

Exploring Women's Everyday Mobile Phone Experiences in Nairobi, Kenya

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This article focuses on a range of Kenyan women, and their everyday experiences with mobile phones. We use our qualitative findings to broaden understanding of affordability, mobility and ease of use—design themes which underlie the motives for developing mobile phone applications in Human Computer Interaction (HCI) and Information and Communications Technology for Development (ICT4D). We find that studying women's routine interactions with their mobile devices is useful for re-examining these themes, and for discovering new ones, including the importance of trust within mobile communication and the emotional significance women attribute to mobile devices. We then discuss the practical implications of our research, and argue that technologists should develop interventions that target Kenyan women's everyday technology problems, rather than (as is traditional) focusing on interventions meant to improve their socioeconomic conditions. We also comment on the role of feminist theory in the design of these interventions.

RESEARCH HIGHLIGHTS

- We contribute to HCI by adding a case study about Kenyan women's information and communication technology use, which includes descriptions of their everyday interaction with their mobile phones.
- We consider how this knowledge offers new design and research directions for HCI and ICTD researchers and practitioners.
- We comment on the role of feminist theory in future HCI4D research.

Keywords: HCI; ICTD; Kenya; Nairobi; design; feminist HCI; mobile phones; social media

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1. INTRODUCTION

ICTD, and related HCI4D, research and practice are largely based on the premise that information and communication technologies (ICTs) can contribute to the improvement of socioeconomic conditions in developing countries (Heeks, 2008; Avgerou, 2010). Mobile phones, in particular, have been researchers' and practitioners' platform of choice, and have motivated projects that frequently involve the creation of services and applications meant to empower marginalized populations (Donner, 2008; Dell and Kumar, 2016). In addition to their widespread adoption throughout much of Africa, these devices are perceived to be affordable, mobile and easy to use (Parikh, 2005; Jones and Marsden, 2006)—design

themes that continue to spur the creation of mobile applications that target long-standing socioeconomic problems, such as increasing peoples' income and life opportunities (i.e. Hagan *et al.*, 2012; Kitagawa, 2015; Perrier *et al.*, 2015). The purpose of this article is to re-examine these design themes from the perspectives of women living in Nairobi, Kenya. This shows us that, rather than perceiving them as tools supplying pertinent information that can improve their socioeconomic conditions, our respondents' interactions with their handsets mostly involved figuring out how to operate them, manage mobile airtime and protect them from theft. We use these findings to encourage a design agenda which prioritizes targeting these everyday problems, rather than addressing

more explicitly socioeconomic needs (health, livelihoods, education, etc.).

Our research examined Nairobi women's everyday experiences with mobile phones. That is, we explored a range of women from different economic backgrounds and family situations and their mundane, familiar and unremarkable interactions with technology. Taking an everyday perspective to understanding technology use is nothing new in HCI, and developing an in-depth understanding of people and their technology use is often seen as the basis for invention and intervention (Abowd *et al.*, 2002). While this perspective is common in industrialized nations, it has rarely been applied to understand ICT use by women in sub-Saharan Africa and is useful for drawing attention to how women actually use ICTs for utilitarian and social purposes—topics that deserves more attention in ICTD scholarship (Burrell and Toyama, 2009).

To set the stage for our inquiry, we review research studies examining women and ICTs in sub-Saharan Africa, and design-oriented mobile phone user studies in Kenya. Our analysis suggests that using women's everyday lives as a foundation for constructing knowledge provides necessary nuance to assumptions made about mobile phones' affordability, mobility and ease of use. Our findings also suggest that there is room for technologists in HCI4D and ICTD to examine emotions and trust—design themes largely absent in ICTD scholarship. We conclude by briefly discussing the role of feminist theory in the design of these interventions. From an empirical perspective, we contribute to HCI by adding a case study about women's ICT use, which includes descriptions of their everyday handset use. We also consider how this knowledge offers new design and research directions for HCI researchers and practitioners.

2. RELATED WORK

Our study builds upon research examining women and mobile phone use in sub-Saharan Africa. Notable works in this area include Murphy and Priebe's (2011) description of the opportunities and challenges that phone ownership brings to women in a Western Kenyan Village; Comfort and Dada's (2009) report that Nigerian women find mobile phones a 'mixed blessing', providing them with a sense of control, but at a price; Scott *et al.*'s (2004) finding that women in Uganda have less access to mobile phones than men and Burrell's (2010) discovery that sharing arrangements restrict women's use of mobile phones in rural Uganda. These studies draw attention to the disparities that exist between men's and women's mobile phone access in rural areas. As with Gitau *et al.* (2010), we focus on urban women who own mobile phones, to investigate how their usage patterns change when their access to ICTs increases. In the process, we expand the comparative and geographic range of these prior studies by studying a range of women in Nairobi, Kenya—including older 'businessladies', university students and younger

residents of two informal settlements—and their experiences with mobile phones and newer ICTs, such as Facebook (FB).

