International Journal of Communication 5 (2011), 574–597 1932-8036/20110574

Exploring Mobile-only Internet Use: Results of a Training Study in Urban South Africa

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Using an ethnographic action research approach, the study explores the challenges, practices, and emergent framings of mobile-only Internet use in a resource-constrained setting. We trained eight women in a nongovernmental organization's collective in South Africa, none of whom had used a personal computer, how to access the Internet on mobile handsets they already owned. Six months after training, most continued to use the mobile Internet for a combination of utility, entertainment, and connection, but they had encountered barriers, including affordability and difficulty of use. Participants' assessments mingled aspirational and actual utility of the channel with and against a background of socioeconomic constraints. Discussion links the digital literacy perspective to the broader theoretical frameworks of domestication, adaptive structuration, and appropriation.

Introduction[1]

The postmillennial decade offered two sea changes in worldwide digital connectivity, a relentless spread in conventional Internet access via PCs and an even bigger surge in mobile telephone use worldwide. A convergence now is underway. One estimate from India suggests that 27% of that country's 471 million mobile subscriptions are capable of accessing data (TRAI, 2010). The number of active mobile Internet users is hard to ascertain (Joubert, 2008) and is likely to be only a small fraction of those with data-enabled handsets. Nevertheless, the mobile Internet has arrived on smartphones and on midrange

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Date submitted: 2010–02–08

[1] Results from the training exercise were presented at the IDIA Conference at Kruger Park, South Africa, October 28–30, 2009 http://www.developmentinformatics.org/conferences/2009/3rd.html, results from the follow-up interviews were presented at the workshop on livelihoods and ICTs in New Delhi, March 17–18 2010. (See http://www.iitd.ac.in/events/ICTDworkshop.) We are grateful to Heather Horst and Ed Cutrell for their suggestions for improvement. The fieldwork was supported by Microsoft Research India and by the Hasso Plattner Institute Research School at the University of Cape Town.

multimedia feature phones and may grow to be as much the story of the new decade as the PC-based Internet and the basic mobile phone were of the last (Morgan Stanley Research, 2009).

Worldwide Internet and Mobile Growth, 2000–2010

	2000	2010 (est.)	Annual Growth
Internet users (millions)	390	2,000	18%
Mobile phone subscriptions (millions)	738	5,300	22%

Source: ITU, 2011

Yet if we seek to examine how the mobile Internet is used in everyday life, a skew in the available evidence is apparent. A growing body of research describes how relatively prosperous people use smartphones as complements to their other means of accessing the Internet. For example, we know about struggles in maintaining work-life balance when e-mail comes home (Chesley, 2005), about successes when medical diagnostic tools are placed on smartphones (Leijdekkers & Gay, 2006), and about increases in citizen journalism when passersby have Internet-enabled cameraphones (Allen, 2007). However, *the research community knows far less about the behaviors of the community of users who will access the Internet primarily or exclusively via mobiles.* These gaps are an impediment to needed improvements in theory, policy, and design. This article joins a small set of studies (Bosch, 2008; W. Chigona, Beukes, Vally, & Tanner, 2009; Donner & Gitau, 2009; Kreutzer, 2009) that have recently begun to explore mobile Internet use in the Global South by resource-constrained individuals.

The increasing availability of the mobile Internet to resource-constrained individuals particularly interests the community of researchers and practitioners concerned with information technologies and international development. Mobiles offer a confluence of portability, personal control, and flexibility that make them appealing, disruptive, and ubiquitous (Castells, Fernández-Ardèvol, Qiu, & Sey, 2007; Katz & Aakhus, 2002). Many hope that the mobile Internet, if widely used in the Global South, will combine the ubiquity of the handset with data access and will increase the productivity and agency of individuals and organizations. However, concrete evidence remains scarce.

We describe a study in Cape Town, South Africa. Eight women, each a member of a livelihoods collective, received training in the use of the data features on the phones they already owned. None of the participants had ever used a PC. Although qualitative and of limited representativeness and scope, the study is among the first to examine the introduction and use of mobile Internet among resource-constrained individuals. It takes the methodological and conceptual stance of ethnographic action research, in that our goal was to learn about the complex phenomenon of mobile-only Internet use not by simply observing nor by objectively intervening but rather by working alongside new users, training them, as they wished, to use the technology for their own goals. The discussion draws on the concepts of appropriation and domestication to consider adoption not as a single event but rather as a process. In addition, we link these framings with the concept of digital literacy.

The Spread of the Mobile Internet

Our inquiry is situated within an ongoing multidisciplinary conversation about the use of information and communication technologies in developing countries, or ICT4D/ICTD (Burrell & Toyama, 2009). Although most recent ICTD literature has been implicitly or explicitly about PCs or the PC-based Internet, ICTD studies of mobile telephony are becoming more numerous, addressing its impact on livelihoods, health, education, and social life (Donner, 2008). However, the majority of such mobile studies have ignored the Internet, focusing instead on voice calls or text messaging. Some have drawn explicit *contrasts* between mobile and PC use (Kolko, Rose, & Johnson, 2007; Sey, 2011; Slater & Kwami, 2005), but few consider the convergence of the mobile and the Internet in the Global South.

This scarcity of research is understandable. Although smartphone-wielding, multitasking professionals (Chesley, 2005) and i-mode savvy Japanese users (Ito, Okabe, & Matsuda, 2005) of the Global North are established archetypes, the data-enabled handset is only recently becoming widespread in developing countries. Indeed, data capabilities remain a feature of mid-range handsets, costing US$75 or more, and are not yet found on entry-level phones. However, with every passing day, a higher proportion of the world's handsets support data.

