

University of Massachusetts Amherst

ScholarWorks@UMass Amherst

Communication Department Faculty Publication
Series

Communication

2018

Research on Mobile Phone Data in the Global South: Opportunities and Challenges

Seyram Avle

University of Massachusetts Amherst

Emmanuel Quartey

Meltwater Entrepreneurial School of Technology Incubator

David Hutchful

Grameen Foundation

Follow this and additional works at: https://scholarworks.umass.edu/communication_faculty_pubs

Recommended Citation

Avle, Seyram; Quartey, Emmanuel; and Hutchful, David, "Research on Mobile Phone Data in the Global South: Opportunities and Challenges" (2018). *The Oxford Handbook of Networked Communication*. 84. <https://doi.org/10.1093/oxfordhb/9780190460518.013.33>

This Article is brought to you for free and open access by the Communication at ScholarWorks@UMass Amherst. It has been accepted for inclusion in Communication Department Faculty Publication Series by an authorized administrator of ScholarWorks@UMass Amherst. For more information, please contact scholarworks@library.umass.edu.

Research on Mobile Phone Data in the Global South: Opportunities and Challenges

Seyram Avle, Emmanuel Quartey, and David Hutchful

The Oxford Handbook of Networked Communication

Edited by Brooke Foucault Welles and Sandra González-Bailón

Subject: Political Science, Political Behavior Online Publication Date: Nov 2018 DOI: 10.1093/oxfordhb/9780190460518.013.33

Abstract and Keywords

The rapid uptake of mobile phones in the global South—that is, developing countries located primarily in the Southern Hemisphere—is a fact that is often repeated in popular discourse as well as academic research. In the years since it became a favorite factoid, there have been shifts in some of the most well-known patterns of use, with new data being created and collected. To a large extent, communication and information researchers have yet to fully address the opportunities and challenges regarding these changes. This chapter outlines some of the shifts in usage trends, what kinds of data they generate, and what kinds of questions they can help answer about social and economic ties, mobility and location, and innovation and design. These can strengthen theorizing new communication practices and generate greater knowledge about life in a networked age for those in resource-constrained environments.

Keywords: mobile phones, data, global South, research, mobility, innovation

1. Introduction

It is now almost customary to begin any piece of writing on mobile phone use with some statistic about the swelling number of users around the world. The GSM Association (GSMA) estimates that as of August 2018, there were over 8.7 billion mobile connections and 5.1 billion unique subscribers (GSMA, 2018a) in the world. In Sub-Saharan Africa there are 444 million unique mobile subscribers, of which 38% have mobile internet (GSMA, 2018b). Such detailed information is possible because more than 800 telecommunications (telecom) providers and mobile phone operators around the world furnish this umbrella organization with information about their subscriber bases. In the years since mobile phones have become somewhat mundane (Katz & Aakhus, 2002; Ling, 2012), they have transformed from basic voice devices to minicomputers, interfaced with other devices and gadgets around them, moving toward an Internet of Things. The “datafication” of a highly connected world may seem inevitable and ubiquitous, and indeed, as our lives become more digital, so too has the ability to track and monitor our every move. Today more and more for-profit corporations, governments, and nongovernmental and nonprofit organizations have access to the data that citizens and consumers generate by using networked technologies. As a result, we are seeing more

research focused on using (often) large data sets to predict, make sense of, and interrogate the communication and information uses of connected people.

This research, and indeed, much of the research on the integration of information and communication technologies in our lives, comes from the populations of the world that are most connected online and have smart devices that link seamlessly with others. These people, described by Henrich et al. (2010) as WEIRD (Western, educated, industrialized, rich, and democratic), represent only a small percentage of the world's population. Yet from reading much of the research and its universalizing language, one would think otherwise and take for granted that these populations are the "standard" (Henrich et al., 2010; Chan, 2014). The constantly connected, Internet-data-intensive, app-rich smartphone users (who also reside in wealthy non-Western societies like Japan) cannot be the sole basis for data used by researchers interested in mobile phone uses around the world, if only because the majority of the world's population lives in a more resource-constrained environment.

We use the term "global South" to refer to developing countries located primarily in the Southern Hemisphere. This comes from a regional classification used by the International Telecommunications Union (ITU), the United Nations' specialized agency for information communication technologies (ICTs). This region comprises about 182 countries, and mobile subscriptions in this vast and diverse segment of the world account for 78% of total global subscriptions (ITU, 2015). Significant portions of these subscriptions are on basic phones that provide text and voice on feature (java-enabled) phones. When a majority of these phone subscribers access the Internet from their mobile phones, it is through web browsers and not apps, which are more commonly used in the global North (Truong, 2015). Early mobile phone research across the global South, particularly in Africa and India, suggests that the cost of maintaining a subscription gave rise to behaviors like sharing of devices, owning multiple SIM cards, and beeping or flashing (James & Versteeg, 2007; Donner, 2007; Donovan & Martin, 2014).

However, a lot has changed since the early 2000s, when most of the mobile phone use research was focused on the global South. Access has increased, the range of devices available to those of different socioeconomic status has changed, and services have diversified beyond SMS (Short Message Service) and basic voice. For instance, in many parts of Africa the practice of multiple people sharing one device and/or number has given way to individuals using multiple SIM cards and phones. Local app makers are creating new forms of connectivity across a wide range of devices, while global apps like Facebook and WhatsApp now come preloaded on some devices. Mobile money and other forms of payment services are on the rise, acting as connectors to the unbanked in both rural and urban areas. In all of these developments there are opportunities to broaden research on mobile phones beyond access and connectivity, to speak to broader theory about living in a digital/information age, particularly in a resource-constrained environment. The data generated by contemporary uses of mobile phones invite us to think more about context when interpreting information on uses and appropriations and to look into the social structures built around ICTs, as well as what new information they can give us about the global South, where it has been difficult to get data through more traditional means.

Early research on mobile phones in the global South, mostly from an ICT development (ICTD) perspective, often focused on the socioeconomic improvement or development ends of mobile use. This often meant interventionist strategies targeting education, health care, and agriculture outcomes to "empower" users (Donner, 2008; Sey, 2011; Avgerou, 2010; Ling & Horst, 2011; Gomez et al., 2012). Poverty reduction is a main driver in this type of work, and one criticism is that it is often difficult to disaggregate social and economic uses from other kinds of uses (Donner, 2008; Gillwald 2010). Moreover, when people in the global South choose to buy and use mobile phones, they do so outside of a centrally planned initiative (one assumption underlying interventionist ICTD research), and their uses are as everyday and multifaceted as elsewhere in the world (Sey, 2011; Ling & Horst, 2011). Another criticism is that the multidisciplinary nature of ICTD is such that overall it has not paid attention to communication and information theories, although work on the digital divide and technology appropriation has and continues to be of interest (Gomez et al., 2012; Pearce, 2013; Steinfield et al., 2015).

