of technological engagement seemed appropriate for a design meant for managers and downloaders, the most tech-savvy roles in the distribution.

When asked how this change would affect their experience with *El Paquete*, informants who saw themselves as consumers were neutral to positive. Many described the contents of *El Paquete* as "organized chaos" and while this was not a quality they admired in the system, it was also not their greatest preoccupation: "as long as I can eventually find what I need." Distributors could see the value in "cleaning up" the contents, but also pointed out that the randomness of *El Paquete* helped users encounter content that they might not have been looking for, but would also want.

MiPaquete: Interacting with consumer preferences

A subsequent speculative design exercise focused more specifically on consumers' experiences selecting content on *El Paquete*. The content from week to week distributions may overlap, and the process of finding new files among the thousands of folders can be overwhelming. The second speculative design proposal attempts to address these issues with MiPaquete, a small app that lives on the user's device. Overwriting the *autorun.bat* script, which is run whenever its USB device is plugged into a computer, MiPaquete starts by default and presents the user and distributor with a window resembling a simple file browser. However, instead of neutrally displaying *El Paquete*'s contents, the browser highlights the folders which contain new files compared to the last time the user downloaded content. MiPaquete achieves this by locally storing a copy of the last distribution's file structure, as well as information about which files the user downloaded last time, and comparing this information to the current filestructure. A

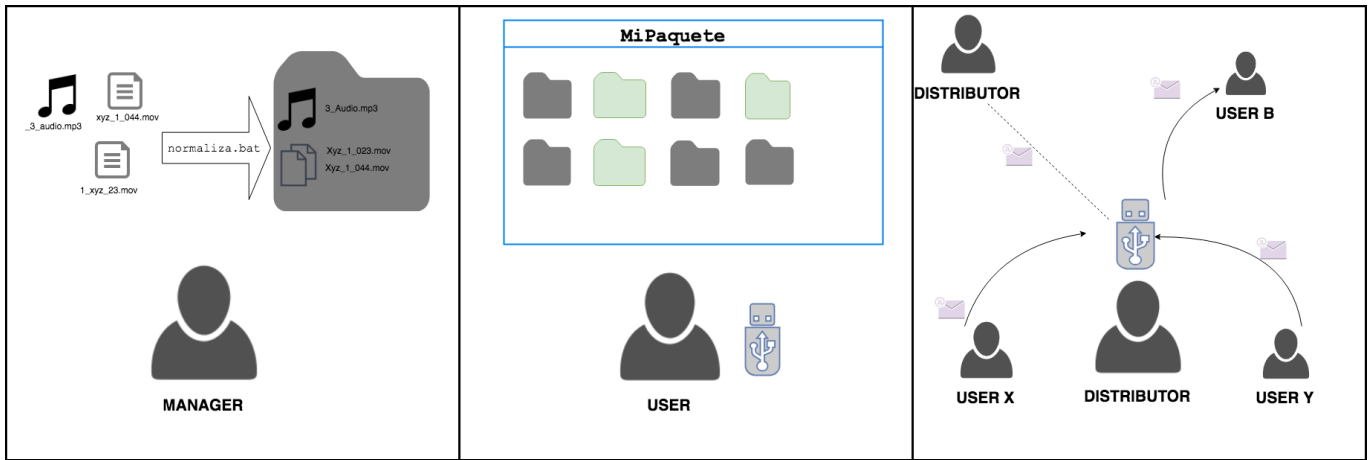


Figure 2. Possible augmentations to the existing functionality of *El Paquete*. Left: *normaliza.bat* helps order files and establish a common naming convention. Center: MiPaquete highlights folders with new content for the user. Right: the distributors acts as nodes within a Disruption Tolerant Network, allowing users to send targeted messages to each other.

further iteration of the design featured a mechanism to contact the managers: MiPaquete would open a message box, and the message would automatically be copied to the distributor's drive, and forwarded up the chain to the master again. This way, users could submit requests for particular content they wanted.

Informants reacted very positively to this design, stating it would make their time at the distributor more streamlined. One informant particularly liked the idea of sending requests back up the chain; another pointed out that it is sometimes able to contact the managers through email or phone provided in advertisements within the distribution, but that he had never done this: "perhaps doing it quickly and casually inside *El Paquete* itself would make it easier. Plus, it would be anonymous, right?"