Women's ICT experiences were central to these prior works; however, HCI user studies in Nairobi—including the author's prior work—rarely take participants' gender into account. Consequently, it is difficult to uncover gender-specific differences in ICT access and use as shown by (for example) Wyche *et al.*'s (2010) study of professionals' ICT use; Wyche *et al.*'s (2013a, 2013b) investigation of FB use within an informal settlement; Ratan's (2008) exploration of 11 'low-literate individuals' to understand how they use mobile devices to support mobile banking; and Oduor *et al.*'s (2014) examination of communication patterns between urban residents and their rural relatives in a Nairobi slum, all did not account for gender differences in their findings. Although quantitative analysis of phone ownership and usage in Kenya acknowledges gender differences (Crandall *et al.*, 2012; Wesolowski, *et al.*, 2012), these studies have lacked the qualitative details included here, which technology designers generally consider useful for generating insights 'that would suggest spaces into which new technologies could be designed' (Salvador *et al.*, 1999).

Chambers (1983) reminds us of the multiple biases which can influence research done in developing countries; these biases can result in women's experiences being partially—or completely—neglected in research. It is unlikely that HCI researchers deliberately ignored women; however—given the known gendered inequalities in ICT access, and tendencies to overlook women's perspectives when designing technology experiences (Buckley, 1989; Wajcman, 1991; Cockburn and Ormrod, 1993)—women's viewpoints merit more attention. Greater sensitivity to women's experiences with ICTs can only benefit HCI and ICTD by drawing attention to gender-based differences in technology use and, ultimately, impacting design so that it accounts for difference.

2.1. The platform of choice in HCI4D and ICTD: mobile phones

Mobile phones are perceived as affordable, mobile and easy to use—key reasons why they are researchers' and practitioners' platform of choice, and have motivated projects that frequently involve the creation of applications meant to empower marginalized populations by delivering them pertinent financial, health or educational information (Donner, 2008). Indeed, falling prices have made mobile phone handsets affordable to many people in developing countries. Jones and Marsden (2006) attribute handset affordability to network operators discounting their purchase prices, in hopes of recovering costs through usage charges. Because cheaper phones are so widespread, many software developers create applications for them. Affordability also affects software developers' design decisions in other ways—in particular, developing

mobile applications which deliver pertinent information via SMS (it is cheaper to send someone a text message than to make a voice call; Hellström, 2010). This trend in HCI and ICTD is exemplified by Perrier *et al.*'s (2015) system which sends pregnant women in Nairobi slums personalized messages and 'Nishauri'—likewise developed for women living in a Nairobi slum—which sends women information about HIV/AIDS, safe sex and other matters related to sexual and reproductive health via SMS upon request (Kitagawa, 2015).

Parikh (2005) offers familiarity and ease of use as additional reasons to use mobile phones as a platform for achieving development objectives such as reducing poverty in rural India. Mobile phone enthusiasts also praise phones for their mobility, arguing that being able to carry the device from place to place reduces peoples' fear of being mugged. 'Safe Mathare' is a prototype mobile phone application capitalizing on this perception (Hagan *et al.*, 2012). Developed as a response to women's fears of walking around a Nairobi slum at night, subscribers to the service can send a text message to 'community escorts' who, after receiving it, come and accompany them while walking.

While these perceptions may be true, they omit the critical and implicit differences between men's and women's access to economic resources (Dwyers and Bruce, 1988), spatial mobility (Kwan, 1999) and levels of mobile phone literacy (Dodson *et al.*, 2013). Furthermore, these design efforts appear to be motivated by a belief in 'technology's promise to quickly and painlessly transform our lives for the better'—what Ames describes as 'charismatic technology' (Ames, 2015)—rather than by a genuine understanding of how women in these contexts use technology. We begin to fill this gap by investigating a range of Kenyan women's everyday experiences with mobile technologies, and thereby deepen and broaden our understanding of these design themes.

3. STUDY CONTEXT: NAIROBI, KENYA

Major advancements in infrastructure and government policy, as well as an active and innovative private sector have put Nairobi and its residents at the forefront of the fast-paced technology adoption evident in other major African cities. The country boasts a mobile phone penetration rate of 75%, a figure that is higher than the African average of 65%. An estimated 50% of the Kenya's population is connected to the Internet (Crandall *et al.*, 2012) and use smartphones to access FB, Twitter and WhatsApp, which is established and rising. Despite the growing use of ICTs in Kenya's capital, Nairobi is a city of extremes. Stores selling the latest Apple products to a burgeoning middle-class population are located just a few kilometers from one of the city's 40+ informal settlements.

The situation of women in Nairobi must be seen within this context of extremes: although constitutional provisions have resulted in increased numbers of women in the national

parliament, the general situation of women throughout Kenya is primarily characterized by traditionally low status and rampant gender discrimination (Kramon and Posner, 2011). Women continue to be at a disadvantage compared to men in terms of finding employment, being victims of crime, escaping persistent poverty and accessing the latest ICTs (Gillard *et al.*, 2008; Crandall *et al.*, 2012). We explored women who represent these extremes, and who draw attention to the plurality of women's experiences in Nairobi; specifically, we interviewed higher income 'businessladies', university students and young women, etc.