While it is understood that poverty is indeed endemic in the global South and constrains or shapes certain behaviors, it is not the defining characteristic of life there. Poverty also provokes innovative responses to the absence of certain infrastructures that are taken for granted in the global North. For example, transfers of phone credit were initially done by transferring their value in money to receivers through mobile phone agents, which later became the basis for mobile money transfers. In this chapter we show some of the gaps in the research using mobile data in the global South from a communication and information studies perspective. We follow the work that has started to go beyond the “development optic” (Chirumamilla & Pal, 2013) to look at other facets of mobile data in the global South, such as innovation and digital production (e.g., Arora & Rangaswamy, 2013; Chirumamilla & Pal, 2013; Lindtner & Li, 2012). To do this, we draw primarily on current trends we have observed in Ghana, but also on our collective work and familiarity with other countries in the global South and the literature on mobile research.

We view what we find in Ghana as emblematic of what one might find in other global South countries. The country’s telecom market is highly competitive for mobile phones, both in service provision and in the sale of handsets and applications; the digital app economy is slowly growing as mobile payments and financial technology become more common. This has inspired new approaches to design through entrepreneurship, and we discuss this as one of the key areas missing in the literature. Mobile connections in Ghana are at 33.4 million subscriptions for a population of around 27 million (GSMA, 2018a; Koranteng, 2016), suggesting multiple SIM card use, and the country has one of the largest mobile broadband subscriber bases in Africa, 59.8% of mobile subscriptions (representing about 30% of the total population) (GSMA, 2018a). Ghana has also been a relatively stable country politically and economically, making what we observed there less driven by volatile or extreme shocks than, for instance, political instability can administer to economies. The country also practices the sort of liberal economic and democratic model that is a familiar context in WEIRD/global North research, although bracketed by a much lower standard of living.

This chapter’s goals are to (1) orient readers to contemporary shifts in access and usage patterns around mobile telephony in the global South and (2) use that information to invite more thoughtful considerations about the assumption that research from the global North translates well into the global South context. Beyond inclusion of the global South as a way of understanding difference and commonality in mobile uses worldwide (Burrell & Toyama, 2009), we argue that what might appear to be counterintuitive responses to austerity and constraint only seem so because academic research has focused on the exception, not the rule (i.e., the hyperconnected consumer). We begin by outlining some of the opportunities for asking new questions, showing shifts in usage and what kinds of data are being created and collected. We then turn to what kinds of questions they can help us answer, specifically with regard to social and economic ties, mobility and location, and innovation and design. We conclude with a call for action to focus more on these areas, as they offer opportunities to theorize not just about mobile phone use specifically but also about life in a networked age for those in resource-constrained environments.

2. Stable Trends of Mobile Usage in the Global South

2.1. Prepaid as the Dominant Model for Paying for Mobile Usage

Much of the global South accesses mobile services through prepaid means (Nielson, 2013); certainly in Africa prepaid is the dominant model (GMSA, 2013). The introduction of prepaid services in Africa is considered one of the key breakthroughs for increased access (Gillwald, 2005; James & Versteeg, 2007). Some 98% of Ghana’s mobile subscriptions are prepaid services (GSMA, 2018a), and this payment structure allows those with low and highly variable incomes to plan their communication needs and hedge against income fluctuations. To access the prepaid service, a subscriber must first purchase scratch cards (see

figure 1), which represent various quantities of airtime. For example, one could purchase a scratch card worth 5, 10, or 20 Ghana cedis (GHS) of airtime. Each scratch card has a unique code printed on it (see figures 2 and 3), which the subscriber must dial to a particular short code or USSD code.¹ If the code is accepted, the subscriber's account is automatically topped up with the amount of airtime purchased. Users can also deposit this credit on other users' phones, either by transferring the credit from their own devices or by giving a scratch card to another user.



Figure 1 Example of a scratch card (front). Photograph courtesy of Emmanuel Quartey.

We find that this scratch card, or more broadly, the prepaid model, has extended from paying for mobile usage to become the dominant means of paying for digital services in Ghana. For instance, many members of the middle and upper classes access the Internet through the use of Internet dongles (a flash drive embedded with a SIM card) or portable devices that contain a SIM card that provides Wi-Fi. To use such a device, the user has to prepay for a data “top-up,” as they would with a phone. Another example is paying for utility services. Some television and cable providers, such as the South African satellite TV provider Multichoice, have introduced scratch cards as an alternate way of prepaying for service. Electricity and water credits in Ghana can also now be prepaid using specialized meters and cards that work more like ATM cards.



Figure 2 Example of a scratch card (back). Photograph courtesy of Emmanuel Quartey.



Figure 3 Example of a scratch card (back) that has been scratched off with a coin to reveal the unique code. Once this code is sent to the relevant short code, an amount of airtime will be added to the user's account. Photograph courtesy of Emmanuel Quartey.

2.2. Lower Costs for Calls and Devices

Cost per call and the cost of devices, as detailed by Sey (2010), have been dropping steadily in the last few years. Tariffs for both local and international calls have been drastically reduced, and roaming rates in some parts of the global South have also gone down. For instance, Research ICT Africa (2010) reports that Zain's (then Celtel) move to end roaming charges across East Africa drove competitors to do the same, making it cheaper for subscribers to use their numbers across the heavily traveled subregion. While costs are generally now lower for calls, the amount that the world's poor dedicate to acquiring and maintaining mobile phone communication remains a significant portion of their income (Sey, 2009). In effect, mobile phone use is still relatively more expensive for the world's poor even if the barriers to owning and using one are dropping.

In terms of devices, China's entrance into the handset business has been one of the most significant forces pushing down the cost of mobile phone ownership. China's manufacturing capacity, particularly in the south, as in Shenzhen, has resulted in an industrial culture of rapid prototyping and niche designs aimed at low-end markets that Silicon Valley and European tech firms do not design for (Avle & Lindtner, 2016). Over time, brands like Huawei, Tecno, and even X-Tigi have become recognizable around Africa, India, and other parts of Asia. Some of these brands, like Huawei, have become formidable competitors to higher end brands such as Apple and Samsung. However, many more "no-name" brands are almost ubiquitous, with unique design features that cater to niche populations all over the world for prices that are continually dropping. For those for whom even these low-end phones are too pricey, secondhand phones are an option, as they come with even lower price tags. Many of these are basic devices that offer voice, text, and some additional features like alarms, flashlights, radio, and long-lasting batteries, which are pragmatic resources for places that might lack certain infrastructure (like streetlights and electricity).