El Paquete as a Disruption Tolerant Network

Having established *El Paquete*'s theoretical possibilities of transmitting messages from the user up the chain, there were only small technical barriers to overcome to make the system capable of transmitting targeted messages between different participants. As *El Paquete* would connect users despite always-on infrastructure and long stretches of disconnect between various user nodes, this speculative design effectively makes a Disruption Tolerant Network built on existing practices. Building off the interface and scripts developed for MiPaquete, all the consumer would need on their storage device is a folder acting as their postbox, and a configuration file with a public identifier (like a phone number). During a transfer with their distributor, the postbox's contents (files addressed to specific Identifiers within the network) would be moved to a folder on the distributor's device, and eventual messages for the user would be moved from the distributor's message load to this postbox. On the distributor's device, an application implements the BUBBLE Rap forwarding protocol, a decentralized message algorithm which routes messages based on measuring how often the device has "socialized" (exchanged files) with other devices[16]. As the distributor interacts with other participants in the chain, the protocol checks devices'

social activities; if messages seem likely to reach a destination through a particular link in *El Paquete*, the algorithm will copy them over to the new distribution. BUBBLE Rap ensures messages arrive at their destination without flooding the whole system with message copies, and without full knowledge of the network layout.

This proposal engenders many questions about dealing with privacy within a network. Exchanging public identifiers would have to occur in person or via SMS; hosting a database on *El Paquete* itself could raise issues of anonymity and complicity. Encryption of files could ensure privacy is maintained within the network despite messages being transmitted to many more nodes than their intended recipient, but this would require more complex software, assumes computational power to perform these encryptions and decryptions regularly, and requires a protocol to transfer encryption keys. Using *El Paquete* to transmit messages, particularly when encrypted, could push the government to take action against the system as a whole.

Informants' feedback on this proposal was very polarized as well. Some could not envision trusting the privacy issues with such a distribution network: "I wouldn't even know what to write or who to send it to when anyone could just try to copy my message and crack it." Others noted a lack of trust in distributors not deleting files underway, or messages not arriving in the first place. However, informants did argue the system might serve those who do not have any access to a regular internet connection at all, or only sporadically. While short messages could still occur through phone or SMS, *El Paquete* could host media files such as photos or videos. One informant described how her grandmother had to wait to see pictures of her family until they came back to visit; sending them through *El Paquete* could lead to more regular visual updates of their lives. In general, though, users did see the system work well for users to participate in a public discourse on *El Paquete*, by posting their own content in a way that it could get publicly disseminated not just from the master down. One informant pointed out that this functionality reminded him of a feature of some *paquete* distributions, where the

managers include some of the emails that people have sent them inside the distribution that are fit for public debate.

Disregarded avenues for design

Pursuing some of the suggestions raised by informants forced a confrontation with some of the inherent economic imbalances and political circumstances that have shaped *El Paquete*. Every member of the chain mentioned the slowness of data transfer between USB devices, but it was beyond the scope of this design research to figure out a faster data transfer protocol. Moving to devices using a different read/write protocol would imply an investment in different technologies which could be less robust, less ubiquitous and more expensive than simple USB sticks or hard drives. Further brainstorming into creating bespoke hardware solutions for *El Paquete*, which could for example harbor WiFi or Bluetooth capabilities to allow multiple users to connect and download files simultaneously, ran into issues regarding both cost of hardware, and an increased risk of being apprehended for illicit activities by authorities. USB hard drives set an upper limit to the performance of the network, but their affordability, ubiquity, and offline nature force them to be the hardware of choice in this politically and economically charged system.

