

Infrastructure as Creative Action: Online Buying, Selling, and Delivery in Phnom Penh

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ABSTRACT

This paper describes a complex global sales and logistics network based in Phnom Penh, Cambodia, which utilizes Internet tools (particularly Facebook) as well as a suite of offline tools such as feature phones, paper receipts, and motorcycles to facilitate the buying and selling of clothes and other commodities. Against the gap or import models that sometimes limit HCI understandings of computational change in non-Western environments, we argue that the consumers, business owners, delivery drivers, and call center staff play active and formative roles in producing this infrastructure, integrating new tools into older cultural practices and determining how they work within the limits and conventions of the environment. We argue that resourceful and imaginative activities such as these constitute a form of creative infrastructural action and are central to the ways that new tools circulate in the world, though they often go unrecognized by HCI as innovation.

Author Keywords

Logistics; e-commerce; infrastructure; ethnography; postcolonial computing; ICTD.

ACM Classification Keywords

H.m. [Information systems]; Miscellaneous.

INTRODUCTION

A call center worker posts a photo of a newly arrived dress on her small, locally owned clothing store's Facebook page. Minutes later, she responds to a comment from a potential customer under the photo, beginning a negotiation about price. After several direct messages and a telephone call, she agrees with the customer about a price for the item. She prints two receipts detailing the product, price, expected delivery time, and location of delivery. She packages one receipt with the product. She posts the other on a bulletin board for the delivery manager, who then decides who on

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his team will deliver the package to the customer by motorcycle. He then calls the customer to finalize a delivery point and ask how much change in cash he needs for the exchange. The next day, a member of his delivery team follows up with a series of calls to find the customer and deliver the product. These types of exchanges happen innumerable times every day across a variety of shops in Phnom Penh, the capital of Cambodia. Yet if someone went to the city to look for (a Silicon Valley defined idea of) "e-commerce," they could miss this online buying culture entirely, since it has emerged in a city without a reliable postal service or regular credit card use and on a popular social media platform not designed or primarily oriented towards commercial transactions.

While HCI attention to the global uptake of new digital tools has grown in recent years [1, 2, 8, 32], the field tends to rely on a binary delineation between "designers" and "users" to describe ways that tools are constructed and disseminated in the world. We argue that this duality inadequately captures the forms of creative infrastructural action necessary to effective tool use and systems development in the world, and encourages an *artifact*- rather than *infrastructure*-level approach to technology adoption and circulation. This tendency obscures important mechanisms and sites of agency by which new computational systems and processes are made effective in the world [17]. The participants in the Phnom Penh online buying ecosystem, from the call center staff to the delivery drivers to the users themselves, actively construct this infrastructure. They build on established infrastructures like public bus routes and motorcycle delivery to cobble together popular new digital tools (like Facebook) with older non-digital tools, matching the use of new tools to the needs and limitations of the environment. The mode of force for the integration of these new tools is defined locally rather than elsewhere, including the places where these tools were designed or envisioned for. Though creative infrastructural action of the sorts described here falls outside of HCI's traditional emphasis on design, it is central to the way that new computing tools move and gain force through the world.

Such dynamics call to mind recent and older themes in HCI and CSCW scholarship. Early work in the field drew on anthropological notions of "bricolage" to emphasize the forms of ordinary making do and working with the materials at hand that characterize practical and 'technical' action of

all sorts [14, 19, 26, 30]. More recent work has drawn attention to the forms of “infrastructuring” [20] by which a wide range of actors engage and shape infrastructure through frequently quotidian and mundane forms of work. Nguyen’s concept of *infrastructural action* has called attention to the ways in which “hacking” practices are deployed to bridge technology users in peripheries to centers [18]. Building on these approaches, our notion of *creative infrastructural action* represents the resourceful, ad hoc and imaginative development of homegrown infrastructures and the work of integrating new tools into older infrastructures and cultural practices. Creative infrastructural action plays a particularly prominent role as new tools circulate into so-called technological peripheries, and supplies one of the principal engines by which “global” platforms and technologies like Facebook are produced as local in their distinct forms and effects.

Attending to creative infrastructural action expands the ranks of agency around technology change and innovation, since the actors participating in new sociotechnical systems are the ones shaping them. In our immediate case, creative infrastructural action includes seemingly mundane work in logistics and customer service, challenging the primacy of professional design expertise as the assumed center of technological value and imagination. At the same time, the gendered nature of this work also demonstrates how the constraints of local culture bound and distribute the possibilities for creative infrastructural action in important ways.

Our study draws on ongoing ethnographic fieldwork in Phnom Penh’s technology community, including participant observation and interviews with the growing number of small business owners, call center staff, delivery drivers, and consumers who are using Facebook as a selling and buying platform in Phnom Penh. We begin by reviewing HCI and social science work around the localization of the Internet and postcolonial computing, and theories of infrastructure, logistics, and labor. We then describe our methods and the context of Phnom Penh. Then we unpack the ways that business owners in Cambodia use Facebook to sell products, call center staff and delivery drivers work together and use tools to get goods to customers, and how consumers engage these new services. We conclude with a discussion of the ways this creative infrastructural action highlights the embedded quality of infrastructure and opens up HCI to new forms of agency.

LITERATURE REVIEW

The circulation of new information and communication technologies (ICT) between disparate parts of the world is facilitating new kinds of cultural encounters. This study builds on earlier ethnographies of the Internet in settings geographically and culturally distant from centers of technology design and production. These ethnographies describe the varied ways that local people interact with the Internet, demonstrating its context-specificity and

interpretive flexibility. Miller and Slater’s [15] study of Internet practices in late 1990s and early 2000s Trinidad argues that the Internet is “not a monolithic or placeless ‘cyberspace’; rather, it is numerous new technologies, used by diverse people, in diverse real-world locations.” Burrell’s [5] ethnography shows the distinctive ways that Ghanaian urban youth use the Internet in the Internet cafes of Accra. She shows how these youth use the Internet to amass more foreign ties and develop a more “cosmopolitan self.” Drawing on long-term ethnographies of design communities in Shenzhen and Accra, Avle and Lindtner [3] show how the “making of things” is also always about “participating in and articulating one’s relationship to ideas of innovation and the global economy.” In both sites, Avle and Lindtner find their participants buy into a “center and periphery” narrative but at times embrace and at times challenge hegemonic Western and Silicon Valley-led definitions of ‘good’ design.

