Research Article

Maintenance Affordances and Structural Inequalities: Mobile Phone Use by Low-Income Women in the United Kingdom

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Abstract

This article shows the impact of "maintenance affordances" on women's capabilities to use mobile phones to lead lives they value. Analysis of data from a qualitative study of mobile phone use by 30 young low-income women—including 15 who had no access to the Internet other than through their mobile phones—shows how maintaining mobile phones through charge, credit, and repair is a significant burden. These challenges were inextricably bound up with structural inequality experienced by respondents such as poor employment conditions and unaffordable housing. This study therefore proposes a new theoretical framework combining affordances and the capability approach, in which the maintenance affordances of a technology are seen to impact directly on individuals' capability to use this resource to lead lives they value.

Keywords: mobile phone, smartphone, mobile-only Internet, gender, maintenance, battery

Introduction

With the explosion in mobile-only Internet access, how might we understand the relationship between gender equality and the use of mobile phones? The potential value of technology as a way to promote gender equality is reflected in Sustainable Development Goal 5.B, "Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women" (UN, 2017, 5.B). In the field of information and communication technology for development (ICTD), mobile phones are seen as a way to improve women's lives, as this quote from the global mobile industry body, the GSMA, illustrates: "Mobile phones help women feel safer and more connected, save time and enable access to key services such as mobile money and health information" (Santosham & Lindsey, 2015, p. 2). This statement is underpinned by the assumption that having access to technologies such as mobile phones is empowering. This simplistic logic is pervasive, despite many years of scholarship in the ICTD literature that has drawn attention to the complexity of the relationship between gender equality and technology (Buskens & Webb, 2009; Gillwald, Milek, & Stork, 2010; Gurumurthy & Chami, 2014; Hafkin & Huyer, 2006). Gurumurthy and Chami point out the flaws in this logic. "From a gender justice standpoint, a more nuanced and longer-term perspective than 'give-access-get-empowerment' is needed for positive gender outcomes in the information society" (2014, p. 8).

Buskens (2010) argues that mainstream ICTD knowledge construction processes champion mobile phones as a way for poor women to overcome structural inequalities, but also argues that these narratives of "technology triumphing over poverty" ignore issues of gendered structural inequality, such as gendered work aspirations.

This article draws on data from a year-long qualitative study of mobile use by low-income and insecurely housed young women in the UK carried out between 2013 and 2014. This study explored whether

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respondents' use of mobile phones helped them overcome the structural inequalities they were experiencing related to their gender. Thirty unemployed and homeless women between the ages of 16 and 24 and four intermediaries who were working with these groups of young women were interviewed. The study design was, in part, intended to address methodological and theoretical limitations in the field of mobile communication studies (Taipale & Fortunati, 2013), which has been limited in its scope by the dominance of studies of college students rather than economically or socially marginalized young people (Wallis, 2012). Only women were interviewed as the research was particularly concerned with the relationship between women's use of mobile phones and the gendered structural inequality they were experiencing. The research design was, therefore, not intended to look for gender effects in the use of mobile phones (for example, by also interviewing men and comparing their use against the women's use). While this study was limited in its scope, the use of constructivist grounded theory (Charmaz & Bryant, 2011) allowed for the emergence of unexpected, critical issues that led to the development of a new theoretical perspective.

The experiences of the women interviewed for this study show the potential value of research on technology use and inequality from a universal perspective, which sees development as applicable to all countries, both in the Global North and Global South (Edström et al., 2017). This perspective is reflected in the 2016 UNDP Human Development Report, which argues that "Medium, high and very high human development countries are home to hundreds of millions of people living in low human development" (UNDP, 2016, p. 53). The women interviewed for this study are among these millions: women experiencing single motherhood, low incomes, insecure and unfit housing, and limited employment opportunities.