Mobile Internet Use in South Africa

With low levels of PC use and near-universal mobile ownership, South Africa is an excellent venue to observe mobile Internet use among resource-constrained communities. Some estimate that there are more active users of the mobile Internet in South Africa than there are traditional Internet users (Joubert, 2008), and research has documented the relatively rapid adoption of mobile Internet use (W. Chigona, Beukes et al., 2009; Donner & Gitau, 2009; Gilham & Belle, 2005). In a survey of 11th-grade students in low-income schools in Cape Town, Kreutzer (2009), finds evidence of widespread use. Seventy-seven percent of respondents owned a data-ready handset, and a remarkable 68% had used a mobile phone on the previous day to access the Internet.

Lower-cost Self-expression and Connection via MXit

MXit, a downloadable mobile instant messaging application, has played a prominent role in the spread of the mobile Internet in South Africa (Bosch, 2008; A. Chigona & Chigona, 2009; W. Chigona, Chigona, Ngqokelela, & Mpofu, 2009; Nitsckie & Parker, 2009). More than nine million registered MXit users (Vecchiatto, 2009) in South Africa pay only 1 South African cent (US$.0012) per instant message. As discussed elsewhere (Kreutzer, 2009; Marsden, 2007), the Internet does not begin and end with the browser, and downloadable applications—apps—like MXit and the operators' premium content can draw on Internet data without being Internet experiences in the eyes of users.

With SMS messages costing 10 U.S. cents or more, it is commonly known that MXit is a cheaper way to text, and the potential cost-savings is a strong motivation for users to configure their mobile data connections (Donner & Gitau, 2009). In prepay environments, many people closely manage telecommunications expenditures (Zainudeen, Samarajiva, & Abeysuriya, 2006). As with missed calls (Donner, 2007), this practice requires the negotiation and construction of norms of interaction. With MXit

established as a socially acceptable alternative to SMS messages, cost considerations actually drive people toward the mobile Internet.

Yet MXit is not a one-for-one replacement for text messaging. With themed multiuser chatrooms, premium content, and opportunities to create profiles and meet new people, MXit shares many features of other social network services and is the first and only such service used by many South Africans. Unsurprisingly, these avenues for self-expression and connection have drawn detractors; media stories of illicit chats and photo-doctoring have fuelled moral panics (A. Chigona & Chigona, 2009). On the other hand, the channel has been utilized for outreach programs, including drug counseling (Nitsckie & Parker, 2009) and math tutoring (Butgereit, 2007).

Mobile Web Browsing

Although the partially walled garden of the MXit application is the most common form of mobile Internet use, some do venture out onto the broader Internet, using WAP or Opera Mini browsers. Some visit Facebook. Others search for information or news, ranging from the trivial (entertainment gossip) to the gravely serious (information on HIV/AIDS, political news from Zimbabwe, etc.) (Donner & Gitau, 2009). Downloadable apps may be particularly important to mobile users, but the browser and search box remain helpful to many.

Without assistance, it can be difficult to configure handsets for the mobile Internet (Lindholm, Keinonen, & Kiljander, 2003); trusted intermediaries (Campbell & Russo, 2003) help would-be mobile Internet users get online. Friends and family help others make the plunge, often advocating for MXit to reduce their own text messaging expenditures. In other cases, people turn to super-users with the skill (and desire) to help. For example, in an earlier study, we met one man, a Kenyan in a local market, who had acquired the nickname Fundi [Swahili for “expert”] from his friends. He explained: “People are always looking for me to put Internet in their phones . . . and so far I think I have set up more than 100 phones” (Donner & Gitau, 2009).

Mobile-only Internet Use

It is worth making a further distinction between those with limited access to PCs and those with no PC access at all. In our earlier study (Donner & Gitau, 2009), we described how the shared PC (or its absence) helps structure the use of the mobile Internet, dividing mobile-only from mobile-primary Internet users. This underscores the importance of understanding mobile Internet use within a communications repertoire (Licoppe, 2004) or ecology (Nardi & O’Day, 1999; Tacchi, Slater, & Hearn, 2003) of other present technologies. This study, conducted with participants who had never touched a PC, focuses on mobile-only Internet use, but many of its findings are relevant to the superset of all mobile Internet users who do not have regular, easy, predictable access to the PC-based Internet.

Digital Literacy, Appropriation, Domestication

Theoretical descriptions of digital literacy, whether from the PC (Ratan, Satpathy, Zia, Toyama, Blagsvedt, Pawar et al. 2009; Stanley, 2003; Warschauer, 2003) or mobile (Fjuk, Furberg, Geirbo, &

Helmersen, 2008) domains, elaborate on social and conceptual factors beyond mere technical competence. These instead stress skills acquired over time, both inside and outside training sessions, identify various factors at play, from symbolism and self-esteem to environmental and structural incentives (Pal, Freistadt, Frix, & Neff, 2009) .

Another research tradition extends well beyond ICTD, stressing the interdependence of technology and user. In these models, users and technologies interact in sociotechnical systems; users adjust over time to the affordances and constraints of technologies, both by creating social practices and by structuring the technologies themselves. Whether called appropriation (Miller, 1987), adaptive structuration (Poole & DeSanctis, 1990), or domestication (Silverstone & Hirsch, 1992), these frames reject dyadic adoption models in favor of more nuanced understandings of ICT use as an ongoing, evolving process. Such perspectives are particularly valuable to ICTD (Mason & Hacker, 2003). As ICTs, especially mobiles, designed in the Global North meet the resource-constrained settings of the Global South, the stage is set for diverse appropriation (Bar, Pisani, & Weber, 2007), structuration (Donner, 2007), and domestication (Hahn & Kibora, 2008) processes.