Technologies themselves play important roles as actors when they move to new settings; they can be understood to have multiple ontologies that hang together through intricate coordination work [16]. de Laet and Mol [6] describe the Zimbabwe Bush Pump ‘B’ type, a water pump designed for building wells in rural villages, as a kind of “fluid” technology, one “that isn’t too rigorously bounded, that doesn’t impose itself but tries to serve, that is adaptable, flexible and responsive” [6, p200]. We build on this notion of technological fluidity to explore how technologies facilitating online buying in Phnom Penh are brought together, deployed, and enacted by a wide cast of actors, within a particular historical and geographical setting.

These fluid technologies work within an *infrastructure*, which Larkin defines as “built networks that facilitate the flow of goods, people, or ideas and allow for their exchange over space” [11]. As Star and Ruhleder describe, infrastructures have social and technical as well as global and local qualities [27]. Infrastructures are embedded within cultures, build on historically accrued installed bases, and are “invisible until breakdown” [27]. They require work, or *infrastructuring*, to be made effective in the world [20]. Beitz et al.’s concept of *synergizing* captures the intentional work of managing relationships (between humans and between technologies and humans) required to develop and maintain an embedded infrastructure [4]. As Monteiro et al. argue [17], though HCI and CSCW work has lately concentrated on localist studies particularly focused on particular applications for collaborative work, these vertical interventions should not be studied to the exclusion of “large-scale, integrated and interconnected workplace information technologies.” They ask what it would take to move from design of “artifacts” to design of “infrastructure” [17].

Recent work has extended these insights on the embedded and “human” qualities [23] of infrastructure in an explicitly transnational and globalist dimension. Nguyen defines “infrastructural action” as “the delicate ways in which

people establish socio-technical connections in the face of endemic distance.... characterized by ongoing attention [and] care” [18]. Nguyen describes smuggling iPhones into Vietnam as a form of infrastructural action and argues that this “hacking” is a “mundane way of coping with life removed from the centers of global modernity.” Rangaswamy and Densmore use the Indian concept of “Jugaad” as a way to understand user-driven innovation, particularly the development of working alternatives in the context of broken infrastructures in the Global South [21]. Similarly, Ahmed et al.’s [2] study of mobile phone use among migrant workers in Dhaka, Bangladesh has argued that innovation in postcolonial computing environments may be best found around “practices of hacking, repurposing and repair.”

Logistics [9], or “the artful coordination of moving people and things,” is a special kind of infrastructural work. Logistics involves coordination [25] and articulation [24, 28], arranging and delegating the varied tasks of a project in large-scale systems. Logistics aims to harness greater control over moving things and people; however, this control is tempered by the inherent unpredictability of the climate and geo-political disruptions, which are particularly acute in disaster and developing contexts [9]. Like working infrastructures and much articulation work, this logistical work and care is often invisible [9, 28], particularly in the digital realm. Irani and Silberman [7] have called attention to the often unseen quality of digital labor by focusing on the labor that powers crowdsourcing and an analysis of Amazon’s Mechanical Turk platform. Jarrett [10] has introduced the figure of the “Digital Housewife,” a digital media user who browses the Internet, online shops, and does crowdsourcing tasks, work which is critical to the success of the technology industry but largely unrecognized and unpaid. Scholars have shown how digital work sometimes puts vulnerable logistics workers at risk for exploitation and increases corporate surveillance and control [1, 12, 22]

The forms of digital and logistical labor described above are key parts of the online buying ecosystem in Phnom Penh and the expertise of these workers is critical to the construction of the ecosystem. The new tools, old tools, shopkeepers, call center staff, delivery drivers and consumers are all actively building the online buying infrastructure that appeals to and works in this particular context. They engage in *creative infrastructural action*, resourceful work that makes a new tool work within the context of older tools and infrastructures in an environment. This online buying sociotechnical system does not have a clear designer to point to as the innovator and instead the diffused creative infrastructural action of all of these laborers has led to its development. This creative infrastructural action is often overlooked as design in HCI but is crucial to the way that new tools are being taken up in the world. Recognizing this distributed innovation, we argue, has important consequences for how and where we look for drivers of technological change.

In this case, the creative infrastructural action is located squarely in this particular context and puts at the forefront the way things work in Phnom Penh. The shopkeepers or buyers, in developing this ecosystem, do not take as a given that Cambodia is a technological “peripheral” setting, as Avle and Lindtner’s participants cited in their understanding of their “local” design in relation to foreign design [3]. Nor is the primary effect of this infrastructural action to bridge the distance to technological centers [18]. Rather, the online buying ecosystem takes the rules of the local context as self-evident (ie, the normal way of working) and “central” to the workings of the ecosystem. The network we describe here, though it recently introduced a new online tool, demonstrates more continuity than discontinuity when compared to older forms of commerce. The use of this new tool also supports and strengthens new local relationships through increased communication between consumers and call center staff and delivery drivers by Facebook and phone. This increased communication, however, comes at the cost of displacing some conventional face-to-face communication between shopkeepers and consumers and the physical experience of shopping.

Our approach to describing the online buying ecosystem in Phnom Penh shares common interest in the local interpretation, use, and meaning-making of putatively global technical systems with Miller and Slater [13] and Burrell [5]; however, we focus on how Internet tools are embedded in non-digital infrastructures and the kinds of labor that are required to produce this locally specific hybrid socio-technical system. By focusing on the Internet (particularly Facebook) only as it works in relation to a suite of other, older non-digital tools and systems, Facebook (and the Internet more generally) recedes into the background of the way online buying works in Phnom Penh. We build on these earlier ethnographies by paying particular attention to user perceptions of online buying, including limited engagement and non-use.