Among the group of 30 women interviewed, most depended on their mobile phone for Internet access. The majority were in unstable accommodations, so did not have access to broadband, and more than half the respondents did not own a computer. This research was originally designed using the framework of the capability approach (Sen, 1999) to look at the impact of mobile phones on young women's capabilities to live lives they valued and, in particular, to explore how their use of mobile phones might help them overcome issues of structural inequality related to employment and housing. Yet as fieldwork progressed, it quickly became clear that their capability to use their phones to overcome these issues were profoundly affected by the need to maintain their phones. Respondents' struggles to use their devices to find work and accommodation were impeded by their phone's poor batteries and the cost of credit. These maintenance issues contributed to a significant theme of intermittent connectivity for the women in this study. Maintenance challenges were inextricably bound up with structural inequality experienced by respondents, such as poor employment conditions and unaffordable housing, showing the importance of theoretical frameworks that are alive not only to gender issues, but to structural issues of class and poverty. This intermittent connectivity fundamentally alters the potential for a mobile phone to impact individuals' capabilities to lead lives they value. On a personal level, it means women lose access to support networks as well as their ability to use their phones for instrumental purposes such as looking for work or housing.

Mobile Phones: Capabilities, Gender, and International Development

Well-established bodies of work in ICTD, and more broadly in the social sciences, theorize the co-construction of gender identity and technology. Other work examines how women's lower economic status has impacted their access to and use of technology (Buskens, 2010; Gurumurthy & Chami, 2014; Wajcman, 2004). Globally, research shows that both access to and use of technology are affected by gender: Women are about 50% less likely to be connected than men in the same age group with similar levels of education and household income (World Wide Web Foundation, 2015). Women in South Asia are 38% less likely to own a phone than men (Santosham & Lindsey, 2015). Gender inequalities reflect broader structural inequalities: Persistent gaps between men and women in income and education contribute to the gender gap in ICT access and mobile ownership (Gurumurthy & Chami, 2014). These issues are persistent themes in the literature on gender in ICTD. For example, in their exploration of gender and technology in development, Hafkin and Huyer (2006) make clear the links between these issues and poverty reduction, rooting their work in the broader gender and development space. Roman and Garrido (2006), in their work in Latin America, show how issues of structural inequality such as wage discrimination prevent women from fully engaging with the potential of ICTs.

Yet, to date, the materiality of the device itself is often overlooked; Burrell suggests that "efforts to develop a deeper theory of the role played by technology as material artefact . . . have been limited" (2016, p. 1). We do not have the theoretical armory to address what it means to maintain a mobile phone: to repair it if it breaks, to keep it charged, and to find the money for credit. Moreover, we have not yet understood how these challenges of maintenance might intersect with gendered inequalities. This is related to broader trends in the literature. Burrell argues that ICTD literature tends to treat technology as a homogenous entity and effectively ignores distinct aspects of a particular technology. Recent work by Donner (2015) on mobile Internet use in the Global South has drawn attention to the limitations of poorer people's use of the Internet via mobile phones. Donner describes the *metered mindset* as an impairment to effective, engaged use of the Internet. Other work on mobile-only Internet use has highlighted how it is an "inferior" form of access in terms of "content availability, platform and network openness, speed, memory, and interface functionality" (Napoli & Obar, 2013, p. 330), but work has not considered how the maintenance required to keep a device going through money, repair, and charge might impede use. One exception is the body of ICTD work on strategies employed to minimize costs associated with mobile phone use (Donner, 2007; Wyche, Simiyu, & Othieno, 2016) and research by advocacy groups on affordable telecoms (Alliance for Affordable Internet, 2016). Some work in the United States has also started to look at issues of technology maintenance. Gonzales' (2014) work on mobile phone use in low-income American communities shows how a reliance on second-hand devices might provide low-income populations with access, but this might result in maintenance problems. The lack of robust theoretical responses to maintenance issues is due, in part, to the rapid acceleration of mobile phone use and, in particular, to the rapid growth in smartphone use in developing countries in recent years, which has not yet been adequately reflected in the slow cycles of empirical research and theory building. While the first billion smartphone subscriptions took five years from 2007–2012 to achieve, the second billion of smartphone users was reached less than two years later. The greatest increases in smartphone use are expected in the Middle East and Africa, where subscriptions are expected to increase by more than 200% from 2015–2021 (Ericsson, 2016). This rapid increase shows the importance of understanding the impact of mobile-only Internet access on people's ability to address issues of poverty and marginalization.