3.1. Methodology

A feminist methodology generally involves starting from the experiences of women in order to fill in the gaps in our knowledge about them (Smith, 1979). This approach also relies on methods that are useful for undercutting the distance between the researcher and research subject, and for collecting data about users' everyday experiences (Oakley, 1981; Bardzell and Bardzell, 2011). Reflexivity is a component of feminist methodologies because it draws attention to the researchers' effects on the actual process of research; thus, in line with this approach, the author self-discloses her positions and intellectual background (Harding, 1987). The author is a 40-year-old Caucasian female American who worked as an industrial designer prior to pursuing a doctorate in computing. She has been conducting fieldwork in Kenya since 2007, studying ICT use in cyber cafes (Wyche *et al.*, 2013a, 2013b), office environments (Wyche *et al.*, 2010) and domestic settings (Wyche *et al.*, 2008). In that time, she has repeatedly seen how women's marginalized status affects their access to, understanding of and use of ICTs. This research was motivated by such observations.

3.2. Data collection

The findings presented here mostly draw from data collection that took place in June 2013; during that period, the author and two research assistants conducted group interviews (13 groups, 5–7 women per group). Our analysis was also informed by direct observations of mobile phones, by their presence in the Nairobi landscape (stores where they are sold, billboards advertising them) and by several *in situ* conversations with people about ICTs. We found participants for the study via personal contacts, and via local NGOs; most of the participants in each group already knew each other. Women were asked to speak in the language with which they felt most comfortable; 11 group interviews were conducted primarily in Swahili, while the other 2 used primarily English; however, all sessions included instances of code-switching (i.e. speakers alternating between two languages). Sharon Alaka, a recent university graduate and Kenyan woman with

social science research experience, was hired as a moderator. She was fluent in Swahili and English, and—with the assistance of Dr Carol Myers-Scotton, a retired linguistics professor with >40 years of experience conducting research in Kenya and who is fluently bilingual in English and Swahili—facilitated the sessions. The author is fluent in English, but speaks little Swahili, so was responsible for recording the sessions, writing field notes and taking digital photographs to document the types of phones participants owned.

Scholars have examined the ethical issues related to foreign researchers conducting development research (Chambers, 1983; Sidaway, 1992); indeed, when an ‘outsider’ from a so-called developed country comes together with ‘insiders’ from a so-called developing country questions about authority and positionality arise. The author is aware of, and sensitive to, these debates; however, this research reveals how the insider and outsider binary is too simplistic to account for realities of fieldwork (Nast, 1994). We all sit on a continuum between ‘insider’ and ‘outsider’, shifting endlessly between extremes as the contexts and individuals are redefined (Scheyvens, 2014). For example, the author (like all of the participants) is a woman, and thus shares ‘a subordinate structural position by virtue of [her] gender’ (Finch, 1984). Furthermore, and similar to the businessladies interviewed, she had consistent employment and a stable income, and like the computer science college students interviewed, she works in a technical discipline. However, sex ‘is not enough to create shared understandings’ (Reisman, 1987): the author is not Kenyan, and lacks shared cultural and class assumptions with many participants. These differences were especially pronounced during interviews with slum residents who had significantly less financial resources and social mobility than the author.

This combination of recruiting women of different ages both as participants and as co-moderators, holding sessions in private places, and using languages participants wanted to speak, resulted in an environment where women openly shared their everyday experiences with ICTs; this has often been suggested as a benefit of conducting focus groups with same-sex researchers and participants (Oakley, 1981). Interview sessions began with the researchers introducing themselves, then asking participants to tell them about their occupations and families. We then asked participants to tell us about their mobile devices, and about their experiences using social media sites such as FB and YouTube. Other questions included how they acquired their phones, how much airtime was available on their handset, what they used them for—including whether or not they used their phones to access health information via SMS.

3.3. Analysis

Following each group interview, members of the research team discussed themes appearing in the data, questions which

merited further attention and the overall progress of the investigation. Throughout the research, the author maintained a daily journal where she reflected on her encounters with women in the focus groups and her relationships with them. After enough data were collected, interviews were transcribed verbatim, and then translated into English by Swahili-speaking researchers so that they could be coded. A qualitative inductive approach involving thematic assessment of the interview data, field notes and photographs guided our analysis (Strauss and Corbin, 1998). This approach consisted of carefully reading and rereading transcripts, field notes and prior research from HCI, and ICTD, while focusing on particular aspects of our participants’ everyday lives which they were more likely to experience than men, and on how these aspects affected participants’ use of mobile phones. After four iterations of coding, we identified the themes presented here.

4. FINDINGS

The findings are organized as follows. First, we present an overview of our study participants, describe the mobile phones they owned and what they used—and did not use—them for. Next we re-examine affordability by describing the models participants wanted, and the economic challenges they faced when either using their current models or upgrading. Then, we re-examine mobility by showing how handset theft, and the fear thereof, puts limits on where handsets are used; we also underline the emotional significance ascribed to handsets, and to their saved digital content. In the last section of the findings, we re-examine usability, and discuss problems women encountered when using their handsets—specifically, preventing online harassment and accessing the mobile version of FB. Throughout the findings, we draw attention to women’s everyday experiences and their effects on mobile phone use: from their participation in chama groups, to their clothes, to their gender-based expectations, to their likelihood of experiencing harassment more than men.