The creative infrastructural action we describe relies on logistical and customer service work and expertise. These kinds of knowledge and labor are undervalued in the physical world and only becoming increasingly so as they move into the digital sphere. Logistical work requires often unrecognized care in order to manage the unpredictability of moving people and things across space [9]. This unpredictability is particularly acute in the setting of Phnom Penh where high rates of growth/change and poverty have led to routinely chaotic roads and neighborhoods that are difficult to navigate for delivery drivers. Customer service, too, is an often invisible form of work that requires a high degree of affective labor. As customer service work moves into Facebook, it has created new work identities for female call center staff, a gendered figure related to Jarrett’s “Digital Housewife.” The concept of creative infrastructural action makes the work in logistics and customer service, as well as other seemingly mundane forms of labor, recognizable as drivers of technological change.

METHODS

This paper is the product of the first author's ongoing ethnography in Phnom Penh's technology community, with the bulk of the data collected in January and June-August of 2016, part of a larger research project on Cambodian infrastructure development underway since 2014. We conducted 31 interviews with Cambodian shop owners-turned-e-commerce-entrepreneurs, online shoppers, call center staff, and delivery drivers, and engaged in many more informal conversations with Cambodian youth about online buying. The business owners interviewed ran shops selling goods ranging from plants, food and second hand items to clothes, cosmetics and fashion accessories. In addition, we conducted participant observation in shops and during two daytrips with delivery drivers. The formal interviews were semi-structured, audio-recorded and transcribed. Data was also collected through online ethnography, visiting and analyzing many of these companies' Facebook pages. We analyzed the data using a Straussian grounded theory approach [29], writing analytical memos on a weekly basis and iterating the data collection approach to flesh out emerging themes gathered from the data. Interviews were conducted in English, Khmer or a mix of English and Khmer. Though the field worker speaks intermediate Khmer, for the interviews that were conducted solely in Khmer, we used the assistance of a translator.

This dataset is skewed towards middle-class Cambodian urban youth (18-30), usually in their early to mid 20s. Though some of our participants come from low-income backgrounds, nearly all of them are educated through high school or university level and most of them speak English as a second language. While this is an important change-making demographic in Cambodia, it is important to note that our participants do not necessarily represent the perspectives and experiences of low-income, rural, and less educated Cambodians.

THE CONTEXT: ONLINE PRACTICES IN CAMBODIA

Cambodia is a small country in Southeast Asia, bordered by Laos, Vietnam and Thailand, with 15.6 million people. Phnom Penh is the capital city and is home to between 1.5 and 2 million people (10-14% of the Cambodian population), though it is growing quickly as the country continues to urbanize. Cambodia is a World Bank-designated low-income country recovering from a traumatic history. For the past twenty years, the country has been in a slow process of healing from a genocide followed by a long-lasting civil war and political tensions remain high. Today, the country's economy is steadily growing; according to the World Bank real growth rates reached 7.1% in 2014 and 7% in 2015. Much of this growth has been driven by the garment industry, tourism and construction, themselves heavily influenced by foreign direct investment (World Bank, April 2016).

In the past three years, Cambodia's relation to media and digital tools has begun to change dramatically. According to

some published reports, Internet penetration (via computer or Internet-enabled mobile phones) grew from 7% to 32% between 2013 and 2015.¹ Cambodians are responding to this expanded infrastructure actively, shaping the way the country changes in response to the impacts of the Internet. At the forefront of this change and growth are Cambodian young people (younger than 30), who make up a large majority of the Cambodian population today (65%).²

A notable feature of Internet usage in Cambodia is the extreme popularity of Facebook. There are at least 3.5 million Facebook accounts in Cambodia, representing approximately a quarter of the Cambodian population. As one of our informants put it, in Cambodia, "Facebook is king." One can see the importance of Facebook not just in the number of likes and comments on an average Cambodian young person's Facebook wall, but also in the interest that politicians have in getting a strong Facebook presence. The prime minister, Hun Sen, began his Facebook page in January 2016 and amassed 3 million Facebook likes by April (at the time of this writing in September, his page has 4.7 million likes). His Facebook presence is strategically important to counter the strong presence of his rival Sam Rainsy of the Cambodian National Rescue Party (2.8 million likes at the time of this writing). Beyond these usage statistics, Facebook has begun to take on core social functions in the capital for event promotion and announcing major life events such as weddings and the birth of children.

FINDINGS: DESCRIPTIONS OF ONLINE SELLING AND BUYING PRACTICES

This paper focuses on one important way that Cambodians are using the Internet and Facebook, today: to buy, sell and arrange delivery for commercial products. Most Cambodians do not use credit cards and there is no reliable postal service in the capital or provinces. Further, business owners and users we spoke with argued that many Cambodian people are resistant to using new (non-Facebook) web-based platforms for buying and selling. This resistance has caused some frustration amongst hopeful foreign and domestic entrepreneurs in Cambodia who have struggled to build traffic on dedicated e-commerce websites. Despite these limitations, many Cambodians do use the Internet to buy and sell goods, changing the Cambodian marketplace and Cambodians' access to international and domestic commerce.

Online shopping arrangements in Cambodia come in two principal forms. The first is focused on giving Cambodian consumers access to international e-commerce websites. On some sites people living in Cambodia can directly order products from abroad. The most popular in Phnom Penh is AliExpress, a subsidiary of the Chinese conglomerate Alibaba working in Cambodia. The use of this site is limited to Cambodians with credit cards, a rarity even

¹ 2013 Internet penetration statistic from ITU World Internet Statistics (2013) and 2015 Internet statistic from *Southeast Asia Globe*, June 2016.