Two recent examples of research on mobile use in everyday life stress such interdependencies. First, in their analysis of the telecommunications practices in Cape Town's Khayelitsha township—also the site for our research—Skuse and Cousins (2008, p. 23) remind us that ICTD advances when "grounded and contextualized analysis emerges of the way in which particular communication technologies embed themselves in, and simultaneously help to create, highly distinctive social milieus." Second, Horst and Miller (2006, p. 7), in their analysis of cell phone use among resource-constrained communities in Jamaica, argue that there is "no fixed thing called a cell phone" but rather a process by which technologies and communities influence one another. In both cases, the mobile phone's significance intertwines with instrumental calls reflective of (and mingled with) rich social networks of support which extend beyond the neighborhoods being studied; mobiles help mediate and maintain these networks.

Although a focus on everyday mobile Internet activity may reveal instrumental uses, it does not presume developmental impacts, nor does it exclude other uses, be they self-expression and family connections or flirting and entertainment. The setting for the study was an NGO focused on livelihoods and job training, and participants made it clear that they wanted to use the Internet to find jobs. Yet their interactions with the mobile Internet cannot be described exclusively in such terms; throughout the training, expression mingled with search, escape mingled with hope. The symbolic and instrumental complexity of the medium was manifest in the initial approaches and experiences of the study participants.

Methods

During our earlier interviews (Donner & Gitau, 2009), we had difficulties finding adult women using the mobile Internet, reflecting regrettably common gender differences in ICT use (Cockburn, 1994; Scott, McKemey, & Batchelor, 2004). Many women we approached were unaware of the mobile Internet or found it too complicated. Others reported relying on brothers, husbands, and sons to use it for them. In addition, our initial interviews identified users only after they had adopted the technology. Thus, we became *fundis* of a sort, training eight women to use the Internet functionality on the phones they already

owned. All the participants live in Khayelitsha, Cape Town's largest township, and work as seamstresses at a skills development NGO[2] with extensive and trusted relationships within the community. With the permission of the NGO, participants interested in having the Internet on their phones were recruited by self-selection and informal word of mouth.

Ethnographic Action Research

We approached the training as an exercise in ethnographic action research, or EAR (Hearn & Foth, 2004; Slater, Tacchi, & Lewis, 2002; Tacchi, 2004; Tacchi et al., 2003). Emerging originally from a UNESCO-funded program to assess community multimedia centers (Slater et al.), EAR has been designed specifically "to focus on the actual use of, and interaction with, technologies in the wider context of people's lives and social and cultural structures" (Tacchi, 2004, p. 94). Its developers sought a methodological stance that, while rich and open to diverse outcomes, nevertheless was both rapid and inclusive. They did so by "integrating an ethnographic research approach into projects and their development, training project workers to undertake long-term ethnographic work and drawing on the strengths of participatory action research" (Tacchi, 2004, p. 94). Using multiple methods, patient listening, immersive observation, and the analysis of field notes, EAR thus draws on the ethnographic tradition. However it draws equally on action research (Avison, Lau, Myers, & Nielsen, 1999), a method of inquiry that embraces engagement and goal-directed change arrived at collaboratively with participants. As Tacchi explains,

> There are two main types of research that make up ethnographic action research: broad research that helps you understand the wider society, cultural, social and technological structures and communicative ecologies in which projects works; and more targeted research aimed at understanding one particular issue or set of issues or one particular part of the communities served. (Tacchi, 2004, pp. 94–95)

Coming together in a cycle of "plan, do, observe, and reflect," the method "continually investigates what the ongoing impacts of a project are, in what ways it is working and in what ways *it can be improved*" (Tacchi, 2004, p. 95, italics added). It is emphatically not classical, long-term ethnography, but rather a form of project evaluation particularly sensitive to the complexities of technology use in context, and intended to bring about improvements to technical systems and programs themselves. In this sense, the EAR researcher plays the role of a "social-cultural animator" (Tacchi et al., 2003, p. 27) who both seeks to "breathe life into the projects and the underlying dynamic of the community in which they are located" (ibid.) and to capture and document the complex interactions between people, technologies, and projects.

Exploring "Successful" Internet Use

In our case, the technology was the mobile Internet, the people were first-time users with no previous exposure to the PC-based Internet, and the project was, broadly, a training exercise. Using EAR,

[2] For confidentiality reasons, all participant names are pseudonyms, and the name of the NGO has been withheld.

we tried to nurture successful mobile Internet use among participants through a collaborative, exploratory, and flexible engagement process. Over 13 weeks, one of the authors immersed herself in the women's environment through frequent half-day visits. Our goals were to learn at two levels, (a) to assess and recommend improvements to the ways in which mobile Internet is offered/accessed via mid-range feature phones and (b) to gather broader insights about the technology in context, including social and cultural meanings exceeding those we could have gathered via focus groups or usability assessments. Our findings on the technical side—about usability—are detailed in (Gitau, Marsden, & Donner, 2010). This article focuses on the contextual side, on issues of usefulness and utility.

Our interactions with the participants were not focused exclusively on training; participants went about a normal day, sewing, chatting, interacting with NGO staff, etc., with only periodic swings in the conversations toward the mobile Internet. Our analysis draws on notes taken during and after the visits, augmented with references to digital recordings, made with participants' permission. We provided 30 rand (US$4) of prepaid mobile airtime to each participant on two occasions (60 rand total); once at the beginning of the study to cover the cost of Internet access during the study, and again at the end of the follow-up interviews as an honorarium.