4.1. Overview of women and their everyday mobile phone use (and non-use) practices

Of the 71 women in the study, 24 lacked formal employment but ‘hustled’, 16 were university students, 20 described themselves as ‘businessladies’, meaning they earned a consistent income because they owned and operated small electronics stores, or sold chickens, lumber or cakes. The remaining women worked at cyber cafes, area NGOs, or at small retail kiosks. Women who hustled used their wits to earn money by engaging in short-term activities such as begging, prostitution, housework or even participating in a research interview (Gayle, 1983). Our sample covered a range of ages: students and women living in informal settlements tended to range in age from their early 20s to late 30s; businessladies were in

their 50s and 60s, and were mostly mothers and grandmothers. Almost all were members of a chama (Swahili for 'group' or 'association'—informal women-only savings clubs that meet monthly).

What emerges from these women's narratives is a deep appreciation for their mobile phones, indicated by repeated instances of many jokingly referring to their phones as their 'baby'. Handsets provided most with a sense of control, helped some earn more money and improved all of their social networks by making it easier to communicate with family and friends, organize meetings and receive and send money via the mobile banking service M-Pesa, a service some also used to pay bills. Businessladies used their handsets to interact with international clients, students exchanged photographs and 'chat' using WhatsApp, while those living in Nairobi's slums Viwandani and Korogocho knew that having a phone meant they could be reached if an informal employment opportunity arose. Women talked about sending and receiving SMS messages, in particular sharing inspirational Biblical quotes and other 'encouraging' messages with close friends (e.g. 'Life is fragile—hold on with prayers'). They added that such messages provided a 'lift' when they were feeling 'down', and many reported saving these messages in their handsets' inboxes.

Consistent to all groups was the use of phones primarily for communication between trusted people, but not necessarily as a delivery platform for expert information. Indeed, none of our respondents had ever used an SMS service that delivered health information, and laughed at the idea of doing so, saying 'Why would we ask such question using SMS?' and 'If we do not know who is sending the answers, how can we trust them?' Most of our respondents told us that they would prefer to ask such questions (i.e. about maternal health and sexually transmitted diseases) in person, or if necessary over the phone. Molony (2006) observed that trust is a 'hugely important issue' in the use of ICTs among small business owners in Tanzania. Similarly, our findings suggest that trust plays a significant role in women's everyday use of mobile phones, particularly as it pertains to the reliability of information transmitted via SMS.

4.2. Re-examining affordability: widespread ownership yet (un)affordable handsets and mobile services

During group interviews, we asked women to show us their phones and watched as they dug into their purses, pockets and brassieres to fetch the devices. We observed a variety of models, ranging from the basic kabambe (a slang Swahili term for a simple handset) to the Samsung Galaxy Pocket Plus (a device recently introduced to the Kenyan market). Common to many of these handsets was a screen wallpaper showing the participant's child or children. 'Original' mobile phones were prized and there was widespread disdain toward

lower quality counterfeit phones called 'China-makes', which reports suggest have inundated Kenya and other countries in sub-Saharan Africa (Chebusiri, 2012). The most commonly observed brand was Nokia, a brand which was preferred for its durability and perceived ease of use. Forty-five of the 71 participants owned a feature phone with a color display and some Internet capabilities; 14 women owned non-Internet-capable 'dumb' phones; the remaining 12 women owned smartphones with touchscreen interfaces. Everywhere in Nairobi, billboards and newspaper advertisements feature these new phones. Although they are described as 'affordable', their price tag of KES 10 999 (~\$125) means that they are out of reach to those without steady employment.

Kabambe and most feature phones were affordable; however, these handsets were not the phones women wanted. Most participants aspired to own models with faster Internet connections, longer lasting batteries and more stylish form factors—that is, the ones they saw in the billboards. Furthermore, fancier and more expensive mobile phones appeared to be status symbols, a finding which has been observed in prior studies of mobile phone use in urban Nigeria (Smith, 2006). Those with the latest smartphones had diligently saved money before purchasing them. Some used the funds accumulated in their chama groups; Anne,¹ for instance, told us, 'the moment I got my chama's money, I went to the shop and bought it!' Her account, and those like it, speaks to the role that chamas play—not only in nurturing friendships, and in helping women accumulate and save money (Ardener, 1995), but also in accessing the latest ICTs. Others saved their own money until they could afford the models they wanted: Victoria, for instance, saved for a year to buy the Samsung Champ Deluxe that she had in the interview.

I did not just take 3800 shillings and go to the shop and buy this phone, I saved for a year. You know like me I don't just have 3800 I will work and save.

We see that affordability is dynamic: in particular, it changes with the introduction of new devices, and the ebb and flow of financial resources—a dimension of affordability overlooked within HCI.