Technology and the Capability Approach

In recent years, the capability approach has been used as a normative framework in the ICTD literature to unpack the relationship between technology and structural inequality (Zheng & Walsham, 2008). The approach was developed by Amartya Sen as a way to understand and analyze how people might live lives they value (Sen, 1999). The effective use of mobile phones could be seen as part of an individual's capability set: enabling a person to take advantage of other resources to further their valued goals in life (Sen, 2010). However, this process depends on the presence of certain personal, social, and environmental *conversion factors,* which enable a person to transform a resource such as a mobile phone into capabilities, which may then be realized to achieve *functionings* (realized achievements and fulfilled expectations; Robeyns, 2005). The approach has strong links with feminist scholarship: Nussbaum suggests the approach is particularly well-suited to approach issues of gender justice in that it allows us to understand how women may display *adaptive preferences* by making choices about their lives which do not maximize their wellbeing, but are adjusted to their lack of status in society and to traditional norms and opportunities (2003). In ICTD research the approach is considered to be one of the most significant theoretical models (Walsham, 2017) adopted as a framework to evaluate the impact of a technology or of social projects using technology (Kleine, 2011; Oosterlaken & Hoven, 2012). This body of work influenced the choice of the capability approach for this study as it was concerned with understanding the impact of mobile phone use on the lives and opportunities of low-income women.

Maintaining Phones: Charge, Repair, and Credit

What impact does mobile Internet access make on the lives and opportunities of low-income young women? Data from a year-long qualitative study of mobile phone use by 30 young low-income and insecurely housed women in the Southern England city of Brighton illuminate the way that the use of these devices and their

impact on people's lives is interwoven with experiences of structural inequality. Having Internet access on their mobile phones had a degree of positive impact since women were able to get access to employment, housing, and educational opportunities. However, this was compromised by the need to maintain the phone. The cost of credit and contracts was also a significant burden for women who were employed in low-wage jobs or living on welfare payments. This section draws on data from this study as well as using examples from the ICTD literature to show how these maintenance issues resonate through work on the use of mobile phones by low-income women in the developing world. This shows the value of universal approaches to understanding technology use by marginalized communities.

Researching Capabilities, Affordances, and Mobile Phones

The research approach for this study was informed by anthropological work on mobile phone use by low-income communities, including Horst and Miller (2006) and Madianou and Miller (2011). The design was informed by feminist approaches to research; Oakley argues that the process of interviewing women can be in itself a way to give women greater visibility and is "a strategy for documenting women's own accounts of their lives" (2005, p. 226). This study applied several principles of ethnographic research defined by Hammersley and Atkinson (2007), in that respondents were interviewed in an everyday context. While an interview schedule was used, there was significant room for discussion and informal conversation. Anonymized quotes from interviews using pseudonyms are included below. During the fieldwork sessions, informed consent was gained by reading and sharing an FAQ (frequently asked questions) document based on the British Sociological Association Statement of Ethical Practice. All but two of the interviews took place at drop-in advice sessions for women aged 16–24 who had problems with housing or were facing other life challenges. The other two respondents were residents in supported housing for women who were experiencing family disputes. The interviews varied in length from 10–40 minutes and were recorded on a smartphone and then transcribed and analyzed in Nvivo.[1]

The initial research design and interview schedule were based on an operationalization of the capability approach and were developed with the overall goal of reflecting functional lists of capabilities accepted in policy and academia, in particular Nussbaum's (2003) list of Central Human Capabilities. This wide-ranging list includes capabilities relating to life, health, imagination, emotion, practical reason and shelter. The first phase of coding reflected themes from the capability approach and from significant themes from early fieldwork. But as fieldwork and data analysis progressed, it became necessary to modify the research design to take account both of emergent critical themes associated with women's need to maintain phones and of categories that turned out to be "empty" or irrelevant. As it became clear that maintenance issues were highly significant, new data on this issue were collected using theoretical sampling (Charmaz & Bryant, 2011). This iterative process of recoding data and adding subnodes was accompanied by a process of revisions to the interview schedule to explore issues of credit, charge, and repair. Analysis of the data was conducted inductively, using an approach informed by *constructivist grounded theory,* in which cycles of data collection, coding, and analysis were grounded in specific social conditions (Mills, Bonner, & Francis, 2006), rather than treating the process of inquiry as separate from these conditions. This iterative process therefore saw the initial thematic categories of the capability approach supplemented by cross-disciplinary theories of affordances.