We began with individual pre-training interviews, conducted in English and transcribed for analysis, during which participants outlined their expectations about the Internet. However, there was significant resistance to the planned group training; after the first 45-minute session, half the women wanted to drop out, feeling less savvy than their friends. By switching to individualized training sessions, we were able to coax back most dropouts.

The training introduced mobile Internet as a tool for daily life, including searching for business and job opportunities, news, and entertainment (music downloads). The protocol combined instruction and examples. We illustrated, for example, how to access a popular search engine using WAP, then entered "domestic care job" as a search inquiry; this produced several links to job databases, which we followed to display the job descriptions. We also helped participants establish e-mail addresses, which are a major gateway to interaction and exchange online (Gitau et al., 2010). Given the EAR approach, the relative weighting given in training and discussion to instrumental versus entertainment uses—between, say, getting a job and searching for gospel music—was developed collaboratively between the researchers and the participants. More details on how this weighting emerged and evolved, given the context of the training in the NGO setting, will be described in the results section below.

A group dynamic evolved. The women became comfortable learning from one another. We adjusted our methods and began teaching each participant different things, encouraging them to teach one another. This peer-to-peer learning model was advantageous in three ways. First, although most of the women spoke enough English to communicate with the trainer, they primarily spoke isiXhosa. Hence, the peer learning resulted in more animated, natural conversation. Second, this led to accelerated learning in the group. Finally, the peer learning encouraged ongoing and unstructured learning even after the initial 13-week period concluded.

After the initial kickoff, most of our interactions were informal one-one-one refresher sessions, which gave us a chance to gauge progress and adjust the training content. We concluded the training phase after 13 weeks with a group feedback session.

Initial Results

Two volunteers dropped out after the first training session. Of the eight remaining, five were in their twenties, two in their thirties, and one in her fifties. Four were married. All but one lived in a household with three or more members. Monthly household income ranged from 1,300 rand (US$150) to 8,000 (US$960) rand. The group median of 3,000 rand is above the poverty line for South Africa but nevertheless quite resource-constrained. Six of the women had moved to Khayelitsha from homes in the Eastern Cape. Only three of the women had completed high school.

Each participant owned an Internet-ready phone, with GPRS capability and WAP 2.0 (a browser capable of visiting a wide range of Web sites). Some had heard of the Internet, but most did not know it was available on their phones. Some knew that one could access the Internet by pressing a hotkey; however, none knew how to configure the data settings on their handsets. None had previously used a computer.

The participants had each already decided to join the NGO and pursue training in search of better livelihoods. The NGO manager explained:

> Khayelitsha has close to 90% unemployment. . . . What we offer here is a form of income generation. We pay them depending on the work that is available, and their personal input, because for many of them this is the only way to feed their families, but we hope with the skills that they acquire here they can be able to find secure employment elsewhere.

In this context, the search for a path out of poverty was salient, and it was not surprising to us that much of the focus of the training would be on using the Internet to search for a job. Indeed, even in the initial interviews, some of the women drew connections between this search and the iconic (though mysterious) power of the Internet. Job search, at a basic level, was sufficient rationale for taking the time to sit with a stranger and learn the intricacies of the mobile Internet. Tindi, one of the participants, was confident during her initial interview:

> I know this life is not for me, I know I will get out, and I hear in the Internet I can get information . . . all type of information; I know it will help me get out.

Anne has two kids and is expecting a third. She is working at the NGO while her husband is undertaking nursing training. She explains why she seeks a job:

> Here they give me R800 (US$90) per fortnight, and sometimes even that I am not assured as it depends on the orders that they get, there I have to buy food, pay 200 for crèche and give my husband some money to at least have something in his pocket. I still need money to go to the clinic (prenatal care) and buy things for the baby. I just

> want something that will pay me more than R2000 (US$230) a month, that will be enough. Do you think this Internet can help? They say it can help and I am willing to try.

Job Search

In South Africa's highly stratified economy, some jobs are announced and filled by worth of mouth and some through classified ads in the traditional mass media. Others, particularly professional and service-sector jobs in the formal economy, are likely to be advertised online on one of dozens of listing services[3]. Many formal-sector employers in urban South Africa virtually assume potential employees have access to the Internet. Ammy's experience:

> Here in the Internet I know I will find people who want me. Look, I went to this place in the morning and they told me put my CV here in the web, but I do not know how to do that, they do not consider me, if I do not know how to use Internet.

Without the means or skills to directly access the Internet, many job seekers walk door to door seeking for employment, distributing their printed curricula vitae or inquiring after open positions. Others rely on assistance from cybercafe attendants, who offer various services (CV writing, printing, e-mailing and faxing) for a fee. The efficiency to be gained by self-directed Internet searches is significant, replacing time on foot or a steady bleeding of out-of-pocket fees to cybercafé operators. Would-be job seekers with Internet connections and the skills to use them have the advantage in urban South Africa.

After the initial training, many participants searched for jobs and used their new e-mail addresses in contacts with potential employers. Linda used Google and moved on to Gumtree.co.za, a service similar to craigslist.

> I put "job in Cape Town" and they gave me Gumtree, I go to Gumtree and they show me many jobs here in Cape Town, but this one they don't want many things so I put my e-mail address and ask them if they can employ me and here see they replied in my e-mail and ask for my CV. . . . I am very excited.

As participants like Tracy progressed, they drew from multiple sources, combining old and new media.

> I enter "home based care training" here and then say OK, then they give many things I read them and write them here [she bought a notebook for this purpose only] and then I go here [Opera Mini] and write the www [URL] and I read more and then I find their e-mail address, and write here and then . . . send them e-mail.