With SIM card registration in most developing countries (Donovan & Martin, 2014), it is now easy to distinguish between unique subscribers and multiple ones. SIM penetration in Ghana, according to GSMA (2018a), is at 122%, implying multiple SIM subscriptions and not as many subscribers (Sey, 2010). The early practice of multiple people sharing one device and/or SIM card has decreased as the prices of SIM cards have fallen each year (James & Versteeg, 2007). These days, it is not uncommon in Ghana and other places, like Nigeria, to see people with two mobile phones, holding two different SIM cards, or more commonly, one device that accommodates two SIM cards. The need for multiple SIM cards, one for each network, was initially

to minimize calls across networks, because it used to be much more expensive for members of one network to call members of another. The gradual decrease in the cost of voice calls has made it less necessary to have multiple SIM cards, although people maintain those numbers as the years go by and they keep their old contacts.

A crucial aspect of this cost issue is access to smartphones. These are still prohibitively expensive for the majority of people in the global South, even though there has been a gradual increase in affordability, thanks to the phones from China. At the end of 2014, about 18% of mobile phone users in Africa had a smartphone, and only about 10% in India (Pew Research Center, 2015; Meeker, 2015). However, this resulted from a 32% increase in 2013 across India, China, Brazil, Indonesia, and Russia (Meeker, 2015). This suggests the market will keep increasing over time as the costs of both devices and data decline.

One outcome of lowering costs is that within some populations, women, who have typically lower independent economic means, are now also able to own their own phones (Gillwald et al., 2010). In some places, such as South Africa and Mozambique, more women have access to mobile phones than men, and where women have similar education, employment, and so forth as men, they are as likely to own a mobile phone (Gillwald et al., 2010) as men are. One study by the Grameen Foundation notes that in the five years of the study of about thirty thousand women, ownership shifted from women using a household mobile phone to having their own personal phones (Grameen Foundation, 2012). Still, in rural areas of, for instance, South Asia, poor households share a mobile phone owned by the head of the house (Ohri, 2016), and even where women have their own, they sometimes rely on their husbands to use them (Grameen Foundation, 2012).

Ling and Horst (2011) have argued that “while the mobile phone reshapes development and micro dynamics of gendered interactions, it is not necessarily a revolutionary tool. Existing power structures may be rearranged, but they are nonetheless quite stable” (p. 363). We find it necessary to emphasize this because increased access to and use of mobile phones does not mean universal access or ubiquity. There is still a large section of society (in both global North and South) for whom having a mobile phone is out of reach due to either lack of applicable infrastructure or prohibitive cost even if the infrastructure is there. In general, income, gender, location (rural or urban), and education all shape adoption and usage. Indeed, the sharing trends that early mobile phone research in the global South noted continue, particularly in rural areas, where incomes are even lower and it is thus extremely difficult for the majority to own their own phones.

2.3. Mobile Payments

One of the most visible trends is the entrenchment of mobile money and payments in Ghana (as well as in Kenya, India, and other parts of the global South). Mobile money now does not act only as a transfer mechanism but is increasingly becoming a place for stored value as well. Some consumers use it as a bank, with new regulations by the Bank of Ghana (Dedicated Electronic Money Issuers Guidelines) permitting telecom providers to pay interest to users who keep their money there. Mobile money in this way is reaching more of the largely unbanked populations in the global South, where the dominant payment modality has been cash. Instead of cards and online payments, mobile transfers of value (money, airtime, gift certificates, etc.) are used to pay for goods and services as well as remittances between rural and urban areas. M-Pesa in Kenya is probably the most well-known of the mobile payment platforms and is now also integrated with bank accounts and cards.

Some studies suggest that M-Pesa use has diffused to a more diverse range of incomes and socioeconomic status, and its use has been associated with increased expenditures and savings for both the banked and previously unbanked (Morawczynski, 2010; Jack & Suri, 2011; Mbiti & Weil, 2011). From the Ghanaian consumer end, fees for mobile payments are less than what banks charge on savings and checking accounts, so it is more affordable to store money on the phone. This also eliminates the need to carry around large amounts of cash, a safer alternative in areas where security might be an issue. Another variation of mobile payments is the use of airtime as a micropayment system for value-added services (VAS), subscription services in which users

receive messages from their telecom providers (e.g., football scores, daily religious verses, etc), paid for by micro deductions from their airtime. In Ghana, VAS are provided by mobile service/telecom providers as well as third-party companies like TXTGhana and Mobile Content Ltd.

2.4. Increased Access to Mobile Data

Both the demand for and supply of mobile data and mobile Web have been growing in the last decade. For many segments of the global South, given the low level of broadband penetration, their first Internet interaction will be over mobile phones. Some mobile data is accessed or made available through special “deals” by telecom providers. In response to their popularity as low data using messaging apps, WhatsApp and Facebook (both owned by Facebook) now come preloaded on some low-cost devices largely originating from China. It is also popular now for providers to not count data used on those sites against users’ accounts, due to arrangements with Facebook. Regardless of whether or not users consider Facebook activity Internet use (Mirani, 2015), social network sites are part of what has increased the appetite for mobile data and are now a means through which many in the global South get access, given the persistently high cost of broadband (Gitau et al., 2010).

There are other interesting aspects of the increased access to mobile data that might not be obvious at first blush. Preliminary findings from a study in one of the slum areas in Accra (Nima), where incomes are low and illiteracy is high, show that people living there use more data than the middle class elsewhere in the city (UGBS, 2016). It appears that being unable to read or write means using more voice and video capabilities to communicate, especially online. The Pew Research Center (2015) names texting as the most frequent activity on mobile phones in Africa. This indicates that most of those already using mobile phones, both online and offline, are literate, strongly suggesting that perhaps the growing middle class is driving the growth of mobiles, not the desperately poor who are often the lead in the story of mobile use in the global South.

While mobile web access is increasing, it is still costly to be online for long periods. One way to manage this is “data bundling,” a practice introduced by telecom providers in which one can define a specific amount of airtime credit and convert it into a fixed data package at a subsidized rate. Figures 4 and 5 show the data bundling process in action. This bundle costs less than if subscribers simply loaded credit and then used some for data and some for voice and text. It also gives users granular control over how much of their money goes toward airtime versus data. Telecom providers benefit by getting detailed information about their user base, to whom they can target other products more directly.