Young Women and Inequality: Capsulized Employment and Expensive Housing

At the time of fieldwork the economic environment for low-income young women in the UK was challenging. Arguably, they were facing more difficulties than their male counterparts because of an increasingly casualised labor market in the UK which has had the effect of sustaining and creating gender-based inequalities (McKay, Campbell, Thomson, & Ross, 2013; Trades Union Congress, 2014). From 2004–2014, there were more young women than men out of work (Young Women's Trust, 2014), and the job openings available to young women were in feminized, low-wage sectors of the economy such as care work or waitressing (Fawcett Society, 2013).

1. The full interview took approximately 40 minutes, but some interviews were cut short in response to an unwillingness to talk at length that I sensed in some respondents. This reticence is undoubtedly linked to the fact that they were looking for advice at a stressful time in their lives.

These sectors dominated discussions with respondents about the kind of jobs and apprenticeships they had done, suggesting they were subject to structural inequality related to their gender. Women also faced the barrier of adaptive preferences (Nussbaum, 2000) where they could be seen making choices which were reflective of their lack of status in society, rather than of their actual potential to work in higher-paid sectors. There is evidence that experiencing unemployment or low wages between the ages of 16 and 24 (the age of the women interviewed for this research) can lead to permanent negative impacts on their life chances. Experiencing unemployment causes a reduction in predicted salary in later life for young people; women who were unemployed between the ages of 16 and 24 will earn 17% less by the time they are in their early 30s than those who were employed or in full- or part-time education during that time (ACEVO, 2012). Of the 30 women interviewed, 12 were unemployed and eight were full-time mothers. Only one woman was working full-time. The remainder were either studying or working part-time. The women with children and the unemployed women received welfare payments, but were experiencing the impacts of a market-driven restructuring of the social welfare policy (Hodkinson & Robbins, 2013). The impacts of these changes in social welfare were especially felt in relation to housing. While some support was available for young people to pay for housing, high rents meant that at the time of the fieldwork, there were only two affordable homes available in the city of Brighton for young people receiving full housing benefit (Parsonage & Garner-Ford, 2014). Hence, it can be seen that this group of young women were experiencing structural inequality related to their gender: low incomes, precarious unemployment, and insecure housing.

Capabilities and the Mobile Internet

Do you have access to a computer at home?

I do not. But—phone. It does everything.

Is there anything you can't do on it?

There's nothing I can't do on my phone.

Courtney was 20 years old, and she and her small baby were homeless. She was using her iPhone 5 to stay connected with her family and friends. Most respondents' experiences of access to and use of mobile phones were characterized by instability caused by economic issues. More than half the respondents had no computer, but almost all had a smartphone (26 of 30 respondents). A range of positive impacts on women's job seeking and housing opportunities emerged during fieldwork. This suggests that mobile phones are a resource that can used be to achieve the functionings of getting a job or finding housing, thus impacting positively on their capabilities. Eight of 30 respondents reported using their phones to look for work, while seven reported looking for housing.

While mobile-only Internet has limitations, this study shows how job hunting has been transformed by smartphones, which enables young people to make and receive calls away from home and to search for jobs. A youth employment advisor reflected on shifts in access in the time she had been working with young people between 2009 and 2014. Her perception was that the majority of young people she worked with had some form of Internet access via smartphone for job hunting, which had not been the case five years previous. However, the affordances of a small screen and challenges with text input meant that her clients experienced difficulties using phones to complete full job applications. The jobs they were able to apply for were poorly paid and insecure. Another youth support worker reflected on the type of work the women she was working with were doing.

> Care work, retail, bar work, café jobs, call centers, youth workers, volunteering. There's a lot of minimum wage, a lot of zero hour contracts, commission-based work. The wages are really low, and it doesn't correlate with the cost of living in Brighton.

These precarious low-wage employment sectors dominated discussions with respondents about the kind of jobs and apprenticeships they were doing. Although women were able to search for jobs on their phones, they found it challenging to complete application forms because of the difficulties of typing long documents and

navigating complex websites on a small screen. An employment advice worker remarked that although it was a positive development that young people were able to find work on their phones, it was possible they were submitting a poorer standard of application because they were trying to fill in forms on their phones. This meant the young people she worked with would prefer sometimes to apply face-to-face for jobs rather than online. This was certainly the case for one woman, Melissa, who preferred to ask in person for the low-income work she was applying for. Her perception was that it would be easier to find work in person than online.

And what kind of jobs are you looking for?

Cleaning, café work, stuff like that.