4.2.1. Unaffordable access, frugal use and difficult decisions

Another overlooked dimension of affordability is that it relates not only to one's ability to purchase technology, but to whether one can use the device: regardless of whether one owns a phone, if one wants to make phone calls, send text messages or browse the Internet, one must have money. All of the women in our study, like most Kenyans, used pre-paid airtime and Internet bundles. Airtime is necessary for making a voice call or sending a text message, and bundles are

¹All participants' names have been replaced with pseudonyms to preserve their anonymity.

needed to browse the Internet. Rates change and differ among providers: at the time of our study, it costs roughly \$0.03 to talk for 1 min, to send a text message costs roughly 1 cent and 4 MB of digital information costs ~\$0.05. We observed disparities between women's abilities to consistently 'top-up' or add credit their phones.

There were exceptions—for instance, businessladies consistently maintained up to 500 KES (\$5.30) on their phones—but more than half the women interviewed kept only small amounts of airtime, 5–30 KES, on their handsets. When we asked these participants about buying airtime or data bundles, they typically laughed and told us, 'we would like to top-up with a lot, but we have no money'. Meager amounts of credit meant they could choose to make a few short phone calls, send a dozen text messages or briefly access their FB accounts two or three times during the day. Without credit or bundles, the functionality of the phone is limited to receiving calls, text messages or dialing *130 (+ recipient's phone number) to send a free 'Please Call Me' text, a practice which appears to be replacing 'flashing' (the well-documented process where individuals call someone, then hang up before paying for the call (Donner, 2007; Wyche *et al.*, 2016)). For women with irregular employment or who were unemployed, finding money to buy airtime was not always possible and typically only purchased when there was an emergency, such as sick child. We see how the ability to purchase airtime increases the device's mobility: although our respondents could receive calls and messages anywhere and anytime, their ability to initiate a call or a message was dependent on their access to money. Effectively, their handsets were 'mobile coin-operated pay phone(s)'.

Regardless of their ability to regularly top-up, all of the women in our study were frugal, and adopted strategies to maximize their airtime and bundles. They carefully monitored their mobile phone use, judging whether voice calls were necessary or could be either replaced by less expensive text messages, or delayed until late in the evening (when their providers' rates went down). Some participants who had feature phones or smartphones used the 'money-saving bundles' offered by Kenyan network providers, but even those with discounted rates frequently limited the time they spent online, telling us:

Bundles don't last that long, so unless you are doing something important you don't use it that much.

Visits to data-intensive websites like YouTube were uncommon; when we asked about watching short videos, the common response was 'it is too expensive', because streaming content rapidly depleted the funds available on women's phones. Having an affordable device does not necessarily guarantee internet access, 'anywhere and at anytime', an image which remains prominent in marketing imagery for mobile technology and which shapes the design of mobile applications for users globally.

Visiting YouTube and other sites that required long periods of engagement also quickly exhausted the charge of their handset's battery. Many of the women living in informal settlements told us they paid a few shillings every week to charge their mobile phone battery. Even participants who had access to electricity bemoaned the difficulties of maintaining a charged battery for multiple days in a row and attributed this to Nairobi's frequent and unscheduled power outages that could last for hours and disrupt battery charging. A charged handset battery with plentiful amounts of airtime also presented challenges such as the 'temptations' of wanting to always use one's phone. Joyce, a law student, explains:

If you can buy the 500 shilling (about 6\$) [scratch card] it is better, but then again temptations, if you have 500 [shillings] on your phone, you will start calling people for no reason just to talk. But you will end up spending it so badly if you know it is there.

Joyce's comment reflected a tension other participants experienced. They wanted to use their phones to browse FB, download pictures and/or chat with friends for extended amounts of time—but they had to cautiously monitor the available credit on their handsets. Sambasivan and Cutrell (2012) similarly observed microenterprise employees in India making negotiations about using airtime given to them to use for work purposes to make personal phone calls; they describe this as 'self-regulation'. For some women in our sample, the decision was not one of whether to use airtime for professional purposes or personal; rather, it was a choice between buying Internet access or being able to afford food. Liz, a mother living in the Viwandani slum, explains her dilemma:

Facebook is addictive and if I spend money on Facebook I will go to bed hungry, I would rather go hustle than use Facebook. Not enough money for credit, I buy food instead of airtime.

She added that she had eventually deleted her account, because otherwise FB was 'too much of a temptation'. The economic well-being of cash-strapped households can be negatively impacted when family members spend money on airtime or data bundles, instead of on more prosaic expenses. Prior research mentions the difficult decisions low-income consumers make regarding whether to buy food for their households or pay for Internet access, and concludes that there is a dire need for more research into the area (Carmody, 2012). These decisions are especially complicated for women living in informal settlements, who—more so than men—tend to be responsible for budgeting their meager funds to acquire the necessities of daily life for their families (food, water and rent) (Swart, 2009). Such difficulties pose ethical quandaries which are rarely accounted for in studies of ICTs use among more affluent populations in developed countries, where the associated costs of Internet access are less of a concern (Wyche *et al.*, 2013a, 2013b). Given FB, Inc.'s interest in increasing users in emerging markets, HCI practitioners—and the company's

executives—ought to have these discussions, because of their discipline's focus on designing easy-to-use interfaces and the company's interest in encouraging frequent site use (Rogers *et al.*, 2011; Zuckerberg, 2013). This finding also demonstrates why HCI and ICTD researchers must pay greater attention to corporate power structures affecting mobile phone use when developing interventions (Irani *et al.*, 2010). More broadly, our focus on women's everyday interactions with their mobile phones reveals complicating factors, which affect affordability, including phone credit, battery charging, upgrades and—as we discuss now—replacement after theft.