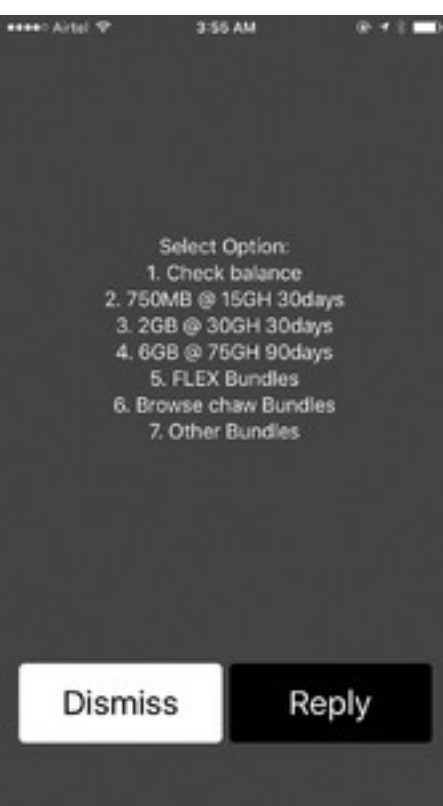


Figure 4 Screenshot of the first screen in the process of bundling data with USSD.

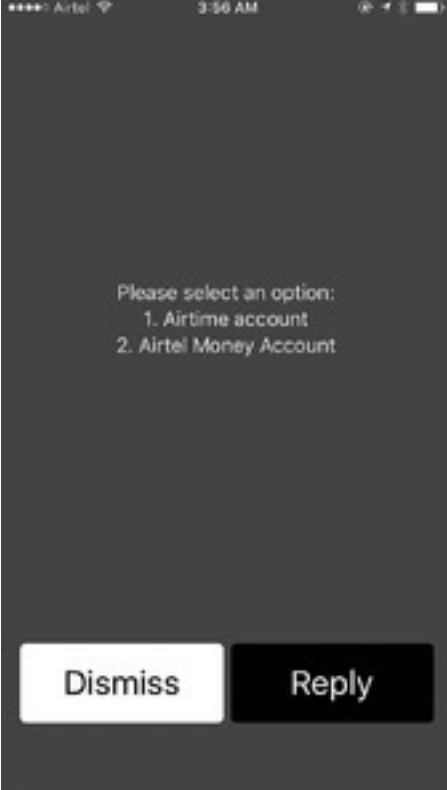


Figure 5 Screenshot showing payment options when bundling data. Customers can choose to pay with airtime or with mobile money.

2.5. Web-Page-Driven Mobile Internet

Despite the fact that Africa and Asia are the fastest growing mobile markets, the majority of mobile Internet activity in these regions happens on web pages, not through apps (Truong, 2015). Mobile websites account for about 90% of mobile Internet usage in Asia and about 96% in Africa, while apps account for about 10% of mobile Internet usage in Asia and 4% of mobile Internet usage in Africa (Truong, 2015). This is in stark contrast to global North markets like the United States, where mobile websites account for 9% of mobile Internet usage and apps for 90%. The prevailing explanation is that although millions of people are acquiring mobile phones, smartphone penetration (a requisite for strong app usage) is still currently relatively low across the global South. As smartphone penetration increases, it is reasonable to expect a shift in favor of app usage.

For now, the Opera Mini browser for mobile phones, which strips websites of data-hogging elements before displaying them, remains popular. Routinely in the top 10 most downloaded apps in Africa, this browser compresses websites down to as little as 10% of their original size, allowing users to reduce data consumption by about 82% (App Annie, n.d.). In late 2015, Opera released a company report that claimed to have saved African users of the mini browser (who make up a third of its users) at least \$500 million in data costs (Kelven, 2015; Atieno, 2015).

2.6. Other Forms of Subsidized Connectivity

Beyond prepaid and data bundling, we have seen other strategies for providing access in the global South. On the one hand, companies like OneWeb, SpaceX, and O3b are launching multiple low orbit satellites to provide Internet to global South countries and the “last mile” in the North. On the other hand, companies like Google have been laying fiber optic cables in select

countries around the world. Google's Project Link in Ghana aims to provide fiber infrastructure to Internet service providers (ISPs) and mobile network operators (MNOs) at a subsidized rate that is lower than if they built the infrastructure themselves. The goal is to pass on the cost savings to consumers.

Beyond these infrastructure attempts, some software and content providers as well as telecom providers have collaborated to provide connectivity at the end user point. Facebook's "Free Basics," in conjunction with telecom companies, provides free access to a preselected list of websites to those in the "the bottom billion." This "zero rating" style has alternatively been described as a cost saving practice for the poor, charitable expansion of access, or a walled garden, depending on one's perspective. Another model that is helping to move toward greater connectivity at the end user point involves providing free or subsidized Internet access in return for engaging with brands. Examples include Sliide Airtime (through which users earn airtime by engaging with ads and content on their lockscreen) and OmniUp (which lets users access Wi-Fi at public places like parks and restaurants in return for engaging with branded content).

3. Beyond Connectivity: Researching Mobile Data in the Global South

The trends we have noted are predominantly aimed at cost efficiency. However, economic constraints are but one aspect of what it means for much of the world's poor to use mobile phones in various ways. The available observable data on basic and feature phones can be revealing of how social and cultural norms may (or may not) be changing in relation to increased communication capacities. In what follows, we present a range of questions related to these trends and the theoretical gains that can be made from them. We focus on "the data inadvertently generated in the everyday use of technology, and [that require] no special device or software to be given to the subject" (Blumenstock, 2012, p. 110) because they can be useful where interviews and surveys are difficult or where direct interventions are not possible or scalable. That mobile Internet is limited in use does not mean that mobile data on mobile use(r)s cannot be employed to answer questions *beyond connectivity*. The metrics and methodologies using observable data are often replicable and do provide a useful way to do cross-country work (Molony, 2012). Used in concert with other research methods, these observational data can strengthen theorizing on the interaction of mobile and social life in a much more global manner than current literature suggests.

3.1. Social Ties and Public Connections

Ultimately what mobile devices and information technologies do is enhance our ability to connect across space and time. How people use these networked devices tells us about who they communicate with, where they feel they belong, and what relationships they value (formal, personal, etc.). Using social network analysis, observational data on call logs, with the appropriate theory (with and without other research methods) can tell us much about affective and evaluative networks (friendships, respect, support, etc.). For instance, Eagle et al. (2009a) compare observational data with standard self-report surveys to infer friendship patterns based on proximity, spatiality, and recency of interactions. They argue that "it is possible to accurately infer 95% of friendships based on the observational data alone, where friend dyads demonstrate distinctive temporal and spatial patterns in their physical proximity and calling patterns" (p. 15274). Patterns of interpersonal relationships, for instance gender differences and longitudinal effects, can also be inferred from mobile phone use. These can be compared to face-to-face interactions, as Igarashi et al. (2005) have done, to show how mediated communication is different from or similar to face to face. Such questions do not require that the population under study have Internet-connected devices. Anonymized logs of voice calls in proper context can reveal personal networks; knowing the average length and time of calls and analyzing deviations shows patterns of social interaction.