² UNDP Factsheet

among middle class urban residents. One participant that we spoke to, however, did have a credit card, which he used to buy smartphone cases on that site. He chose the site because it was cheaper and had products that were not sold in Cambodian markets. Alibaba ships through private logistics companies, which, according to participant reports, are expensive and unreliable. This same participant said that some things he had ordered from AliExpress had gotten lost when he tried to ship them to his office; however, AliBaba had given him a full refund when they went missing.

Another new third party company (established in July 2016) allows consumers to buy goods on Amazon (not currently popular in Cambodia) and have them delivered in Cambodia. The consumer is responsible for paying up front for the product either in cash or through mobile-based direct money transfer (the most popular and long-standing of these is called Wing,³ established for mobile remittance). The company will then order the product for the consumer and ship it to a warehouse in California. From California, the company ships goods by airplane to Ho Chi Minh City, then puts packages on the public bus line to Phnom Penh. This arrangement builds on widespread practices of the casual smuggling of products into Cambodia from family and friends traveling outside of the country.

Small Clothes Shop

By far the most prevalent form of online commerce in Cambodia today however centers on the use of the Facebook platform to buy and sell goods from domestic shops. Many shopkeepers in Phnom Penh (and all of the shop owners we spoke to) are now looking to the Internet, specifically Facebook, to expand their customer base and sell more goods. These shop owners take images of their staff in clothes on sale in the shop then post them on their Facebook pages on a daily or weekly basis. Facebook users negotiate and ask questions about the products in the comments box, by direct message, or through phone calls, most frequently using feature phones. Most of the shop owners we spoke to have a storefront and referenced the added legitimacy a physical store gave to the business; one interviewee said the storefront gives customers the impression they are “the real deal.” After a customer decides to purchase the product, he or she picks it up at the store or the good is delivered to their house by motorcycle and paid for with cash on delivery. This phenomenon is quite recent; the oldest company started this practice in 2010, but most of the companies we spoke to had started selling products on Facebook within the last year.

We focused our research on the staff and operations at the oldest and most established of the Facebook selling companies, which has been in operation since 2010 and which we will call “Small Clothes Shop” (a pseudonym). This shop grew quickly and is well known locally as a

pioneer in Facebook buying and selling. The shop sells mid-priced fashion for men and women, targeted at young people in their teens through twenties. Most of the products are imported in bulk from China. Two Cambodian brothers own the shop, one of whom manages the business and works on the shop premises. He is familiar with staff workflow and has helped establish good practices with the input of the drivers and call center staff.



Figure 1: "Small Clothes Shop" Facebook post

The team consists of eight female call center staff (two part-time) and three male delivery drivers. The call center staff work four to eight hour shifts and are paid hourly. The delivery drivers work a similar eight hour shift and are paid a salary rather than an hourly rate. The staff works in an open office next to a brick and mortar shop where consumers can come in to browse and traditionally buy clothes and accessories. The shop is located on a busy road in a high-end neighborhood in Phnom Penh and Western and Khmer pop plays in the background of the shop. It has three rooms displaying merchandise for sale attached to the open-plan workspace for call center and delivery staff. Adjacent to the call center room is a warehouse where extra clothes are stocked. The staff room seems to be in constant motion, with women moving in and out of the warehouse, workers wrapping packages, and delivery drivers preparing for their drives. A set of cubbies line the wall of the workroom, each labeled with a series of Romanized letters and numbers which correspond to a single customer.

The gender relations in the staff room are striking, as are the relations between the shop workers and the call center staff. The women wear clothes in line with the aesthetic of the clothes typically sold by the shop. These are characteristically stylish and somewhat revealing, such as skirts or shorts and tank tops. The women who work at the call center have the same female manager as the women who work at the brick and mortar shop, suggesting a continuity between shop staff and call center staff. The male drivers wear pants and long-sleeved shirts to protect them from the sun and elements while driving and are not particularly stylish, especially in relation to the call center staff. The women sit at a line of desktop computers close to the store. The male drivers have their own table in the

³ For more information, see <https://www.wingmoney.com/>

middle of the room, but without desks and desktop monitors.

The call center staff take and process orders through Facebook (Figure 1) and phone calls. They are responsible for monitoring Facebook, wrapping packages, entering order information into the corporate intranet and organizing packages into their appropriate outbound cubby. The call center staff constantly monitors the company's Facebook page and responds to comments and questions on photos. Often the discussion moves to Facebook messenger to keep price negotiations private. The staff conducts online discussion in Khmer and English, often through a blend of Khmer script and Romanized Khmer spelled out phonetically. They also answer phone calls requesting more information about products and take orders (typically in Khmer). Though sometimes the opening negotiations display a similar pattern, the conversations are not automated or scripted and instead represent the judgment of the customer service agent. Once a customer expresses interest in purchasing a good, the call center staff member collects information about the customer's phone number and details about where they want the good delivered. This information is then entered into a form on the company's intranet, which the company owner developed.

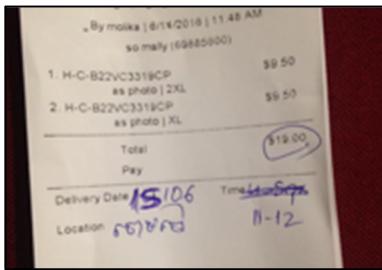


Figure 2: Revised paper receipt

Once the information is entered in the intranet, the call center staff member prints out two paper receipts, one that will be affixed to the package and one that is stapled to a board closer to the delivery staff. Two junior call center staff then find the goods in the warehouse, fold and package them in opaque white bags with the company's logo on them. All orders destined for any particular customer are labeled with a code of numbers and letters that correspond to a customer-specific cubby lining the wall of the call center room.

The paper receipt pinned to the bulletin board collects details about what time the good needs to be delivered, to where, the phone number of the customer, the proper amount of change to bring, and the identifying number for the product sold. The paper receipts are often revised manually with more details about the location and time of delivery as the delivery drivers and call center staff gather more information. Figure 2, for example, shows that some pieces of information captured in the online database remain

constant (in this case, price), but the date and time are written in pen, then scratched out and revised as needed.