The women encouraged one another to follow up on leads. Once they could recognize URLs, they found them in offline media and brought them in to share. Similarly, after Tracy and Linda discovered

[3] http://www.ananzi.co.za/catalog/Employment/JobSites/index.html lists dozens of online job resources in South Africa. Only a few, such as http://www.careerclassifieds.co.za/Wap.aspx are optimized for mobile access.

Gumtree.co.za and Careerjet.co.za, they shared their phones with the other participants, demonstrating how to replicate the steps to find the sites.

Other Searches

In the seamstress' area at the NGO there is always a radio playing. Further, many of the women had shared MP3 files via Bluetooth (Smyth, Kumar, Medhi, & Toyama, 2010). Thus, Tindi's first search was for her favorite gospel musician Lindiwe. Phyllis sought the same. Her initial searches were successful, although surprising: "*Eiiishh.* I found the gospel music, but I must have R16 to get it. . . ."

Participants were less interested political news (even during a national election) than in the weather, because rain can easily flood Khayelitsha's former wetlands during winter storms. Beatrice says "I live in a zinc house [of temporary iron sheets], and here if they give me weather I can be prepared."

South Africa has among the highest HIV/AIDS incidence levels in the world. One participant described how HIV had touched a family member. Her searches led her to the website of a local HIV support NGO and to information about antiretroviral drugs and mother-to-child transmission.

Participants searched for a variety of things. Paths to useful content were not as clear as those to local job listings or to MP3 tracks. Unstructured searches and a jumble of sponsored and unsponsored links led them down sometimes less-than-helpful paths, or to non-local content from beyond South Africa, , referring to circumstances quite different what they were facing in Khayelitsha.

Chatting and Networking

Our training did not focus on social networking, but the participants quickly found their way to such services. Linda heard about Facebook, and clicked on the preconfigured link on her handset's browser:

> Then they ask I put e-mail address and password and they send me code in e-mail. . . . I even went there and found Ne-yo [a hip-hop musician] and sent him a message, and I chatted with this guy from Australia.

Follow-up Interviews

Efforts were made in October 2009 to contact all of the women who participated in the original May 2009 training. We made contact with seven of the eight women and were able to conduct semi-structured face-to-face interviews with six; the seventh was interviewed via telephone, as she was no longer visiting the NGO. Interviews lasted 30 to 60 minutes. All but one was recorded for later transcription (one woman refused). Based on our previous experience of the group's dynamic, we also held informal discussions with two or three of the women at a time, as in this way we were able to uncover some of the things that that were not able to come through in a structured interview.

To assess skill retention, we used a demonstration exercise that asked them to send us an e-mail and perform a search on their preferred search engine. After six months, all seven participants tested were able to access a browser and search for a result. Six of the seven had accessed the mobile Internet

since the conclusion of the training (using their own money and airtime to do so). Five could access and compose e-mails; Beatrice could do so with assistance, and Phyllis could not. Five of the seven reported using Facebook; three reported using MXit.

Immediately below, we present an update on each of the seven women with whom we completed follow-up interviews. It the discussion section that follows, we will identify some emergent crosscutting themes from the interviews (access and costs, confidence, and family contexts) and will weigh what transpired against the metric of a successful job search.

Two New Mobile-only Internet Users

When we first met **Ammy,** 22, she was in desperate need of a job to help support a family of five adults and four children. In her words, "I want to learn this, because I know someone there will want me . . . I need a job like yesterday." Ammy's fortunes improved. She reported holding three part-time jobs. Although none of her new jobs could be directly attributed to Internet use, she reported actively searching for new jobs via the mobile Internet.

Thanks to urging from friends, she became active on Facebook; after a false start with an inactive profile, she created a profile, accumulated a number of friends, and sent regular status updates. She has also begun to influence the ICT habits of those around her, directing her sister to enroll in a nanny training course that Ammy found online.

Ammy reported wanting to do more with her handset. On the jobs side, she wanted to be able to create a digital CV to send to prospective employers. On the personal side, she has been unable to master uploading photos to her Facebook profile.

Tracy, 29, lives with her extended family. Her main objective was to find a course to help her become a nurse. Using search functions, she found one in Cape Town and got all the necessary information about the course via e-mail. She visited the physical site of the course only to sign documents and begin her classes. The communication that would have been done either telephonically or via physical commute cost her "less than R3" (US$0.35). By the time of the follow-up, she had completed the course and was undertaking a practicum at a local hospice. She reported looking online for jobs for herself, her sisters and her partner.

Tracy also signed up for Facebook but is not active as she had no friends who are users, other than the other women in the study group. She attempted to teach her partner and sibling how to use the Internet, and used Opera Mini to open e-mail accounts for them.

Four Between Use and Non-use

A mother of two, 21-year-old **Linda** was able to search and apply for several jobs on her mobile phone; two of these applications resulted in interviews, and one led to a job offer. However, Linda could not be employed because her original identification card had been stolen. Linda has used her skill to search for jobs for her aunt and recipes for her grandmother. With a cousin, she started working on a business idea of buying and reselling second-hand items in Khayelitsha, using the mobile Internet to find factory outlets and second-hand merchandisers.

In the months after the training, Linda lost three handsets in street muggings. She was unable to transfer her mobile Internet practices to her new phones, as she could not find either the WAP or Opera Mini browsers. In spite of these challenges, Linda is still able to access the Internet on models that she is familiar with and was keen to demonstrate her skills to us. Linda was the first in the group to start a basic computer literacy course. She is now able to perform basic tasks on a computer; however, she preferred the convenience of mobile Internet access to the option of accessing a PC via cybercafé or at a friend's place.