Young people in the global South increasingly have access to many of the same social media apps and platforms that their peers in the global North have. With subsidized data access and value incentives making it cheaper than ever to access the Internet, global South youth are actively using Facebook, Instagram, Snapchat, and Twitter to connect with others and participate in public and political life. How are people's social networks in general being shaped by social media activity? While there is a lot of work on social ties and networks using data from the North, theorizing is still in the early stages, and broadening the database can only be beneficial to understanding how such platforms work within human relationships. Research on social ties and interactions from anthropology and sociology suggest that interpersonal expectations and norms differ by region (e.g., Hofstede & Hofstede, 2001). This suggests that mediated communication at the interpersonal level might also work somewhat differently than in Western societies. Some of the extant literature on texting and other forms of use is about those at the base of the pyramid, as is the trend in development-focused research, which has done the most work on mobiles in the global South (e.g., Kang & Maity, 2012). However, as suggested by the Pew study (2015) that found texting is the most common use, middle-class and educated mobile users might be driving current trends in mobile communication, not the abjectly poor, and studies on mobile use should diversify to other social classes in the global South as well.

In parts of Africa and India, these platforms and other new media intersect in interesting ways with radio and television, both of which continue to be vibrant media spaces in the South (Avle, 2016; Moyo, 2013; Punathambekar, 2010; Willems, 2013). These public means of engagement provide excellent opportunities for more work on how technology facilitates public culture, political deliberation, play, and reception. Recently the literature has tipped toward political engagement following the "Arab Spring" (Howard et al., 2011; Howard & Hussain, 2013); however, there is much more that is unknown about the various kinds of social, cultural, and political engagement work in the diverse political systems found in the global South, and there are opportunities to observe and make sense of changing trends in public mobile phone use.

3.2. Economic Transfers and Well-Being

The mobile money sector in parts of the global South took off earlier than in the global North. The mechanisms used, however, are different, as many of the transfers in the South reach the relatively larger population of unbanked consumers. M-Pesa's initial system of money transfers was built on the knowledge of money transfers between Nairobi dwellers and their rural-based family members. Mobile credit transfers in Ghana began informally as gift transfers, before telecom providers and later banks formalized them. Some of these transactions are in micro amounts, but they can be substantial for the poor populations sending and receiving them. Basic information on mobile money transfers (whether actual money or airtime credit), with the right additional demographic and location data, can reveal much about life on a daily basis, specifically estimates of what economic and social impacts mobile transactions and transfers have. Questions that derive from data on sending and receiving money and phone credits can also be informative about consumer behavior, philanthropy/giving, religious transfers, and so forth.

In the general absence of institutions such as credit agencies directly tied to banks in the global South, mobile data are now being used as a proxy for financial indicators like credit scores. InVenture, a start-up headquartered in San Francisco but operational in Kenya, as well as telecom providers like Airtel and banks such as Zenith are piloting projects that use mobile usage to determine creditworthiness.³ InVenture, for instance, describes the data it uses for this as "diverse + frictionless" (>10,000 data points per user) that give "real-time credit scoring" (InVenture, 2016). Tigo/Millicom (a Colombian telecom provider in thirteen African and Latin American countries) is also using airtime to determine insurance premiums; that is, the more you talk, the lower your insurance premium. These all link one's communication practices to other perhaps "weightier" metrics that have real impacts on socioeconomic well-being.

As part of the larger development drive that focused on ICTs in the early 2000s as mobile phones began to be taken up across the global South, socioeconomic well-being continues to be of interest as poverty stubbornly remains prevalent. There are

opportunities to use these alternate measures to assess if any gains can be made in linking communication, as an act and a process, to things like economic transfers. The mobile phone itself need not be the focus, as it facilitates largely unanticipated uses and appropriations.

3.3. Mobility and Location

De Bruijn (2008) described mobile phones as telephones with legs, and “the very mobility that the mobile phone offers became a rich research field for those with various interests in developing countries” (Molony, 2012, p. 87). Reliable data on movement and migration in the global South are hard to come by, and this is largely true for within-country migration, as most governments’ census data do not capture specific kinds of migration like circular or temporary migration (Blumenstock, 2012). However, this need not be the case. Even the most basic phones can provide location simply because they need to ping the nearest cell towers to connect calls and the sequence of towers can show movements of the cell phone (user). In urban areas where cell phone towers are more dense, this sort of inference can be very precise (Blumenstock, 2012) and can be used for traffic and transportation estimation, origins and destinations (e.g., Calabrese et al., 2011), and large-scale movements and migrations.

Using the concept of “inferred mobility” and a longitudinal data set of phone records from Rwanda, Blumenstock (2012) computed detailed trajectories of user movement that were then compared with existing qualitative data on internal migration in the country. Other work by Eagle et al. (2009b) and Frias-Martinez et al. (2010) also used individual movement logs to analyze large-scale mobility, with the latter focused on populations of different socioeconomic status and the former focusing on rural versus urban populations in a developing country. These works present quantitative ways of understanding patterns of movement that are hard to find with standard survey techniques and can be also used to “measure patterns of information diffusion, or analyze the impact of mobile-based services” (Molony, 2012, p. 89). Global Positioning System (GPS)-enabled devices provide even more precise locations and are increasingly found in the basic and java-enabled feature phones that are ubiquitous in the global South, where there appear to be more crises given the inadequate infrastructure to cope with both natural and man-made disasters. Some work on disaster and crisis communication have used GPS data to assess the value of mobile phones in aiding recovery work after a crisis (Bengtsson et al., 2011).

3.4. Digital Innovation and Technology Entrepreneurship

One outcome of mobile usage in the global South that is only now receiving attention in the literature is the increase in technology entrepreneurship and digital innovation. The ubiquity of the mobile platform and the relative ease and low cost of creating programs and content for mobiles is driving entrepreneurship, particularly among the youth across the global South. Other communication technologies have always required huge investments to monetize (TV, radio, and land lines vis-à-vis call centers). From Chile to Zimbabwe, new mobile applications that cater to not just the small percentage of smartphone users but also the millions who have feature and basic phones largely manufactured in China are being designed for a myriad of interests and challenges. Mobile phones have been a more accessible platform, and the ways that they are being appropriated for entrepreneurial ventures need to be better understood.

Thus far, most of the interest in this area has come from the business and development worlds (e.g., Dahlberg Africa, McKinsey Consulting, the World Bank). There has not been much development since Levy and Banerjee (2008) issued a call to turn to new theories about the network society and bring them to bear on mobile phones within the setting of urban entrepreneurial activity. Still, recently there has been interest within communication and information studies in discursive practices around the creation of mobile apps and other information technologies (Avle, 2014), how entrepreneurs respond to technological change in

resource-constrained environments (Zachary, 2004), how ICT innovation challenges dominant ideas of innovation and design practice (Marchant, 2015; Avle & Lindtner, 2016), conceptual connectivity in specialized sectors (Graham & Mann, 2013), and tech innovation in ICT hubs (Jimenez Cisneros, 2012).