And are there lots of jobs around?

On the Internet, not as much. But if you go and ask around, there are more.

Seven of the 30 women interviewed reported using their mobile phones for housing-related purposes. Alice had been working in childcare before she had her little boy. Now she was living on welfare payments. She had access to a family computer and had her own laptop, but her mobile phone was the dominant device for her: "I use my phone more than anything." Alice was using her mobile phone to check a website that detailed council and housing association rentals as well as information about the welfare benefits she was entitled to. However, while women were using their phones to access housing information, intense competition for housing meant that young people found it difficult to get landlords to accept them as tenants. Amy, a housing worker, described the barriers faced by young women.

If they're on housing benefit, they're competing with professionals a lot of the time and older people. So, who are landlords going to go for? A young person who's just been evicted from the family home, who has no life skills, but hasn't got enough support? Or someone who maybe is working?

Sarah had been trying to use her phone to find housing but had problems with the software on her device.

I have been using it recently to try and find private rented housing, [but] to be honest I don't really know how to use it.

What do you find difficult about it?

They change the software all the time, so things all look different. Or they move, and I don't know where they've gone, or it freezes.

So what do you do when it freezes?

I leave it. I think I better not touch it.

These examples show that while mobile-only Internet access is of value to low-income communities, mobile phones are clearly unable to help women overcome structural inequalities related to the kinds of employment they are able to access and the lack of affordable housing. And while mobile-only Internet can be an invaluable resource for low-income communities, the burdens of maintenance are a major challenge. Throughout fieldwork, complaints about charging and repairing phones and the cost of using phones emerged as significant barriers to effective use of these devices.

Charging Phones and Maintaining Batteries

The experiences of one respondent, Rachel, demonstrate the challenges of charging phones for respondents. At the time of our interview Rachel was unemployed and lived in a tent in a graveyard on the outskirts of Brighton. She had been brought up in the city, but was no longer in contact with her family. Rachel relied on her smartphone to keep in contact with her friends at a time when she was very vulnerable, but she was finding it difficult to find places to charge her phone, and at the time of the interview it had been without charge for two days. For many of the young women interviewed, poor battery life was one of the issues they raised when asked what they did not like about their phones. This is also possibly related to the fact that for the 10 homeless women in this study, finding a place to charge their phones was difficult.

Rachel's experiences are mirrored in the experiences of mobile phone use of millions of people in developing countries. In the ICTD literature charging batteries appears as a barrier to mobile phone use for poorer women. This is unsurprising, given that 2 billion people lack electricity outright or have poor-quality service. In some of the world's poorest countries such as Liberia, only 2% of the population have regular access to electricity. While 1.7 billion people gained access to electricity in the two decades between 1990 and 2010, the rate of gain barely outpaced population growth and also disproportionately benefited urban populations (Bazilian, 2015). Research by the Grameen Foundation (2014) on usability issues in mobile money among women in Uganda also found that charging was a challenge. Women had to take phones to the town center for charging: A phone charge cost 500 Ugandan Shillings (US$0.20) for a phone charge that lasted 3–5 days, plus travel fees. When women are low on funds, they might skip charging, leaving their phone turned off for a few days. Similarly, a study of mobile phone use in a village in Western Kenya revealed that both the financial resources and the time needed to charge phones were major obstacles to phone use for women (Murphy & Priebe, 2011).

Poor battery life is, in part, caused by the fact that the speed of improvements in smartphones' battery capacity has not matched the more rapid pace of development in the phones themselves, so there is a disconnect between users' demands on the phone and its battery life (Rahmati & Zhong, 2009). This is shown by the experience of respondents who reported that the battery life of their phones was less than a day. In contrast, two of the featurephone users in this study reported a battery life of 3–4 days. For example, one young homeless woman complained that her phone's battery life was "crap" and that she had to recharge it after an hour of using the phone to send text messages. Another homeless woman found it necessary to pay £1 (US$1.32) to get her phone charged for half an hour because the battery life was so poor. Another woman who had paid to get her phone charged related her need to charge the phone regularly due to her heavy use of the device and the variety of functions the phone offered her, complaining it would only last a day "because of all of the stuff that you use on there." Short life was not the only problem with batteries. Another woman complained that her phone's battery life had declined by half in the time she had owned her phone. Batteries in the generation of smartphones used by women in this study start declining immediately after manufacture (Rahmati & Zhong, 2009). Research from the United States links higher overall levels of smartphone use and impact on battery use with socioeconomic status: Users with lower socioeconomic status had much higher overall phone use (Rahmati, Tossell, Shepard, Kortum, & Zhong, 2012). Given that more than half the respondents in this study were mobile-only Internet users and were therefore reliant on their phones for getting online, it is likely they also had high overall usage levels. It is possible to suggest that these usage patterns are also replicated in developing countries where mobile-only Internet access dominates.