DISCUSSION

Learning from *El Paquete*

The design of *El Paquete* is not one of ideal planning, but a dynamic response to political, social, economic and resource conditions within Cuba. The system is therefore intimately tied up these conditions, and studying its design as a series of dynamic interactions can help further understanding about how these conditions shape life in Cuba. The model's conceptions of networks through actors performing various roles speaks to the dynamic fluidity of *El Paquete*, highlighting the absence of solid reliable hard infrastructure and the compensatory roles of social interactions as infrastructure. Through *El Paquete* we can shine a light on Cuba's informal economy, on emerging business ventures, on the efforts of the Cuban tech world to circumvent the limits of internet connectivity and hardware on the island to reach users, and on how Cubans share identity beyond state channels. There is still a need to more thoroughly analyze the contents of *El Paquete* in a longitudinal study, which could raise issues of how Cubans interact with media from within and outside of Cuba, and concretize the ethnographic approaches that have dominated knowledge of *El Paquete*'s use so far. As a medium so molded to the political, economic, and social situation in Cuba, *El Paquete* is bound to adapt to changes in that situation. Cuba has announced it would begin rolling out mobile internet to its citizens in 2018, a further evolution in connectivity on the island[26]. With these evolutions, *El Paquete*'s continued relevance is uncertain, but it will remain important to study how its practices are enacted, or how they shift to alternative practices, such as those that have shaped connections through public WiFi[13]. The attention to social and technical interactions that has molded our understanding of *El Paquete* can transfer to understanding a wider set of interactions should *El Paquete* become obsolete.

El Paquete's complete entanglement at first sight make it a difficult design to translate to different contexts: while the individual interactions and hardware are not complicated, they all speak to larger circumstances of internet accessibility, informal economies and political circumstances that are not as relevant other contexts. It is exactly that specificity to local context that *El Paquete* can teach other projects aimed at community-driven digital systems: designs must aspire to engage with the resources, limits, pre-existing practices and ongoing cultural negotiations of a community should they hope to meaningfully contribute to that community. This notion sounds similar to the general notions of context awareness underpinning ICT4D philosophy, but derives from a different philosophy and carries different implications. Consider, for instance, Ali and Bailur's[2] critiques of ICT4D's quest to define "sustainability," proposing instead that the *bricolage* of local innovations or appropriations of external technologies suggests a viable future for sustainable technology. Interpreting *El Paquete* as a bricolage, however, frames it as a peripheral activity to an "intended" use of technologies, when our analysis has argued that it forms a complete technology centered on its own users as its conceptors and benefactors. Designers must center local knowledge and practices and create technologies that facilitate communities in maintaining their own knowledge - or as Terje Sanner[28] opines, move away from "sustainability" as a hallmark of design for underserved communities and towards "generativity," the ability for these communities to continuously innovate and thus exert authority over this technology. Centering local knowledge as the primary motivator for developing digital technologies is evident in projects such as those described by Vitos *et al.*[31], in which non-literate indigenous people in Congo devise smartphone-based software that can help "citizen scientists" compile knowledge helping the management of the rainforest, or in Klopp *et al.*'s[18] efforts in collecting data through mobile phone activity in order to fully map out and validate the *matatu* (shared taxi) network in Nairobi. Both of these projects exhibit high levels of local knowledge input, but also aim at local agency over that knowledge beyond academic research interest.

Reconfiguring the role of the designer

Though ethnographic interviews, and articulating models have established places within academic literature detailing post-colonial design approaches [33], the speculative design work attempted to explore how designers could engage with informal innovations within the context of postcolonial computing [17]. Isolating issues raised by informants, proposing solutions and soliciting user feedback acts as a model of articulation and engagement, in which it was important that these designs did not claim finality or authority, but rather attempts to understand the parameters of the community innovation from the inside out. The work of the designer here is not to come up with the smartest, most concise solutions, but to offer their skills in helping to first understand local practices, then shape a design that they have no ownership over. A designer here must step away from their role as overseer of a design process, and instead embrace that they are another actor who is involved within the community process.

Reframing the role of the designer also means reframing the specifics of design processes. Dunne and Raby[11], the pioneers of critical design, might argue that the designs in this thesis are "affirmative design," bound too closely to real limits to evoke discussion as critical design should. However, learning the limits and letting the designs be informed by them became a model of engagement, and a way for the designer to establish trust with informants based on a mutual understanding of context and limitations. For instance, the designs deliberately focused on decentralized applications, that a single individual could begin to use and spread through USB transfer. Because this model of dissemination is realistic within *El Paquete*, informants were inclined to interrogate exactly why or why not this would be something they would do, instead of imagining the nonexistent. Learning the rules of engagement of a design process is an advantage in postcolonial computing, as it informs participants that the designer is there to facilitate, rather than dictate, and that they are actively searching for the role they can play within the community's practices.