In general, there is little known about how technological artifacts emerge out of the global South, considered in innovation literature to be the periphery. Postcolonial, feminist, and critical cultural studies theories have served as theoretical starting points for some of this work, located in design and human and computer interaction (HCI) (e.g., Chan, 2014; Bardzell & Bardzell, 2013; Lindtner et al., 2014, Avle & Lindtner, 2016). Silicon Valley's strong influence on extant theories of digital innovation and information technologies belies the reality that is the global nature of technology production. Who is designing and building the myriad software and hardware products that are used across the global South? Silicon Valley largely does not design for the world's poorest, so tech entrepreneurs in Accra, Nairobi, Santiago, Bangalore, and Shenzhen are innovating, building on bare bones infrastructures to serve the billions who cannot afford iPhones. Design and innovation are already happening. As researchers interested in mobile phones and the data their users produce, we have a blind spot if we take for granted where the devices and their software come from, how they are made, and who works to get them into the hands of the populations we study.

4. Challenges to Using Mobile Data from the Global South for Academic Research

With increased access comes increased data, and one crucial question we want to address is: Who has access to users' data across the global South? For the most part, it is understood that telecom providers hold their customers' data and, where applicable, third-party content and app providers on phones, in exchange for service provision. In many cases, additional user data are collected before they are needed for any immediate use, in anticipation of mining for patterns that might end up useful. For instance, Android apps tell users what the applications they install require. More often than not, the items requested are not core to the functioning of the app. Opting out of "request for access" does not mean opting out of releasing certain data, but rather opting out of use. In other words, refusing such a request means the user is no longer able to download the app.

Third parties that do not directly interface with users but have access to their data are becoming more common. For instance, a company like Jana Mobile, through its mCent app and partnerships with over 237 telecom providers in 102 countries, has access to nearly 3.5 billion phones in the developing world (Bergen, 2014; Olson, 2015). In addition, government agencies are increasingly requesting data from tech companies and telecom providers, often under blurry legal and regulatory guises. In the global South, the nongovernmental organization industrial complex (Gereffi et al., 2001) holds a lot of data on some of the world's most vulnerable populations due to the interventions that have been ongoing for the last thirty to forty years in development and ICTD. There is often some overlap between these players and academics who produce research from these populations. The data asymmetry of corporations and other powerful stakeholders knowing more about individuals' lives thus puts the onus on regulators to ensure as fair a platform as possible for the most vulnerable populations.

Other issues, such as data security and protection, are of paramount importance as more and more of the world's vulnerable populations get access to mobile data. This is where researchers ought to be more mindful as they work to gain access to user data. The ethics of doing mobile and other ICT research is covered in this volume, but we wish to underscore that some data may not be necessary to answer some of the questions we have posed. Identifying information is typically not needed, and other issues covered by the Belmont Principles and institutional review boards are good reminders when seeking data for our research.

With precise location data comes an increased risk of the targeting of populations, particularly of the most vulnerable, such as refugees fleeing conflict. Biases can and have been built into systems that end up favoring the already well off and powerful in different societies (Blumenstock, 2012), whether about policing, lending, or voting, in both the global North and South. In a world wracked by war and refugee crises, the same tools that help migrants can in the wrong hands be used against them. The potential for political, economic, and other forms of targeting for harm arises where adequate protections of consumer/citizen data are not in place, either by law or by volition.

Access to observable data poses a challenge, particularly in places that might not be researchers' primary area of expertise. This is one area where collaborative work with global South researchers is valuable. The greater value to working with researchers in the global South lies in the perspectives and theories they bring, as well as their familiarity with the sites that provide empirical evidence for what we already know from the North and new ideas coming from the South.

5. Conclusion

Mobile phones have moved from novelty, to “nice to have,” to mutual expectations of being readily available at all times, almost to the point of being mundane, particularly in the global North (Katz & Aakhus, 2002; Ling, 2012). In the global South, an increasing number of people are integrating mobile phones into their lives in ways similar to how others do elsewhere. In this chapter we have focused on personal data, although we acknowledge that mobiles are increasingly being integrated into business workflows in the global South. We have primarily discussed ways that observational data, or data generated by everyday uses (not interventions), can be useful for research. We have reviewed mobile phone usage and industry trends, not to “render the familiar strange” (Riles, 2001) or to look to the South to reify difference. Rather, our goal has been to reorient us as researchers to emerging trends in contexts that are not part of the everyday for most of the researchers conducting work on communications in the networked age. By highlighting some of these practices, we have shown ways that we can better understand how the everyday is being changed with mobile phone use on a much more global scale and specific areas in which data can inform theory or open new pathways for research.

References

App Annie. N.d. “Google Play top app charts.” <https://www.appannie.com/apps/google-play/top/ghana/overall> (accessed February 24, 2016).

Arora, Payal and Nimmi Rangaswamy. 2013. “Digital leisure for development: reframing new media practices in the global South”. *Media, Culture & Society*, 35: 898–905.

Atieno, Milicent. 2015. “Opera Mini users in Africa saved \$500 million in mobile data usage”. <http://innov8tiv.com/opera-mini-users-in-africa-saved-500m-in-mobile-data-usage/> (accessed August 21, 2018).

Avgerou, Chrisanthi. 2010. “Discourses on ICT and development.” *Information Technologies & International Development* 6, no. 3: 1.

Avle, Seyram . 2014. “Articulating and enacting development: Skilled returnees in Ghana’s ICT industry.” *Information Technologies & International Development*, 10, no. 4: 1–13.

Avle, Seyram, and Silvia Lindtner. 2016. "Design(ing) 'here' and 'there': Tech entrepreneurs, global markets, and reflexivity in design processes." In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '16)*, 2233–2245. New York: ACM.

Avle, Seyram. 2016. "'Radio locked on @citi973': FM radio audiences on Twitter." In W. Willems and W. Mano, (Eds.), *From Audiences to Users: Everyday Media Culture in Africa*, 161–179. London and New York: Routledge.

Bardzell, Jeffrey, and Shaowen Bardzell. 2013. "What is critical about critical design?" In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pp. 3297–3306. New York: ACM.

Bengtsson, Linus, Xin Lu, Anna Thorson, Richard Garfield, and Johan Von Schreeb. 2011. "Improved response to disasters and outbreaks by tracking population movements with mobile phone network data: A post-earthquake geospatial study in Haiti." *PLoS Med* 8, no. 8: e1001083.

Bergen, Mark. 2014. "Mobile startup Jana launches new tool to reach next billion consumers, on their phones: Unilever among several top brands to test out the novel platform." <http://adage.com/article/digital/unilever-taps-emerging-market-mobile-platform-jana/292211/> (accessed February 18, 2016).