Repair

In their article on the Zimbabwe bush pump, De Laet and Mol describe the love they feel for an admirable water pumping device, for its positive impacts on a community's health and development (De Laet & Mol, 2000). A particular focus of their love is its ease of maintenance and repair, partly due to the fact that its creator had designed the pump, choosing not to obtain patents. As a technology, it affords the possibility of repair: Plans are available and parts are inexpensive. This is a "fluid" technology—adaptable, repairable: "Designed for simplicity, durability, ease of maintenance and assisted by manuals and instructions, it is created to survive" (De Laet & Mol, 2000, p. 238). The bush pump stands in stark contrast to the mobile phone. Broadly speaking, the mobile phone is not a technology designed to survive, but instead, designed to be frequently upgraded and replaced. Graham and Thrift see these processes as part of a pattern of commodification and acquisition of technology; devices that are "made to be replaced and disposed of through accelerating cycles of acquisition and almost immediate disposal" (2007, p. 18). They blame experiences such as broken mobile phones on the manufacturers that make them expensive to repair so consumers will feel pressured to replace the device.

The experience of using smartphones is entangled with their needs for maintenance and repair. This is exemplified in one woman's response to a question about her first mobile phone, where she contrasted the robust featurephones she had used when she was younger with her current smartphone.

> Old Nokias . . . they seemed to last me well. This phone's got a screen crack; that would never happen with the Nokias. They seemed to be indestructible.

Just as with battery use, complaints about broken screens and damaged phones were a significant theme. Respondents used various strategies to deal with these issues, including continuing to use damaged devices or using contracts and insurance as a way to upgrade phones. While the experience of broken phones is universal, the financial impact of expensive repairs and insurance is likely to have a greater impact on poorer young women. In her work on mobile use in low-income communities in the United States, Gonzales notes that repair work often "falls along class lines with low-income communities engaging in greater acts of maintenance and repair" (Gonzales, 2014, p. 241). These high costs of repair were perceived as a financial burden for respondents. Women reported that they deferred repairing their phones as they could not afford it. In their study, Schaub et al. (2014) report a similar trade-off in which phone damage and challenges to user interaction are balanced against the high cost of repair. One woman used language suggesting that she blamed herself for damage to her phone, saying "I am a bit careless when it comes to technology." But she also echoed the view that smartphones with touchscreens were more fragile than featurephones. This woman had insurance for her phone and saw this as an effective strategy for dealing with the fragility of the device, which her baby had smashed several times when he played with it. Repair issues were a significant issue for these women, and several respondents contrasted the perceived fragility of smartphones with the featurephones they had grown up with.

Credit and the "Metered Mindset"

Mobile phones need to be maintained financially through credit or contract payments if they are to make a positive impact on women's lives. Julie despaired of the financial burden of maintaining her phone connection by describing it as a "walking bank account. So much money going into it." Julie was working in a call center for 30 hours a week earning £3.31 (approximately US$4.37) an hour plus commission. She estimated she was earning roughly £100 (US$132) a week. By the time of the interview on a Wednesday she had already spent £20 (US$26) to top up her phone that week. These challenges were common: 40% of women interviewed reported financial problems associated with their phones, including broken contracts, inability to afford credit, or exceeding their call allowance.