The call center staff and delivery drivers use a suite of electronic devices at all times. Each of the call center staff has a personal smartphone, a desktop computer, and a landline. Two of them responsible for confirming orders by phone also have six simple Nokia feature phones. The delivery drivers each have three feature phones, personal tablets and personal smartphones. The staff carry multiple phones so they can have lines on different carriers to facilitate carrier to carrier calling when possible. Carrier to carrier calling is often cheaper and, some informants claim, can lead to more success in reaching a customer.

The call center staff fluidly moves between 'personal' and 'work' contexts, since they regularly take breaks from their monitoring of the corporate Facebook account to look at their personal Facebook feed, respond to chats on their personal smartphone, or (for the delivery drivers) watch videos on their laptops while waiting to make a delivery. Staff members sometimes take breaks in the workroom to eat and casually chat at the table where the delivery drivers sit.

The call center staff's digital tasks require attention to detail and careful organization. As the company owner describes the requirements of being a call center staff... "People with very little attention to detail would not be able to work at this job. All day, you just see data, data, data."

The company owner has also noted some conflict between those who are interested in working with data and those who want to do the delivery work. Working with data does not always appeal to the delivery drivers and the perceived learning curve is steep. As the company owner explains, many of his drivers say, "*I'd rather work in the hot sun.*" Because of this, he finds "*it's very hard to find someone to learn and work with data instead of going out.*" The delivery drivers, however, do manage various kinds of information, by organizing receipts, keeping track of the time and location of their various deliveries, and properly recording when they begin and complete jobs. While our informants do not call this information "data," it is what constitutes much of what is often understood as logistics data. Both the call center staff and the delivery drivers are working with data while simultaneously performing physical labor; the divide between data-driven work and physical work is more and more blurred.

Delivery Services

At Small Clothes Shop (as was the case in all of the companies that we spoke to), local Phnom Penh delivery is done by motorcycle delivery by an in-house staff member. The driver brings the product directly to the consumer, most regularly to the consumer's office, school, home, or to a designated meeting place (such as a gas station or street corner). Small Clothes Shop offers this service for free but some companies charge a small fee (typically \$1) until a

certain price threshold (usually about \$50) has been reached, at which time they offer delivery for free. We interviewed the delivery drivers at five shops and accompanied two delivery drivers on their routes in order to better understand the challenges they face and the way they coordinate their jobs.



Figure 3: Driver looking at map

At Small Clothes Shop, the drivers use the paper receipts stapled to the board as a guideline for where and what they need to deliver on any given day. The call center staff, as part of the Facebook messaging and calling order process, will decide on a general time and place with the customer. They then write this information (usually in pen) on the paper receipt that they staple to the driver's bulletin board (see Figure 2 for an example). The city is divided into three main sections, and each driver is responsible for a particular region, divided in the map that one of the drivers looks at in Figure 3. The senior driver divides these paper receipts into groups based on the general location of the delivery, usually using a popular city landmark, and arranges the receipts on the board in three sections, representing the jobs for the three drivers. The driver responsible for the drop off calls the customer to coordinate the specifics of the exchange near the pre-arranged time of the delivery. Drivers typically aim to deliver three or four packages on each run when business is good.

The drivers use a system of calling directly on feature phones to coordinate the delivery process. This is complicated when the buyer is on the move and expects the driver to meet them where they are. For example, on one delivery route that we shadowed, the driver dropped off a product with a young woman who was in her car waiting for him to arrive. The delivery manager explained the various coordination tasks required to find the customer:

"So, the starting point is to ask for the customer's general location. They might say, 'I'm around the Chinese embassy.' We know that road number and the general area. But, as you know, the road numbers here don't always count up or count down. When we get to the general location, they might tell us, 'we are at Java coffee, next to the Chinese

embassy.' So we pinpointed it even smaller. When we get to Java, we call them again, and they might give us another direction. I'm across from there, a few doors down from there. We use direct communication to find the area. That's why it takes so much work... For us sometimes, we have to call four or five times, and when we get there, they can move location. Or, when we get there, they don't pick up. Also, sometimes they don't have much respect for us delivery men or just people lower than them. You know what I'm saying. They think: I'm buying, I'm king, you follow me."

The biggest challenge for delivery drivers is when they cannot connect with the purchaser on the phone. To offset this problem, the drivers carry multiple phones (or, with one driver, multiple SIM cards.) One of our informants explained that sometimes calls are dropped between carriers and trying with another carrier will allow them to connect. One delivery manager explains, *"If the network is busy or you can't contact, we send a text, saying, hey we are from the delivery company, we arrived, you didn't pick up. Then, to save our butt, we call the store right away, we explain that we called this person they didn't pick up, blah blah. Then when they call the store, we already saved our butt."*



Figure 4: Roadblocks in Phnom Penh

The delivery process requires detailed knowledge about the city. None of the delivery drivers we spoke to used GPS or virtual maps, though they sometimes had smartphones that enabled these features. In two of the delivery centers we visited there was a paper map of Phnom Penh on the wall (Figure 3), but none of the drivers reported using this map in their regular delivery process. Instead they always claimed to "just know the city" through years of driving in it. This tacit knowledge comes in handy when they need to change route due to traffic or other disruptions. For example, we accompanied a driver on a route in which one of the roads was unexpectedly closed due to construction and another was experiencing heavy congestion due to lunchtime traffic and construction (see Figure 4). The driver found alternate routes based on his knowledge of the city.

To deliver to the provinces, the delivery drivers coordinate either with a taxi line or with the public bus service. They typically drop off goods at the public bus station in the city center, near the Central Market. The delivery driver drops the goods with the person who runs the ticket counter, who then gives the goods to the bus driver to load into the bus (see Figure 5). Then the bus driver transports goods to the closest bus station to the consumer on his normal route. The customers then either pick up the product at the bus station or another taxi drives the product to their homes. Sometimes consumers live in such a remote locations that the only way to get products to them from Phnom Penh is by taxi. During these exchanges, the package is labeled with the telephone number of the consumer and the selling store as well as the location of the exchange. Whenever products are sold remotely in the provinces, customers pay upfront using Wing or another mobile money platform.