Blumenstock, Joshua E. 2012. "Inferring patterns of internal migration from mobile phone call records: evidence from Rwanda." *Information Technology for Development* 18, no. 2: 107–125.

Burrell, Jenna, and Kentaro Toyama. 2009. "What constitutes good ICTD research?" *Information Technologies & International Development* 5, no. 3: 82.

Calabrese, Francesco, Giusy Di Lorenzo, Liang Liu, and Carlo Ratti. 2011. "Estimating origin-destination flows using mobile phone location data." *IEEE Pervasive Computing* 10, no. 4: 0036–0044.

Chan, Anita Say. 2014. *Networking peripheries: Technological futures and the myth of digital universalism*. Cambridge, MA: MIT Press.

Chirumamilla, Padma and Pal, Joyojeet. "Play and Power: A ludic design proposal for ICTD." *ICTD (1)* 2013, 25-33.

De Bruijn, Mirjam. 2008. "*The telephone has grown legs: Mobile communication and social change in the margins of African society*." African Studies Center, University of Leiden.

Donner, Jonathan. 2007. "The rules of beeping: Exchanging messages via intentional 'missed calls' on mobile phones." *Journal of Computer-Mediated Communication* 13, no. 1: 1–22.

Donner, Jonathan. 2008. "Research approaches to mobile use in the developing world: A review of the literature." *The Information Society* 24, no. 3: 140–159.

Donovan, Kevin, and Aaron K, Martin. 2014. "The rise of African SIM registration: The emerging dynamics of regulatory change." *First Monday* 19, no. 2–3. doi:<https://doi.org/10.5210/fm.v19i2.4351>.

Eagle, Nathan, Yves-Alexandre de Montjoye, and Luís MA Bettencourt. 2009. "Community computing: Comparisons between rural and urban societies using mobile phone data." In *CSE '09: International Conference on Computational Science and Engineering, 2009*, vol. 4, pp. 144–150. IEEE.

Eagle, Nathan, Alex Sandy Pentland, and David Lazer. 2009. "Inferring friendship network structure by using mobile phone data." *Proceedings of the National Academy of Sciences* 106, no. 36: 15274–15278.

Frias-Martinez, Vanessa, Jesus Virseda, Alberto Rubio, and Enrique Frias-Martinez. 2010. "Towards large scale technology impact analyses: Automatic residential localization from mobile phone-call data." In *Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development*, p. 11. New York: ACM

Gereffi, Gary, Ronie Garcia-Johnson, and Erika Sasser. 2001. "The NGO-industrial complex." *Foreign Policy* 125: 56–65.

Gillwald, Alison (Ed.). 2005. "Towards an African e-Index: Household and individual ICT access and usage across 10 African countries." LINK Centre, Wits University, School of Public and Development Management.

Gillwald, Alison, Anne Milek, and Christoph Stork. 2010. "Gender assessment of ICT access and usage in Africa." *Towards Evidence-based ICT Policy and Regulation* 1, no. 5: 1–39.

Gitau, Shikoh, Gary Marsden, and Jonathan Donner. 2010. "After access—Challenges facing mobile-only Internet users in the developing world." In G. Fitzpatrick and S. Hudson (Eds), *Proceedings of the 28th International Conference on Human Factors in Computing Systems (CHI 2010)*, pp. 2603–2606. New York: ACM.

Gomez, Ricardo, Luis F. Baron, and Brittany Fiore-Silfvast. 2012. "The changing field of ICTD: Content analysis of research published in selected journals and conferences, 2000–2010." In *Proceedings of the Fifth International Conference on Information and Communication Technologies and Development*, pp. 65–74. New York: ACM.

- Graham, Mark, and Laura Mann. 2013. "Imagining a silicon savannah? Technological and conceptual connectivity in Kenya's BPO and software development sectors." *The Electronic Journal of Information Systems in Developing Countries* 56, no. 2: 1–19.
- Grameen Foundation. 2012. "Women, mobile phones, and saving: A Grameen Foundation case study." Grameen Foundation USA. <https://grameenfoundation.org/resource/women-mobile-phones-and-savings-case-study> (accessed August 21, 2018).
- GSM Association (GSMA). 2018a. "Definitive data and analysis for the mobile industry." <https://www.gsmainelligence.com> (accessed August 21, 2018).
- GSM Association (GSMA). 2018b. "The mobile economy Sub-Saharan Africa 2018". <https://www.gsmainelligence.com/research/?file=809c442550e5487f3b1d025fdc70e23b&download> (accessed August 21, 2018).
- GSM Association (GSMA). 2013. "Sub-Saharan Africa Mobile Observatory 2012." London: GSM Association & Deloitte.
- Henrich, Joseph, Steven Hein, and Ara Norenzayan. 2010. "The weirdest people in the world?" *Behavioral and Brain Sciences* 33: 61–135.
- Hofstede, Geert H., and Geert Hofstede. 2001. *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*. London: Sage.
- Howard, Philip N., Aiden Duffy, Deen Freelon, Muzammil M. Hussain, Will Mari, and Marwa Maziad. 2011. "Opening closed regimes: what was the role of social media during the Arab Spring?" SSRN 2595096.
- Howard, Philip N., and Muzammil M. Hussain. 2013. *Democracy's fourth wave? Digital media and the Arab Spring*. Oxford: Oxford University Press on Demand.
- Igarashi, Tasuku, Jiro Takai, and Toshikazu Yoshida. 2005. "Gender differences in social network development via mobile phone text messages: A longitudinal study." *Journal of Social and Personal Relationships* 22, no. 5: 691–713.
- International Telecommunications Union (ITU). 2015. "Facts and figures." <http://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx> (accessed February 18, 2016).
- InVenture, 2016. "Modern credit for a mobile world." <https://inventure.com/#learnmore> (accessed July 31, 2016).
- Jack, William, and Tavneet Suri. 2011. "Mobile money: The economics of M-PESA." No. w16721. National Bureau of Economic Research. <https://www.nber.org/papers/w16721> (accessed August 21, 2018).
- James, Jeffrey, and Mila Versteeg. 2007. "Mobile phones in Africa: How much do we really know?" *Social Indicators Research*