Anne, 25 years old, is a mother of two and lives with her partner. Like Linda, Anne would love to be a mobile Internet user. She had learned how to use the Internet so she could help her partner secure employment and had bought a second hand data-ready mobile phone for this purpose. However, that phone was stolen. She and her partner are saving up to buy Anne a similar unit. In the meantime, Anne uses her partner's phone to search the Internet for jobs and has taught him how to do the same. On seeing jobseekers' personal profiles on Gumtree, Anne and her partner approached a cousin who is a PC user and asked him to post their profiles. She reported wanting to start a basic computer literacy course once she found a constant source of income.

Initially skeptical, **Nancy,** 30, started the training late. Once she was underway, her main aim was to search for employment, as she is the sole breadwinner in her family. She reported using the Internet to help her sister (who lives in the Eastern Cape) search for jobs, and had accessed The Grid, a South African social networking service. She also discovered that a "co.za" search site offered better access to more localized information than the same ".com" site. Her knowledge of the mobile Internet increased her confidence in the use of technology and she enrolled in a basic computer literacy class. She likes using the Internet, but time and money are challenges: "No. . . . I do not have long time on the Internet . . . and you see there are times I do not have airtime."

Phyllis, 24, lives with her husband in Khayelitsha while they support their children staying with extended family in the Eastern Cape. Phyllis became technically proficient on the handset, conducting search and composing e-mails. However, shortly after the training, she had to put up her phone as a guarantee on an informal loan for travel funds, to travel 1000 kilometers to fetch one of her children. Upon returning to Cape Town, she retrieved her handset, and is able to navigate to the WAP browser. However, she is unable to access her e-mail account as she has forgotten her password.

Not a User (for now)

Beatrice, 33, is married with three children. During the original training, she had demonstrated the ability to access e-mail and a search engine to look for jobs. She had received several job listings via e-mail from a cousin who lives in the Eastern Cape but told us she never followed up on the opportunities. In her words, she was "too busy to look at this, I have no time even in the evening. . . ." Beatrice nevertheless uses the Internet's symbolic value. During the initial training, her husband tried to prevent her from using the Internet, particularly MXit; but after six months, she spoke of protecting her rights to use the Internet as she wished. She expressed interest in learning about Facebook, which she had heard about from a local radio station presenter. Her curiosity points to a growing enthusiasm and a difference in attitude from her earlier acquiescence.

Discussion

Eight new users in Khayelitsha do not represent the experiences of billions of potential mobile Internet users across the Global South. Nevertheless, following their interrelated processes of literacy acquisition and domestication helps shed light on a critical yet under-researched phenomenon. How does one approach, understand, and use the Internet via the mobile telephone if one has never touched a PC?

For the implications of our research for interface design, we refer readers to (Gitau et al., 2010), which describes six barriers to effective mobile Internet use found during the study: three handset issues (confusing GPRS settings, challenging security settings, WAP/menu confusion and nonstandard interfaces) and three ecosystem issues (unfamiliar passwords, no mobile-friendly websites, and difficult e-mail initiation processes).

We focus instead on the intersection between mobile Internet use and daily life and stress the ways in which participants' use is both a product of and a potential challenge to difficult socioeconomic contexts. Our discussion seeks to reconcile the two disparate results from the interviews. On the one hand, the participants retained skills (and even acquired some new ones) six months after the original training. On the other hand, not one of the seven women we revisited had secured a job via the mobile Internet, even though doing so was among primary motivations for the training and central to the domestication process beyond the walls of the NGO.

Online Presentation of Self

Participants did not exclusively look for jobs online. They also used the Internet to find gospel music, craft profiles, send birthday party invitations, and even "friend" hip-hop stars. While registering e-mail addresses, some participants invented names. Anne wanted to be referred to as "Jojo." Asked why, she replied, "Well I like it, it sounds nice." Likewise, Tindi was excited that she sent an e-mail to a local radio station: "They read *my on*e." The fact that her e-mail was read on radio boosted her self-confidence — "I now can do more. . . ." E-mail, MXit, and Facebook demanded a conscious, selective presentation of self (boyd, 2007; Oksman & Turtiainen, 2004), and revealed a willingness to appropriate technologies for self-expression also found among first-time users of the PC-based Internet (Ratan et al., 2009).

Some participants built on their positive experience with the mobile Internet and elected to pursue traditional PC training, in the words of Nancy: " I want to learn more, I do not want to sit here at [NGO's name] and do nothing . . . I want to get more jobs . . . Yes I think I will get more jobs with the computer course." In all, five of seven expressed some interest in this direction.

Despite some spillover in confidence between the mobile and the fixed Internet and between the social and the instrumental domains, the mobile Internet, like the mobile handset itself (Marsden, 2007), is a flexible medium that supports a range of simultaneous pursuits. Indeed given the variety of apps, premium proprietary content, e-mail clients, and browser experiences available, it might be better to re-conceptualize it as a multipurpose data channel rather than as a singular medium to be mastered or taught. This need not be discouraging to those who wish to leverage the mobile Internet for important tasks in health, education, agriculture, etc. Nor does this imply that that every M4D application must leverage a social/expressive model, but initiatives using MXit chats for education (Butgereit, 2007) and

drug counseling (Nitsckie & Parker, 2009) are examples of applications that work with interactivity and self-expression (Kolko et al., 2007).

Offline Context and Reputation

At the same time the women were crafting online identities, their use of the mobile Internet had implications for their relationships with people in their lives and had to fit their domestic contexts. This was not always a positive or easy development.

The male shadow was frequently visible, as personal goals and expressions were invariably intertwined with family relationships, roles, and responsibilities. Initially reluctant, Tindi showed her husband how to search:

> I told my husband see, I found Internet on my phone, he tell [me]to find his company and I put [anonymized], and there I see all the people as my husband say about them. I see his boss and other people, and he is very happy and he say *eeiiish* my wife is clever. . . .