The cost of Internet access is a barrier to adoption in developing countries, and the significance of this issue is recognized in Sustainable Development Goal target 9.C, which calls for universal and affordable access in the world's least-developed countries by 2020. Mobile affordability is typically measured by looking at the costs of a standard basket of mobile use as a percentage of gross national income. The ITU/UNESCO Broadband Commission has recommended that the cost of a 500 MB per month mobile broadband package should not exceed 5% of a person's annual income (Broadband Commission, 2015). However, in some of the world's poorest countries such as Chad and Niger, mobile broadband represents approximately 200% of the annual income of the bottom 20% of the population (GSMA & Deloitte, 2016). For the poorest 20% of the population in India, a smartphone plus basic Internet costs approximately 11% of their annual income (GSMA & Deloitte, 2016). And while the practice of providing Internet access at no cost, known as *zero rating,* through programs such as Facebook's Internet.org has increased affordable access to a limited range of websites, this raises the possibility of new digital divides between those with unlimited Internet access and those with limited access to zero-rated content (Futter & Gillwald, 2015). The Alliance for Affordable Internet (2016) argues that women are more seriously affected by these issues because women at the bottom of the income pyramid typically earn 30–50% less than their male counterparts.

Of the 30 women interviewed in this study 18 (60%) had contracts and 12 (40%) were on a pay-as-you-go plan. At the time, monthly mobile phone contracts were accessible even to low-income young people in the UK with poor credit ratings. For example, one pregnant, unemployed 22-year-old woman was surprised that she had been given an iPhone 5 on a contract for £32 (US$42) a month despite having a bad credit rating. The typical £34-a-month (US$45) phone contract represented as much as 14% of the monthly income of respondents who received welfare benefits. However, these contracts were often exceeded or broken by young women, who were confused by the marketing and pricing information disseminated by mobile phone

companies. When the women lost a phone, they still had to pay the monthly bill for the duration of the contract—typically 24 months. The choice of mobile phone contracts offering a "free" handset, the complexity of these contracts, and the various ways the women were able to purchase top-up credit on pay-as-you-go phones presented problems for respondents. One woman reported difficulty in finding out how much her operator was charging her for calls when she went over her allowance. She was being charged for calls on top of her allowance because the app did not update regularly enough for her to keep track of the calls she was making. She described herself as having been "swindled" into a mobile phone contract; she had wanted a laptop, which was included "free" with the contract. Another woman was having problems finding out from her mobile operator how many free text messages were included in her pay-as-you-go deal; she was also concerned that she was being charged £1 (US$1.32) every time she used the Internet on her phone. She relied on this mobile Internet access as she was living in a temporary overnight accommodation after arguments in the family home forced her to move out. A housing advisor working with respondents spoke about the opacity of the language used in mobile phone contracts and how young people misinterpret their allowances.

> I think it's also about the misinterpretations from some of the contracts around what they can offer. I think sometimes they think they've got loads of data stuff and they don't realize, so they do a month of going on Facebook because they think they've got no data charges, and they've got a bill for £200 (US$264).

For low-income young women already experiencing structural inequality, maintaining their mobile phones was a significant source of financial stress. This resonated with the experiences of the "metered mindset" discussed by Donner, where connecting to the Internet for low-income people was described as an experience of "looming, ambiguous, persistent constraint" (2015, p. 128).

Discussion: Maintenance Affordances, Capabilities, and Structural Inequalities

The women interviewed for this study were emotionally attached to their mobile phones; they used the phones to maintain connections with family and support networks, find jobs, access travel information, and keep their children entertained. For the women who were homeless or socially isolated because they were at home with small children, their mobile phones were a vital means of accessing emotional and social support. Within the theoretical framework of the capability approach, mobile phones can be seen as part of the "resources" that might affect respondents' capabilities to lead lives they valued, but different conversion factors affected this process (Robeyns, 2005). These conversion factors are typically categorized as personal (e.g., skills, intelligence), social (e.g., public policies, social norms, discriminatory practices, gender roles), and environmental (e.g., climate, geographical location). If we look at job seeking on mobile phones using the framework from the capability approach, a woman with a personal conversion factor of digital literacy and skills would be able to transform the resource of a mobile phone into the capability of being able to seek employment by applying for a job on her device, despite its small screen. But ultimately the phone will not help the woman address structural problems such as feminized, low-wage employment; nor is it likely to address the adaptive preferences (Nussbaum, 2003) that lead women to choose these jobs.

ICTD research using the capability approach is valuable in that it provides a framework to make evaluative, normative judgments on technology and opportunity. In an overview of work on ICT and the capability approach, Oosterlaken and Hoven (2012) note that a substantial amount of this work is situated within countermovements in ICTD, where the approach has been used by authors such as Thomas and Parayil (2008) to show how technology can increase inequalities. Yet, to date, the approach has not successfully addressed the materiality of technology such as the maintenance issues described above. These maintenance issues are particularly critical for mobile-only Internet users since smartphones use more power than featurephones and are more expensive to use and repair.