- Jimenez Cisneros, Andrea. 2012. “Technological innovations within ICThubs—The case of Bongohive, Zambia.” Master’s thesis, Royal Holloway.
- Kang, Juhee, and Moutusy Maity. 2012. “Texting among the bottom of the pyramid: Facilitators and barriers to SMSs use among the low-income mobile users in Asia.” SSRN 2309353.
- Katz, James E., and Mark Aakhus. 2002. *Perpetual contact: Mobile communication, private talk, public performance*. Cambridge, UK: Cambridge University Press.
- Kelven, Udoh. 2015. “African Opera mini users saved US\$500million in mobile Internet sata, says Opera software.” <http://techloy.com/2015/11/19/african-opera-mini-users-saved-us500million-in-mobile-internet-data-says-opera-software/> (accessed February 24, 2016).
- Koranteng, Kweku. 2016. “An inclusive growth approach to understanding network neutrality in Ghana.” Research ICT Africa.
- Levy, Mark R., and Indrajit Banerjee. 2008. “Urban entrepreneurs, ICTs, and emerging theories: a new direction for development communication 1.” *Asian Journal of Communication* 18, no. 4: 304–317.
- Lindtner, Silvia, Garnet D. Hertz, and Paul Dourish. 2014. “Emerging sites of HCI innovation: hackerspaces, hardware startups & incubators.” In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pp. 439–448. New York: ACM.
- Lindtner, Silvia, and David Li. 2012. “Created in China: the makings of China’s hackerspace community.” *Interactions* 19, no. 6: 18–22.
- Ling, Rich. 2012. *Taken for grantedness: The embedding of mobile communication into society*. Cambridge, MA: MIT Press.
- Ling, Rich, and Horst, Heather. 2011. “Mobile communication in the global south.” *New Media Society* 13: 363–374. doi:10.1177/1461444810393899.
- Marchant, Eleanor. 2015. “Who is ICT innovation for: Challenges to existing theories of innovation, a Kenyan case study.” CGCS Occasional Paper Series on ICTs, Statebuilding, and Peacebuilding in Africa. Center for Global Communication Studies, University of Pennsylvania. http://www.global.asc.upenn.edu/app/uploads/2015/01/Marchant_Who-is-ICT-Innovation-for.pdf (accessed October 12, 2015).

Mbiti, Isaac, and David N. Weil. 2011. "Mobile banking: The impact of M-Pesa in Kenya." No. w17129. National Bureau of Economic Research.

Meeker, Mary. 2015. "Internet trends 2014." Kleiner Perkins Caufield & Byers.

Mirani, Leo. 2015. "Millions of Facebook users have no idea they're using the Internet." <http://qz.com/333313/millions-of-facebook-users-have-no-idea-theyre-using-the-internet/> (accessed February 19, 2016).

Molony, Thomas. 2012. "ICT and human mobility: Cases from developing countries and beyond." *Information Technology for Development* 18, no. 2: 87–90.

Morawczynski, Olga. 2010. "Saving through the mobile: A study of M-PESA in Kenya." *Advanced Technologies for Microfinance: Solutions and Challenges*: 148.

Moyo, Last. 2013. "Introduction: Critical reflections on technological convergence on radio and the emerging digital cultures and practices." *Telematics and Informatics* 30: 211–213.

Nielson Company. 2013. "Pay-as-you-phone: How global consumers pay for mobile." <http://www.nielsen.com/us/en/insights/news/2013/how-global-consumers-pay-for-mobile.html> (accessed December 14, 2016).

Ohri, Chandni. 2016. "Role of digital financial services to empower people living below the poverty line." Grameen Foundation Insights. <http://www.grameenfoundation.org/blog/role-digital-financial-services-empower-people-living-below-poverty-line> (accessed August 5, 2016).

Olson, Parmy. 2015. "This app is chasing in on giving the world free data." <http://www.forbes.com/sites/parmyolson/2015/07/29/jana-mobile-data-facebook-internet-org/#5c2d58fc29a6> (accessed January 27, 2016).

Pearce, Katy. 2013. "Phoning it in: Theory in mobile media and communication in developing countries." *Mobile Media & Communication* 1, no. 1: 76–82.

Pew Research Center. 2015. "Cell phones in Africa: Communication lifeline." <http://www.pewglobal.org/2015/04/15/cell-phones-in-africa-communication-lifeline/> (accessed February 25, 2016).

Punathambekar, Aswin. 2010. "Reality TV and the making of mobile publics: The case of Indian Idol." In Marwan Kraidy and Katherine Sender (Eds.), *Real Worlds: Global Perspectives on the Politics of Reality Television*, 154–174. New York: Routledge.

Riles, Annelise. 2001. *The network inside out*. Ann Arbor: University of Michigan Press.

Sey, Araba. 2009. “Exploring mobile phone-sharing practices in Ghana.” *Info* 11, no. 2: 66–78.

Sey, Araba. 2010. “Managing the cost of mobile communications in Ghana.” In M. Fernández-Ardèvol and A. Ros (Eds.), *Communication Technologies in Latin America and Africa: A Multidisciplinary Approach*, 143–166. Barcelona: IN3.

Sey, Araba. 2011. “‘We use it different, different’: Making sense of trends in mobile phone use in Ghana.” *New Media & Society* 13, no. 3: 375–390.

Steinfeld, Charles, Susan Wyche, Tian Cai, and Hastings Chiwasa. 2015. “The mobile divide revisited: mobile phone use by smallholder farmers in Malawi.” In *Proceedings of the Seventh International Conference on Information and Communication Technologies and Development*, p. 8. New York: ACM.

Truong, Alice. 2015. “The fastest-growing mobile phone markets barely use apps.” <http://qz.com/466089/the-fastest-growing-mobile-phone-markets-barely-use-apps/> (accessed February 18, 2015).

University of Ghana Business School (UGBS). 2016. Ghana business development report. University of Ghana, Legon—Ghana.

Willems, Wendy. 2013. “Participation—in what? Radio, convergence and the corporate logic of audience input through new media in Zambia.” *Telematics and Informatics* 30: 223–231.

Zachary, Pascal. 2004. “Black star: Ghana, information technology and development in Africa.” *First Monday* 9, no. 3. <http://firstmonday.org/ojs/index.php/fm/article/view/1126> (accessed October 23, 2015).

Notes:

⁽¹⁾ USSD or unstructured supplementary service data is a GSM Association protocol that links a mobile device to the service provider’s servers. It functions somewhat like SMS texts but can accommodate more characters, is more interactive, and is arguably more user friendly than SMS without the development and data cost of a native mobile app. See figures 4 and 5 for examples of what the USSD interface looks like.

⁽²⁾ Zain is a Kuwaiti telecom provider, operating in eight African and Middle Eastern countries. Celtel, a Sudanese-founded telecom company, was acquired by Zain in 2005 and then sold to Bharti Airtel in 2010.

⁽³⁾ Bharti Airtel is Indian owned and operates in eighteen African countries and three Southeast Asian countries. Zenith is one of Nigeria’s biggest banks, with operations in three other African countries as well as the United Arab Emirates and the United Kingdom.

Emmanuel Quartey

Emmanuel Quartey, General Manager, Meltwater Entrepreneurial School of Technology Incubator

David Hutchful

David Hutchful, Director of Technology Innovations, Grameen Foundation