On the other hand, Beatrice's domestic obligations kept her mostly offline, even in the evening. At times, she described this simply in terms of responsibilities to family. But she also reported that she had trouble using the popular social networking application MXit: "I cannot use that [MXit] anymore because my husband begun to become jealous that I am going to meet new people." The fear of her husband had even made her reluctant to use her e-mail account.

Outside the home, respondents reported a more unambiguously positive outcome associated with increased mobile literacy: like the *fundi* we met in our previous study, many participants became exemplars and influencers in a community where mobile Internet literacy was still an exception rather than the norm. Nancy, who had initially resisted using the Internet, was taking a basic computing class, where her status as a mobile Internet user allowed her to stand out in a class where the use of Internet was not being taught. "My teacher said she wants to know who teach me Internet in the phone." She also checked on jobs in the Eastern Cape for her sister.

Tracy and Anne took it a step further: Tracy became a *fundi*. "I find it easy to teach other people, I have got the experience; it is easy to use now, I teach the Google all the time." This included teaching her boyfriend, who, unlike Beatrice's husband, seemed happy with his partner's new skills. Similarly Anne, who had specifically learned to use the Internet to help her partner find employment, returned to the follow-up interview with her partner, hoping that he could also benefit from any further training that we could offer. "Anne told me that I can get the job in the gum-tree on the phone, I go there and I see that there are people who have put their names there, Anne did not know how to put the name there, so I talked to my cousin who has a computer and he put my name there"

Results of the Task at Hand, Job Search

Only Beatrice seems to have been unwilling to follow up on job leads shared via mobile Internet. The rest were trying in one way or another to use their mobile Internet search skills to find jobs. But after

six months, none could attribute a new job to their acquisition of mobile Internet search skills. In summary, a variety of factors blocked them:

Access is sporadic and can be lost. A simple forgotten password threw Phyllis off the trail. Who would help her reset a password if the mobile was her only means of Internet access? Similarly, Anne's and Linda's access was curtailed by handset theft (Donner, 2006). These thefts did not target participants' phones because they were Internet-enabled; it is simply and unfortunately the case that handset theft is common in South Africa. Later Linda dropped off one of her replacement handsets for repair, where it sat, out of reach, until she could save the 200 rand to retrieve it. These results remind us that people can drop in and out of technology use and that is an oversimplification to consider its adoption a one-way process (Anderson, 2005).

Affordability is an ongoing concern. Nancy's comments about the times she does not have airtime underscore that investments in time and funds are not inconsequential. Just because the handset is data-enabled does not mean individuals will spend airtime (or any time) on the device, even to do things that might lead to more income down the road. Similarly, Phyllis was willing to use her phone as collateral on a loan. Many participants said they could not spend as much time as they wanted on the Internet because they had to take care of their households in addition to their work, and they could spare time only late in the evening.

Handsets may feature limited functionality. Ammy was able to make contact, via e-mail, with potential employers but could not get over the next hurdle; when they asked for an electronic CV, she could not create or send one via her mobile. She had similar difficulties uploading pictures to her Facebook profile—technically possible but not as easy as doing so via a PC. Internet-enabled handsets and services have been designed to be used by technically literate users from the Global North, as part of an information ecology (Nardi & O'Day, 1999) in which mobiles have been optimized to work as complements to PCs, not as standalone access modes. This is a significant issue, requiring Internet companies to take seriously the issue of mobile-only access.

Even if everything goes right technically, success is not guaranteed. Linda put her new skills to use and secured an interview for a job in the formal sector. At the decisive moment, she was unable to provide the proper ID and lost the job to another applicant. That this ultimately unresolvable barrier has nothing to do with our training or with the mobile Internet is actually a helpful reminder of how ICTD interventions (like our training) play out it in a larger context of social structures, norms, and requirements that can influence economic mobility.

That leaves Tracy, who was actively searching for jobs for herself and her siblings and had successfully enrolled in a nursing course via e-mail. Nothing identifiable had tripped her up, but she still had not been successful. In a market with at least 20% unemployment, it might be a while before she succeeds. Like radio, TV, PCs, and shared PC Internet before them, the mobile Internet is not going to be a silver bullet or immediately transform the macroeconomic conditions in which people like Tracy must find their way.

That said, the most lucrative jobs in South Africa are advertised online. Although a few job sites are WAP-enabled, these are the exception. Better designs and more inclusive functionality for mobile-only Internet users could help ensure that online listings (which currently may actually reinforce stratification) become a channel for greater employment mobility.

Conclusion: The Slow Process of Acquiring Digital Literacy

Was the project of mobile Internet training a success? If our metric is the successful acquisition of jobs, it would be hard to argue that it was. None of the participants got all of what they had hoped for out of the mobile Internet. None got a job. That this endeavor, which can be narrowly constructed as a failure, can also be considered an enriching, empowering experience speaks both to the complexity of ICTD interventions and to the fluidity of mobile Internet use.

The tone of participants' responses during the follow-up interviews was generally upbeat. Despite setbacks in job seeking, they achieved victories, such as faster and wider searches for jobs, interviews secured, courses enrolled in, and even business ideas hatched. They found ways to make the most of the access they had, and in the surest two signs of enthusiasm, began teaching others (four of seven) and trying to learn more about PCs and the conventional Internet (five of seven). They built on existing digital expertise acquired to operate the mobile handset (text messaging, Bluetooth transfer, loading and monitoring airtime) to move relatively quickly to a state of reasonable competence with the mechanics of Internet searching, browsing, and social networking.