4.3. Re-examining mobility: mobile phone 'snatching' and the device's emotional significance

Women told us how their handsets offered some sense of security, particularly for the young women living in slums, where everyday life was described as 'unpredictable'. Esther's comment about the value of owning a mobile phone in these settings were typical:

You never know, really, anything could happen to you like, maybe someone has just mugged you and you still have your phone, you can call somebody.

Although prior research has conceptualized mobile phones as a tool that will help women stay safe (Hagan *et al.*, 2012), a more common story from our participants was that mobile phones made women targets for theft. The fear—and reality—of theft pervaded participants' everyday lives; nearly everyone had a story about having her phone taken from her. Some women had experienced multiple mobile phone losses; most thefts took place on public transportation buses ('matatus') and involved trickery. Emily's story was typical:

I was in a matatu from Kasarani and there are thieves in matatus and they will tell you something like 'there is a policeman coming so tie your seat belt' so I am looking for my seatbelt and he is taking my phone out of my pocket. I cried so much for a week.

Women shared their strategies for reducing the chances of having their mobile phones stolen on matatus and elsewhere. One common approach was to hide a handset inside a bra, because thieves do not suspect it will be there; however, this was risky because the phone can also fall out unnoticed and be lost. Another tactic was clutching the handset tightly; unfortunately, there were inevitably times when participants needed to unclench their hands. Women in six groups told us about having forgotten their phones in public toilets. Men in Nairobi tend to carry mobile phones in deep pockets which are difficult for thieves to access; conversely, women tend to wear simple skirts without pockets. Some women carried handbags, but most avoided this because purses could attract thieves. Thus, the most common and effective way to minimize the risk of theft was to hide a phone at home, and/or not

use it in certain locations. Joyce's remark was similar to many we heard:

I don't use when I am crossing the road and I don't walk about speaking, because someone can take it and run away.

Joyce was careful not to use her phone to chat or text while walking on Nairobi's crowded sidewalks, because she feared someone would walk up behind her, grab the phone and run off, getting lost in the crowd. To avoid this, she—like other women—tended to wait until she was at home or work, or in another trusted environment, before using her handset. Restricting mobile phone use to certain areas meant ignoring it when it rang, and rarely browsing the Internet in public. Donner (2008) has observed how fear of theft limits the utility of mobile phones in African cities—they are not very mobile. Little has changed since these findings were published in 2008; theft remains a pervasive and persistent problem, hindering phone use in Nairobi. Furthermore, consistent among women were strong feelings of loss after such a theft: reports of weeping and shock were common, for example:

After the first 30 minutes you can not believe your phone is lost, it is true. You are in denial, the world is ending and you keep checking, but it is gone.

These feelings were intensified by the knowledge that there was little chance of ever retrieving the phone. New phones were unaffordably expensive: for more than half the women interviewed, losing a phone meant having to save money for a long period of time—during which they had no phone at all. A fortunate few were able to borrow a mobile phone from a friend or family member while they saved to buy a new one. For all, 'going without a phone' was dreaded because, as a number of women told us, this loss made them feel 'disconnected from the world'.

Losing a handset was traumatic, and so was losing the information saved on the 'line' (the embedded Subscriber Identity Module, or 'SIM card'). The plastic cards cost ~\$1, but participants valued them because they stored contact lists, saved text messages and in some cases photographs and music. A frequently mentioned activity, particularly among younger participants was looking through saved SMS messages, including jokes, inspirational messages from friends as well as saved photographs. A lost SIM card resulted in the loss of this valued content, further women had to engage in the cumbersome process of rebuilding their contact lists. Mobile phones were the only digital devices participants owned, so they rarely if ever had the option of backing up content to a laptop or desktop computer. By storing all their digital data on a single device, phone owners were vulnerable not only to the theft of their phones, but also to the loss of its content.

The frequency of handset theft among respondents reveals new insights regarding mobility, and draws attention to the emotional significance women ascribe to their devices—an

aspect of use that has been marginalized in prior studies of these devices in sub-Saharan Africa. Within HCI and ICTD, phones are typically characterized as platforms whose widespread adoption can be harnessed for delivering expert information; however, our findings offer an alternative narrative. Rather than being perceived as a device which sends them health information, the phone is a repository for sentimental digital objects (e.g. motivation SMS message, picture of children), or what Odom *et al.* (2011) describe as ‘virtual possessions’.