Figure 5: Goods piled at bus station for transport

User Perceptions: Use and Non-Use

Many Phnom Penh youth we interviewed have experience buying things on Facebook this way; they most frequently cite buying clothing, cosmetics and fashion accessories. The young people we interviewed were generally satisfied with their buying experiences, especially with the perceived convenience and time-savings that the buying model allowed. Some consumers think they can find fashionable products available on Facebook that they are not able to find in Phnom Penh markets because they are imported from foreign countries. Some think they can find cheaper products using Facebook than they find in markets (although many also find that products were cheaper in markets).

According to shopkeepers, the online buyers are most frequently young urban women; however, buyers are in a variety of socioeconomic classes. As one delivery driver put it, “*We deliver to slums and we deliver to mansions.*” We participated in one trip where we delivered to a woman in a Lexus SUV (a high status symbol in Phnom Penh) and, on another trip, to a woman who worked as a garment worker in the outskirts of Phnom Penh. All of the shops reported that consumers in the provinces bought items but that this consumer population was a minority of their business; we

did not interview consumers who lived outside of the capital.

Many of our interviewees currently buy goods online or want to, but there is still active resistance to using the Internet to buy things. Some informants told us they see no need to buy things online because it is convenient to go to the markets they are accustomed to (open air markets such as Orussey Market, Central Market and Russian Market are popular in Phnom Penh). Some prefer to go to “modern” markets, or indoor supermarkets, such as Lucky Market and Aeon Mall. Some Cambodian young people also say that they do not trust buying things online. They do not want to buy something online before seeing the goods and touching them. One buyer had used Facebook to buy clothes in the past but thought that the t-shirts he ordered were cheap and the “quality was off” so he would not use the service again. One of our informants told us that he does not buy a lot of things in general, as he does not make a lot of money and does not have a need for clothes or luxury goods. Only one of our informants had a credit card and a few young people did not realize they could buy something online using Facebook without a credit card. Some of these informants had gotten food delivered to their house (most popular was pizza) and paid in cash on delivery but had only done so once or twice.

Some of our informants who had not bought anything online expressed some interest in buying things from larger international e-commerce sites. One informant had an interest in buying electronics and bike parts internationally but did not know how to do so. He cited his biggest barrier as getting a credit card, which he did not know how to acquire.

New Pressures on Shopkeepers

Some shopkeepers told us that online buying is causing more competition and stress for running a business in Phnom Penh. As one shopkeeper informed us, many business owners in Phnom Penh now are under pressure to have an Internet presence. The first thing they do to reach customers online is to establish a Facebook page and an important part of business is to solicit more likes and followers on these pages, a new responsibility that adds to the burdens of shopkeeping. The proliferation of online shops puts pressure on shopkeepers to offer delivery services for free or very cheap rates. Delivery drivers in older, more established shops say that there are more delivery jobs available now due to the growth of this sector. They claim these new delivery drivers do not know the city as well as the drivers who have more experience.

Shopkeepers who speak English, Chinese, or Vietnamese fluently and have access to international markets have an advantage in online selling over other shopkeepers. For example, some of the shopkeepers we spoke to have business connections in Thailand, Korea, China, or Vietnam or travel internationally and can bring goods back to

Cambodia to sell in their shops. Those who speak, write, and read English at a higher level navigate the Facebook platform with more ease and have less difficulty communicating in the English-Khmer mix that often populates the Facebook selling pages.

DISCUSSION

In the above section, we have described how small business owners, call center staff, and delivery drivers are working to assemble an online buying infrastructure in Phnom Penh. This activity represents *creative infrastructural action*, the resourceful and imaginative development of a homegrown infrastructure. Business owners integrate a popular platform (Facebook) into standard mom and pop business operations and leverage local motorcycle delivery and the public bus system to facilitate delivery in the city and to the provinces. Delivery drivers rely on their knowledge of city geography to overcome obstacles and use landmark triangulation to find customers. Delivery managers spatially organize paper receipts on a board to manage efficient delivery in the city based on neighborhoods. Call center staff use an original mix of English and Khmer to chat with customers on an online forum, continuing the standard cultural practice of price negotiation in the digital sphere. The call center staff and drivers have developed a system using paper receipts that allows them to record key customer information (location of delivery, change needed) and also revise it (using pen) in a real-time and cost-effective way. These creative infrastructural actions are based in expertise in logistical work and customer service, two domains of knowledge and work that HCI does not traditionally recognize as agents of technological change.

Rendering these contributions visible [28] makes apparent the ways that these workers are agents of technological change and questions the binary between “users” and “designers” common in HCI. The online buying infrastructure in Phnom Penh lacks a “designer” recognized as such to HCI; instead it has emerged in organic ways from the input of many different participants pursuing a variety of goals and interests. As earlier scholars of digital labor have suggested [1, 12, 22], moving into an online sphere has broadened the duties required for logistics workers (specifically drivers) in ways that are ambivalent (or even negative) to them. Further, both customer service and logistics work is often invisible [28] or underappreciated to the end user (as work is in the Mechanical Turk case [7]). As in other examples of logistical work [9] and infrastructural action [18], this case demonstrates the ways that care is a precondition for the effective running of this infrastructure, both through the affective labor of the call center staff and the attentiveness of the drivers managing the uncertainty of frequently disrupted chaotic city streets. This case further shows, however, the ways that driver and call center skill and expertise has shaped this sociotechnical system. For example, the drivers’ tacit knowledge of the city and the call center staff’s ability to communicate are both critical to the use of Facebook as a commercial platform in

this setting. This case therefore encourages the field to broaden its scope and look for agents of technological change and infrastructural development outside of professional design knowledge and expertise. It also encourages us to look to spaces of innovation beyond those commonly recognized in the West (e.g. co-working spaces, incubators, or start-up communities) in our efforts to observe and understand the mechanisms and dynamics of infrastructural change.