Further, it is worth noting how the focus on job search was a particularly fertile and evocative choice for an urban South African context. The better, more stable jobs for the women in our study would be found in Cape Town's formal sector, at companies and organizations run with human resources systems as routinized and reliant on technology as any in the world. But a wide range of jobs was also on offer online, including housekeeping, child care, gardening, construction and petrol station work. That abstract information about livelihood opportunities could be gathered digitally, through search and e-mail, was known to those doing the hiring, but the people doing the searching needed to learn how. Beyond a skill like sewing or woodworking, the ability to search—and the productivity gains it offers to those who master it—was perhaps as important over the longer run as the location of the information itself.

Aside from the technical literacies gained, their participation in the training was both a reflection and reaction to what Pal et al. (2009) call a positive discourse of technology, in which non-users and users alike construct social-symbolic meanings of technologies out of an imagined amalgam of hope, knowledge, growth, youthfulness, and utility. Indeed, at the end of the last phase of this study, one of the NGO staff suggested that perhaps the biggest impact on the women's lives was not in the actual use of the technology but rather in "the knowledge that one has the ability on how to do that [browse on the Internet]. . . is empowering in itself." Linda captured this particularly well, saying, "Sometimes it's exciting when you learn something new. Knowledge is power, power that no one can take away from you."

This is not to say that increasing digital literacies and increasing confidence in online and offline presentations of self are sufficiently transformative elements to close the incredible discrepancies between have-lots and have-lesses in South Africa (or beyond), nor are we suggesting that having mobile Internet in one's pocket negates gaps in human or social capital. However, the confluence of upgraded skills,

experimentation, rising self-esteem, and sharing exhibited by the participants in this action research study straddles the frames of expanded digital literacy (Warschauer, 2003) and domestication/appropriation. Even after six months, we witnessed a process still unfolding, rather than a singular training session receding in time.

This was a study of limited scope and exploratory design, and it was exposed to considerable complications of self-selection and uniqueness because of its participants, researchers, and methods. Nevertheless, by framing the work as EAR, were able to gain insights that will inform the design of more appropriate ICT solutions. For example, by being closely acquainted with the various iterations in a participants' struggles to find work on the Internet, we were able to tease apart the impediments that prevented them from achieving that goal, rather than simply framing the entire training exercise as a failure. Our next steps, to be shared in future publications, will focus on building specific tools and applications to further facilitate job search and application beyond what is possible on a simple WAP browser and a numeric/T9 keyboard. Nevertheless, we believe the experiences at the six-month mark, both positive and negative, were sufficiently illustrative of (a) design challenges facing the mobile Internet as a medium for resource-constrained users in the Global South and (b) the complexity of designing interventions that rely on ICT use *in situ* to be shared as a standalone article.

The barriers faced by the women left between use and non-use illustrate how little transformational power any ICT has independent of context, and yet (paradoxically) point to issues in which improvements in experience design would be most helpful. In other words, by arguing that the acquisition of mobile/digital literacy is a complex process, happening not in training sessions but in communities, by people with competing demands and myriad challenges, we nevertheless identify a few areas for improvement that will be critical in the next few years as the mobile Internet wave continues to wash over the Global South. These include more standardized user experiences, more attention to mobile-only use cases, acknowledgement of frequent handset turnover (churn) as a design problem, and reframing of affordability and access as conditions that ebb and flow rather than as divides to be overcome.

The study also raises questions for those who would seek to replace PC-based interventions with mobile interventions. In this case, the portability and personal control of mobile devices is both an advantage and a challenge. In place of a consistent but hard-to-access (and perhaps underfunded) community PC center, our training ground was on the move, our platforms were the handsets that fell in and out of people's hands, and our training's success was held captive to the variances in airtime availability, theft, husbands' permissions and competing demands. We, like most of our participants, remain remarkably enthusiastic about the potential utility of the mobile Internet in the Global South, but we have not closed the books on the challenges of using ICTs for D, despite the move to a mobile channel.

This article focused on how participants made use of the mobile Internet in the absence of PCs. Our participants were urban, not prosperous but also not among the city's poorest. Each had access to electricity, a mobile/GPRS signal, and enough conventional literacy to interact with textual content. Nevertheless, our interactions with them have identified behaviors in an environment where PCs are scarce. Given South Africa's high penetration of mobile telephony and status as a regional technology leader, our results can serve as early indicators of how populations across Africa—urban and rural—may

eventually approach the mobile Internet. Clearly it is a technology that will be woven into the complex fabric of everyday life, not relegated to a narrow informational role.

The exercise illustrates the deficiencies of any conception of literacy focused narrowly on configuration and navigation. More appropriate are models like Warschauer's (2003), in which digital skills are acquired over time and are only one piece of an equation including access to (and command over) physical, digital, human and social resources.

As such, these studies provide early indications of patterns that will demand more research attention as they become more widespread. For ICTD research, the Internet as a medium has been most often left under-explicated, assumed to be a browser-based experience accessed via the larger screen of a PC or laptop. Yet the bulk of Internet use in the developing world will eventually be mobile (Morgan Stanley Research, 2009). Mobile Internet use in the Global South will be characterized by greater reliance on downloadable apps, restricted bandwidth, sporadic access, pay-as-you-go pricing, and personal devices that move between the home, workplace, school, and street. The contrast with traditional patterns of Internet use is starkest for the coming wave of mobile-only Internet users who, like the participants in this study, will be unable look to experience with or access to PCs to fill in gaps in functionality or provide mental models of navigation and information literacy. The Internet is different when it is 2.5 inches wide.

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