4.4. Re-examining usability: new ICTs and online harassment

Nearly, all the women interviewed agreed that they could use older, basic handsets like the Nokia 1100; usability challenges arose when women came to own new or different phones, with unfamiliar capabilities and features. Diane, succinctly explains this difference:

An updated phone can be a challenge, but an old phone—that is not a challenge.

The women in Diane’s group agreed with her observation, and added that phones with touchscreen interfaces were especially complicated to use. They openly wondered why these handsets appeared to be replacing the familiar ‘padded’ handsets with the physical buttons which they preferred and had become accustomed to using. Theft and breakage meant that turnover was frequent; ownership lifetime varied, but most participants told us that they acquired a new handset every 2–3 years. This turnover meant that they had to become familiar with a new phone and its (often vastly different) features, such as accessing FB or the rest of the Internet. We saw older ‘mamas’ with Internet-enabled feature phones, telling us they did not understand how to get online, while more tech-savvy businesswomen with smart and feature phones faced other challenges, most frequently accessing mobile websites.

Remarks about the difficulties of account creation were common, as were stories about giving up or waiting for help from a child or younger friend who was more likely to be familiar with the sign-up process. The women also expressed the desire to learn how to use other mobile services and software applications not yet designed to run on mobile phones (Microsoft Excel). A frequently mentioned way to gain these skills was to enroll in the ‘IT classes’ offered at technical schools in Nairobi. However, unlike their husbands, their ability to do so was limited by constant demands on their time. Margaret’s comments were similar to those of other businessladies:

It is like men most of the time, they are not tied up by responsibilities at the house, cooking, caring for children and working, so most of the time they play with computers.

Her use of the word ‘play’ was telling. Research has shown (Prensky, 2006) that exploring new applications and devices is an effective way to learn how to use computing technologies. However, this requires time—time women in our study said they did not have. As with Munyua’s (2009) study of women entrepreneurs in Nairobi, our findings raise questions about the degree to which ICTs ‘empower’ businesswomen. While these women felt that having smartphones improved their businesses’ performance, it was unclear if earning more money impacted them in other ways because the social traditions and expectation about women’s domestic responsibilities meant they did not have time to learn how to use ICTs so that they could further improve business operations.

Even the younger women who mostly knew how to use smart and feature phones to access FB encountered usability problems, because the site continually introduces new features to users and these changes required re-learning how to use the site. Janet’s quote captured other young women’s attitudes regarding these changes:

What I don’t like with FB is how they keep changing the look, today you wake up to this sort of structure then tomorrow everything has changed to timeline before you realized how to navigate through the old, I find that annoying.

Young women described other ‘annoying’ site features: for instance, Lucy and Alice had not logged onto FB for months because they did not know how to use the password retrieval tool. Another obstacle was figuring out how to control privacy settings and prevent unwanted online interactions (e.g. stalking). Stories of being harassed on the site were common, for example:

Some guy was talking about sex on my profile, saying you are pretty I want to have sex with you—he was a stalker.

Prior research reveals that young women are prone to sexual violence and harassment in Nairobi’s slums; our findings suggest that these abuses also extend to online spaces (Swart, 2009) a problem which affects women globally (Dimond *et al.*, 2011). For many women, this harassment also included being tagged in pornographic imagery appearing in their online feeds. Although FB has mechanisms for blocking images and interactions that bother subscribers, the university students in our study told us that configuring these mechanisms was difficult to do on mobile devices; instead, they made these changes to their accounts when they accessed the site from desktop computers. The non-student users, conversely, were not even aware of the block option. Using—and learning to use—mobile devices and new ICTs was an ongoing process for the women in our study: once they learned how to use a device or website, it changed and they had to relearn it.

5. DISCUSSION

Affordability, mobility and ease of use have been adopted as design principles guiding the development of mobile

applications and services intended to address development problems (Donner, 2008). Our findings suggest that, by re-examining these design themes from women's realities, we can uncover a more comprehensive understanding of mobile phone use in Nairobi. We see that women's relationships with mobile phones is dynamic and change with new economic circumstances and as the technologies evolve. Understanding women's everyday experiences also results in a deeper understanding of design principles and point to new ones. For example, while the emotional attachments that form between people and technology are considered within HCI in developed countries (McCarthy and Wright, 2004), ICTD scholarship, rarely accounts for these attachments, as is understanding the antecedent conditions which are central to the understanding whether or not women trust the content delivered to them via SMS. Here, we discuss other design lessons based on our findings and comment on the role of feminist theory in HCI4D/ICTD intervention projects.

5.1. Designing for everyday problems in HCI/ICTD

Technologists remain enthusiastic about the potential benefits that may come from widespread mobile ownership throughout Africa, and they continue to develop mobile phone apps that target long-standing problems within the economic development domain (education, health and livelihoods). Despite their developers' best intentions, these applications are rarely adopted and many fail to achieve their intended benefit (Heeks, 2002). Rather than largely focusing on interventions that address socioeconomic problems, our analysis suggests that there is room for an alternative approach, specifically developing interventions that address the everyday problems Kenyans encounter when using technology, that is the problems women in our study typically voiced, such as monitoring airtime, managing battery power, learning how to use new ICTs and avoiding phone theft and online harassment. Of course, such recommendations invoke a technologically deterministic perspective that will likely never completely address the problems we observed; nonetheless, we do hope our recommendations spur discussions within HCI and ICTD regarding which problems technology developers choose to address.