The concept of affordances is a productive way to theorize the relationship between inequality and the materiality of mobile phones. It provides a conceptual bridge between material and semiotic understandings of technology (Curinga, 2014). Using this framing we can see how technologies do not determine our actions,

but neither are their meanings completely constructed in the users' societal and cultural contexts (Pinch & Bijker, 1984). The idea was originally used by Gibson (1977) as a way to understand human and animal perceptions and actions in an environment. It is also concerned with understanding the possibilities for action afforded by an object or a technological device. The concept has been widely adopted across the fields of human–computer interaction, psychology, organizational studies, communications studies, and science and technology studies. While some authors in the ICTD literature have used affordances to explore specific aspects of technologies, affordances have not formed the basis of new theoretical frameworks. Loudon (2016) used affordances to explore specific aspects of mobile platforms in mobiles for development (M4D) interventions, while Densmore, Bellows, Chuang, & Brewer (2013) used affordances to describe the characteristics of different communications channels in a health financing organization in Uganda. Roberts (2016) uses the term to describe how participatory video can enhance critical agency. Hatakka, Devinder, and Sæbø (2016) have attempted to create a theoretical framework using Gaver's (1991) four categories of affordances, yet by failing to distinguish the different properties of a technology, this framework falls prey to Burrell's (2016) accusation of heterogeneity in the treatment of technology in ICTD literature. Schrock (2015) outlines a lineage of affordances that can be applied to empirical communication research, arguing that mobile media have relatively stable communicative affordances of portability, availability, locatability, and multimediality. Donner (2015) developed an affordance framework of the mobile Internet that combines the materiality and perceptions of the device. This framework has been further developed by Bailur and Masiero (2017), who juxtapose affordances with Cornwall's (2016) structural analysis of women's empowerment.

Although these examples show the potential for affordances as a theoretical tool in ICTD, it is probably the idea of maintenance affordances described by Best that has the greatest resonance with women's experiences in this study. She talks specifically about the need for users to maintain technologies, describing maintenance affordances thus:

> As agents themselves, technologies come equipped with their own set of needs. They need to keep entropy at bay, and it is a user who must deal with related requirements for energy and for repair. They are also dependent on associated technologies and systems, which may themselves be out of range, broken or difficult to understand. (2009, p. 1034)

This description of "out of range" and "difficult" systems is reflected in the language used by respondents to describe their relationship with their devices; such as the woman who described her phone as "menacing" when she struggled to access the Internet, and another woman who claimed she was "swindled" into a smartphone contract. More broadly, the theory that technologies have their "own set of needs" resonates with the work that respondents were doing to maintain their phones through finding money for credit, finding places to charge their phones, and using broken devices. There is a theoretical weakness in the capability approach in its simplistic view of technology as a resource: There is an implicit assumption that a mobile phone would automatically help a young woman find a job, if she had the skills to use it appropriately and a job were available. This ignores the fact the young woman needs to maintain her phone: She must have sufficient funds to buy credit or pay her contract and she must charge and, if it breaks, repair it. So it is clear that maintenance affordances fundamentally alter the potential for a mobile phone to impact an individual's capabilities to lead a life she values. This suggests that a fruitful theoretical position might be one that combines the capability approach with affordances. This follows other advocates of the approach who have suggested it is possible to strengthen its theoretical rigor by combining it with other frameworks. For example, in their work on the critical capability approach, Zheng and Stahl combine the approach with critical theory to illuminate the hegemonic functions (2011) of technology.

Conclusion

This study had methodological limitations in its small sample size and the absence of follow-up interviews with respondents to assess the long-term impacts of mobile phone use. Despite these limitations, the value of this exploratory research lies in the emergence of unexpected findings on the critical importance of maintenance issues. This suggests the value of future empirical studies to further develop this framework in relation to

mobile-only Internet use. This work also shows the value of linking empirical research on technology use by marginalized communities in Europe to ICTD scholarship: Experiences of normalized disconnection and unstable technology use are common to these communities worldwide. Understanding the maintenance of mobile phones allows us to deepen our understanding of the potential for mobile technology to impact both positively and negatively on the lives of the world's poorest women. ■

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