Ethical considerations

Engaging with a practice such as *El Paquete* brings along a host of ethical ramifications. The Cuban government's restrictive stance towards the right to internet access means proposing improvements to *El Paquete*, a distribution system existing on the fringes of legality, would constitute a political action. These implications also explain why this thesis limits its design work to speculative design, rather than a development process on the island: the speculative design process performed here is an academic pursuit, whereas a concretization of these designs in the field would constitute political activism through design. There is precedent for the development of communications technology for the purposes of regime change in Cuba. In 2010, the United States created the SMS-based microblogging service Zunzuneo to operate in Cuba, as an aspect of a larger strategy to leverage technology in instigating regime change[6, 14]. Nevertheless, I would argue that the case of Zunzuneo carries graver ethical ramifications than the design proposals outlined here. This thesis aligns itself with technological practices developed within Cuba, imagining how they could be internally changed. Zunzuneo, meanwhile, introduced a new practice to the island, while failing to disclose its political motivations or its data harvesting[6]. The case of Zunzuneo highlights the importance of postcolonial computing as a design orientation. Even with a politically neutral interface, the design process as a whole played out on the lines of the larger power narratives between Cuba and the United States. As designers, it is important to be cognizant of the political and social implications of not just our final product, but also of our design process ourselves, our working environments and our modes of transmitting knowledge. This thesis has aimed at a methodology which does not cast political ideologies upon actors within *El Paquete*, and where the design work deliberately turns away from top-down conceptions of technological proliferation in favor of small, individual actions with the potential towards expansion.

Copyright issues, too, rear their head when discussing *El Paquete*. The distribution system plays into the dynamics of

copyright law and infringement, in themselves a subset of the dynamics of economic embargoes between the United States and Cuba. Disentangling these dynamics is problematic and a case in point that postcolonial computing is not an easy process that leads to immediate righteousness.⁷ This thesis views *El Paquete* as a noteworthy community-based informal network, not as an ideologically inspired activist notion against copyright. The Internet, in general, is a medium that has both achieved great successes in humanity as well as enabled horrible crimes and unethical behavior. It would be a disservice to the Internet's ingenuity, though, to invoke its worst aspects as a deterrent for its development. Likewise, it would be irresponsible for a designer to advocate for something as potent as *El Paquete* to be quelled over copyright infringement when it performs a vital function in keeping Cubans across the island connected. In this case, my personal ethics align with *El Paquete*'s attitudes towards copyright and Internet access in Cuba; but it is evident that a designer working within other communities, especially with a postcolonial mindset, must eventually confront their own ethical positions and determine what kind of ethics they can and cannot support in service of helping a community.

CONCLUSION

El Paquete represents a community-driven practice that addresses the lack of Cuban Internet access allowing for the transfer of large sections of media. Dependent not on technological infrastructure, but on social interactions, its network topology is fluid yet surprisingly robust. Individuals take on different roles in the system, with some treating it as a professional operation, and others taking on more informal positions. Analyzing the practices that make up *El Paquete* (its compilation, distribution and consumption) and the practices that *El Paquete* enables (advertising, musical promotion, mobile app distribution) provides an insight into technology, society, and life in Cuba.

El Paquete is not envisioned as a one-stop solution to internet access in Cuba; the filesharing community has shaped it to excel as a system with a high bandwidth and wide reach, at the expense of interactivity and latency. There are technical possibilities to expand *El Paquete*'s functionality to more closely resemble a low-infrastructure Internet. However, the informal community that constitutes *El Paquete* has so far found other avenues (calling, SMS, WiFi hotspots) to deal with the system's shortcomings; it is this community's ongoing dynamic practices that will determine the future of the network as a whole.

Designers should take heed of designs like *El Paquete* as socially relevant, engaged and embodied within the community. It may not be possible to successfully emulate the simple low-cost principles underpinning *El Paquete* and make them evolve into complex emergent systems, but it is possible to take local social dynamics seriously, and to center the community's practices as a force of design. Doing so requires proactively

⁷It should be noted, for example, that the Cuban government itself regularly blatantly infringes upon American copyright; *El Paquete*'s activities are therefore both questionable towards the Cuban State, but not beyond the pail of the Cuban government's own

rethinking the roles and skills of the designer. While difficult and problematic work, this postcolonial orientation can open design to new practices that provide agency to underserved communities, designing a better world not through inventiveness but through uplifting of others.

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