Like earlier ethnographies of the Internet [5, 15], this ethnography shows the ways that Internet technologies exhibit interpretive flexibility and are used in specific ways in local contexts. Unlike earlier ethnographies, online buying in Cambodia highlights the way that new tools (particularly the use of Facebook and mobile payment systems) interact with older tools (feature phones, paper receipts, public bus, and motorcycle delivery services) to establish the online buying ecosystem. The new and old tools are significant as fluid actors, which are “adaptable, flexible, responsive” and “travel well.” [6]. The way that these technologies become localized is through creative infrastructural action on the part of the participants in the ecosystem. We hold a more diffused understanding of fluidity than de Laet and Mol [6], finding it not only in a tool but also in the way the tool interacts with its environment, giving a greater emphasis to the human labor of integration than the design of the tool. Based on our findings, we critically question narratives that suggest that the introduction of new ICT tools represent a dramatic cultural rupture. Rather, the way that online buying culture in Cambodia is emerging is “embedded” [27] in the city’s history and in older forms of infrastructure.

Despite our emphasis on the embeddedness of tools and the human labor of integration, we recognize that not all tools are “fluid” and ripe for these kinds of creative infrastructural actions; there are many examples of brittle technologies which cannot be maintained easily within a society, do not travel well, and are not popularly used within a new environment. We argue that understanding the way the Phnom Penh online buying system works has implications outside of market-driven technology appropriation and also in information and communication technology for development (ICTD) work and scholarship. In some ICTD projects, we see brittle technologies distributed but not successfully integrated into existing infrastructures [for example, 31]. We argue that studying a homegrown sociotechnical system like the Phnom Penh online buying ecosystem and the creative infrastructural action of its participants can be applied to the design of better, more realistic, and more embedded ICTD projects.

The rapid growth of the Internet in Cambodia, instead of representing a major rift, makes the dynamic quality of infrastructure particularly acute. The online buying infrastructure might look drastically differently in the summer of 2017 than it did in the summer of 2016, as trends

change and new tools are introduced. The forms of creative infrastructural action described here emerge as a reaction to changes to the cityscape due to increased access to the Internet and other digital tools, giving this action a characteristic improvisational quality. This improvisational quality is well suited to the tasks of “hacking, repurposing and repair” [1] that often represent innovative practices in postcolonial environments.

This emphasis on the embedded and historically contingent nature of infrastructure expands HCI work regarding infrastructural action in so-called technological peripheries. Though other scholars have shown how the Internet makes users more cosmopolitan by building relationships with foreign people, products, and ideas of design [3, 5, 18], this study emphasizes the ways that infrastructural action can reformulate *local* relationships, work practices, and marketplaces. The result of the creative infrastructural action of our participants is the development of a homegrown infrastructure. Though a foreign-designed platform is critical to the way this ecosystem runs, we see the primary effects of this emerging infrastructure to be in Phnom Penh rather than on relations between Phnom Penh and an imagined or real elsewhere. Though many of the Facebook sellers offer foreign products, imported products have been available in Phnom Penh at local shops long before the rise of Facebook and there is no consensus among users or business owners about whether or not online buying makes international products more available or cheaper. However, our participants reflected passionately about the ways online buying is eroding the physical shopping experience while strengthening relations between consumers and Facebook call center staff and delivery drivers.

Paying attention to these historically contingent and embedded qualities of infrastructure also gives us better insight into the ways that gendered labor relations shape and limit emerging forms of digital labor in this and other contexts. As we have shown, logistical work and customer service are central to online buying in Cambodia and also highly gendered in this context. In the shop, there is a continuum of tasks designated for female staff from traditional shop girl to new position of call center staff. Like Jarrett’s “Digital Housewife” [10], these call center staff members are driving and shaping technology change in important ways but go largely unrecognized under prevailing accounts of technological change and innovation. Much of the work that the call center staff does involves Facebook chatting and messaging, work that is tied to their personalities and personal lives and to stereotypes of women as more social or nurturing. This case gives us insight into how this typically female work can be undervalued in emerging digital forms, even when structured in the form of paid labor. Historically masculine ideas about work also limit both women’s and men’s work prospects as work becomes digitized here. We observe delivery drivers having a masculine-inflected attachment to forms of physical labor

as they rhetorically distance themselves from working with data (even when they in fact are working with data). The duties of their jobs, such as being “outside in the hot sun,” also require a certain style of dress that perpetuates the gendered nature of the work. These examples illustrate ways that creative infrastructural action, though representative of unrecognized forms of agency, is also bounded by history, context, and the exigencies of local cultural environments.

CONCLUSION

We argue that the online buying, selling, and delivery ecosystem in Phnom Penh is the product of creative infrastructural action from the buyers, business owners, call center staff and delivery drivers who are a part of the infrastructure. This kind of technology circulation is representative of the way that new tools often move in and through the world. They are adopted not in isolation but within an ecosystem of other tools and long-standing cultural practices and infrastructures. This creative infrastructural action relies on forms of logistical and customer service work that go under-recognized in typical accounts of technological change and the digital labor, in the global South and elsewhere. This reading of technology circulation therefore opens HCI attention to agents of technology change and innovation outside of established spaces of design and production, and breaks down the traditional binary between “designer” and “user.” This case also illustrates ways that creative infrastructural action may be simultaneously bounded and enabled by history, tradition, and local material conditions. Attending to such cases can help us move towards more balanced and complete stories of the ways that technology and infrastructure move through the world, and the actors that are central to its passage and reinvention.