Our findings offer additional support for developing interfaces that allow users to better monitor and control the amount of mobile phones airtime they use (Sambasivan and Cutrell, 2012)—a frequent and consistent concern voiced by the women in our study. We speculate that our participants would welcome interface features that improve their abilities to track their credit balance and learn about web page costs as they browse; similar features are included in SmartBrowse (a prototype mobile application designed to improve data usage transparency), and have been proven to improve the mobile experience of Ghanaian smartphone

users (Sambasivan *et al.*, 2015). An additional feature could be a battery charge monitor which would also indicate how much charge a given application consumes.

The phones themselves need to be redesigned so that they are less susceptible to theft; this may mean exploring alternative form factors that make it easier for people to hold onto their phones in public places, or developing anti-theft software applications. It would also be beneficial to educate people on how to use current technologies. Usability is not static: with growth in smartphone access and greater use of social media, comes a learning curve—not only regarding how to create an account and to use social media, but also regarding the broader implications of Internet use, such as how to control access to one's information and the implications that accompany providing technology companies your online information. We encourage HCI and ICTD practitioners to emulate public health scholars, and collaborate with television producers to create programs which (like the Kenyan soap opera 'Makutano Junction') educate viewers while entertaining them (Kang'ethe *et al.*, 2012). 'Junction' episodes combine drama and romance with HIV tests and frank discussions about these issues. ICTD researchers could similarly work with the show's developers to create storylines that tackle online stalking, harassment and how to create secure passwords, and in the process teach viewers about FB's settings, features and/or the broader implications of sharing information online.

Furthermore, there is a broader lesson for the HCI4D and ICTD community here. Researchers and practitioners have a tendency to direct attention to a single dimension of women's lives (e.g. providing them with health information). However, people's lives are complex and there is no simple way to summarize how they might use mobile phones, or what to know what they need from the devices. Women's interactions with technology encompass a broader range of issues, and we encourage researchers to explore interventions that defy simple characterizations and to involve women in the design of mobile services which target them.

5.2. Integrating feminist theory into HCI4D research

Our findings also offer some empirical support for the value of integrating feminist theory into HCI user studies and design. Bardzell (2010) notably makes the link between feminist theory and interaction design by recognizing how the design of computational systems and devices can be improved by better understanding gender and its effects on ICT use. She writes that these theories have the potential to 'reveal unspoken values within HCI's dominant (...) design paradigms;' and that by integrating them into user research, we can 'generate new and critical questions'. Our findings do both, first by drawing attention to the assumptions embedded in design themes, and second by raising questions about the

utility of mobile services designed for women. Bardzell adds that feminist empiricists' 'ideas can prompt software developers to imagine alternative design strategies', and we hope that a continued focus on women's everyday experiences will encourage developers to 'imagine alternatives' to mobile applications focused on (for example) improving socioeconomic conditions in developing countries.

Integrating feminist theory into the design of ICTD interventions demands some consideration toward what form of feminism is used; researchers must recognize that in addition to Western feminism there are other forms, including third-world feminism, black feminism, Western feminism and global feminism (Sanya, 2013). Exciting new possibilities may arise from understanding variations in feminist concerns and how they relate to mobile phone use and design, by prompting greater awareness of the Western and masculine values embedded in technology design. Finally, feminist theory provides ways of talking about dilemmas as they arise when conducting interviews and observations in support of ICT design—in particular, concerns about exploitation and misrepresentation that come into play whenever data come from human informants (Oakley, 1981; Reisman, 1987).

6. FUTURE WORK AND CONCLUSION

We use findings from our qualitative study into the everyday mobile experiences of women in Nairobi to re-examine affordability, mobility and ease of use, design themes underlying many mobile phone projects in HCI and ICTD. This was a short-term study; to properly analyze the changes brought about by new ICTs for both men and women in Kenya and other sub-Saharan Africa countries, longer term studies would be required. These efforts should continue to examine a range of women and their experiences with ICTs, because while our finding may apply to the women in our study, we cannot be sure to other groups of women (e.g. those living in rural areas). Future research could provide pointers for how mobile phones and services can help people recover personal content from their phones after it is stolen. Furthermore, there are opportunities to investigate how interventions designed to prevent online harassment in one context may apply to another (Dimond *et al.*, 2011), and to explore the possibilities that can arise from integrating 'locally grown feminist theory' into the design of new technologies (Baraza and Kabira, 2015).

Our conclusion is that by continuing to explore peoples' everyday ICT use, especially those living in developing countries, can be useful for recognizing their varied experiences, and can prompt critical discussions about the assumptions that technologists have about ICTs in development. These discussions can also motivate designs that do not narrowly focus on improving users' socioeconomic well-being, but also

address the everyday problems all Kenyans encounter when using ICTs.

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