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REFERENCES

1. Syed Ishtiaque Ahmed, Nicola Bidwell, Himanshu Zade, Srihari H. Muralidhar, Anupama Dhareshwar, Baneen Karachiwala, Cedrick N Tandong, Jacki O’Neill. 2016. Peer-to-peer in the workplace: A view from the road. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (CHI ’16). <http://dl.acm.org/citation.cfm?id=2858036.2858393>
2. Syed Ishtiaque Ahmed, Nusrat Jahan Mim, and Steven J. Jackson. 2015. Residual mobilities: infrastructural displacement and post-colonial computing in Bangladesh. *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*

- (CHI'15)
<http://dl.acm.org/citation.cfm?doid=2702123.2702573>
3. Seyram Avle and Silvia Lindtner. 2016. Design(ing) 'Here' and 'There': Tech Entrepreneurs, Global Markets, and Reflexivity in Design Processes. Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16).
<http://dl.acm.org/citation.cfm?id=2858509>
 4. Matthew Bietz J., Eric PS Baumer, and Charlotte P. Lee. 2010. Synergizing in cyberinfrastructure development. *Computer Supported Cooperative Work (CSCW)* 19.3-4, 245-281.
 5. Jenna Burrell. 2012. *Invisible users: Youth in the Internet cafés of urban Ghana*. MIT Press.
 6. Marianne De Laet and Annemarie Mol. 2000. The Zimbabwe Bush Pump: Mechanics of a Fluid Technology. *Social studies of science* 30.2, 225-263.
 7. Lilly C. Irani and M. Silberman. 2013. Turkopticon: interrupting worker invisibility in amazon mechanical turk. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*
<http://dl.acm.org/citation.cfm?id=2470742>
 8. Lilly Irani, Janet Vertesi, Paul Dourish, Kavita Philip, and Rebecca E. Grinter. 2010. Postcolonial Computing: A Lens on Design and Development. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '10)*, 1311-1320.
<http://dl.acm.org/citation.cfm?id=1753522>
 9. Margaret Jack and Steven J. Jackson. 2016. Logistics as Care and Control: An Investigation into the UNICEF Supply Division. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*.
<http://dl.acm.org/citation.cfm?id=2858036.2858503>
 10. Kylie Jarrett. 2015. *Feminism, Labour and Digital Media: The Digital Housewife*. Vol. 33. Routledge.
 11. Brian Larkin. 2013. The politics and poetics of infrastructure. *Annual Review of Anthropology* 42, 327–343.
 12. Karen Levy. 2015. The Contexts of Control: Information, Power, and Truck-Driving Work. *The Information Society* 31.2, 160-174.
 13. Silvia Lindtner, Ken Anderson, and Paul Dourish. 2012. Cultural Appropriation: Information Technologies as Sites of Transnational Imagination. *Proceedings of the ACM Conference on Computer Supported Cooperative Work (CSCW '12)*
<http://dl.acm.org/citation.cfm?id=2145220>
 14. Panagiotis Louridas. 1999. Design as Bricolage: Anthropology meets Design Thinking. *Design Studies* 20 (6), 517-535.
 15. Daniel Miller and Don Slater. 2000. The Internet: an *Ethnographic Approach*. Berg.
 16. Annemarie Mol. 2002. *The Body Multiple: Ontology in Medical Practice*. Duke University Press.
 17. Eric Monteiro, Neil Pollock, Ole Hanseth, Robin Williams. 2013. From Artefacts to Infrastructures. *Proceedings of the ACM Conference on Computer Supported Cooperative Work (CSCW '13)*, 575-607.
<http://dl.acm.org/citation.cfm?id=2560945>
 18. Lilly U Nguyen. 2016. Infrastructural action in Vietnam: Inverting the techno-politics of hacking in the global South. *new media & society*
 19. Julian Edgerton Orr. 1996. *Talking about machines: An ethnography of a modern job*. Cornell University Press.
 20. Volkmar Pipek and Volker Wulf. 2009. Infrastructuring: Toward an Integrated Perspective on the Design and Use of Information Technology. *Journal of the Association for Information Systems*: Vol. 10: Iss. 5, Article 1.
 21. Nimmi Rangaswamy and Melissa Densmore. 2013. Understanding Jugaad: ICTD and the tensions of appropriation, innovation and utility. *Proceedings of the Sixth International Conference on Information and Communications Technologies and Development: Notes-Volume 2*. ACM, 120-123.
<http://dl.acm.org/citation.cfm?id=2517938>
 22. Alex Rosenblat and Luke Stark. 2016. Uber's Drivers: Information Asymmetries and Control in Dynamic Work. *International Journal of Communication*, 10, 27.
 23. Nithya Sambasivan, Nithya, and Thomas Smyth. 2010. The human infrastructure of ICTD. *Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development*.
<http://dl.acm.org/citation.cfm?id=2369258>
 24. Kjeld Schmidt and Liam Bannon. 1992. Taking CSCW Seriously: Supporting Articulation Work. *Computer Supported Cooperative Work (CSCW): An International Journal*. 1.1-2, 7-40.
 25. Kjeld Schmidt and Carla Simone. 1996. Coordination mechanisms: Towards a conceptual foundation of CSCW systems design. *Computer Supported Cooperative Work (CSCW): An International Journal*. 5.2-3, 155-200.
 26. Donald A Schön. 1983. The reflective practitioner: How professionals think in action. Vol. 5126. Basic books.
 27. Susan Leigh Star and Karen Ruhleder. 1996. Steps toward an ecology of infrastructure: Design and access for large information spaces. *Information Systems Research* 7.1, 111-134.

28. Susan Leigh Star and Anselm Strauss. 1999. Layers of silence, arenas of voice: The ecology of visible and invisible work. *Computer Supported Cooperative Work (CSCW): An International Journal*. 8:1-2, 9-30.
29. Anselm Strauss and Juliet Corbin (eds.). 1997. *Grounded Theory in Practice*. London: Sage Publications.
30. Claude Levi Strauss. 1962. *Savage mind*. University of Chicago.
31. Mark Warschauer and Morgan Ames. 2010. Can One Laptop per Child save the world's poor? *Journal of international affairs* 33-51.
32. Amanda Williams, Silvia Lindtner, Ken Anderson, Paul Dourish. 2013. Multi-sited Design: An Analytical Lens for Transnational HCI. *Human-Computer Interaction*, Vol. 29:1, 78-108.