"Things on the Ground are Different": Utility, Survival and Ethics in Multi-Device Ownership and Smartphone Sharing Contexts

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ABSTRACT

As phones have become cheaper, there are still instances where people share them. Researchers have explored the sharing in the context of developing economies and brought to light the barriers to ownership and highlight the resulting power differentials. In this work, we explore the dynamics of single and multi-device ownership and sharing in Kenya. Through interviews with 34 participants, we seek to understand what these ownership patterns inform us about affordances and unstated needs–adding to our knowledge of device usage. We find that these dimensions of ownership raise new questions about ethics and survival, and we describe how they also serve as bellwethers to designing for a developing economy–especially in the context of access to money and other financial infrastructures. We discuss the impact and harms of unregulated policies and the influence of survival on peoples' choices, the implications on ethics, and further explore strategies for identifying, auditing, and mitigating these risks.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in HCI**; • **Social and professional topics** → *Cultural characteristics*; *Government technology policy*.

KEYWORDS

Device Sharing, SIM Ownership, Privacy Boundaries, Mobile-Based Transactions, Multiple-Device Ownership, HCI4D

1 INTRODUCTION

Kenya has an estimated feature phone ownership rate of 66% compared to 59% smartphone ownership rate [51]. Very few adults do not possess a mobile phone, with most operating two devices at once. This mobile penetration rate has made it possible for other

services to leverage the relative ubiquity of mobile phones and the scaffolded M-PESA[1] service [27] that supports over 60 million daily financial transactions [68], and is a case study of how devices can support last mile access to financial infrastructure especially for the unbanked[2].

Given the importance of phone ownership to access such services, researchers have long explored the dimensions of technology use in Kenya. This has involved examining how different ownership patterns [74] function across family dimensions and in rural and urban contexts. Additional observations include how device and maintenance affordability and access to critical infrastructure [79] have played a part in broadening access to capital and new forms of commerce. With this, we can make comparisons with similar research conducted in neighboring countries namely: Uganda [11], Tanzania [59], Rwanda [10] and across Africa [80], as the M-PESA infrastructure has been expanded and molded to those contexts.

In this paper, we present the dimensions of phone ownership and how users navigate the M-PESA infrastructure alongside other financial applications, and the challenges made evident through their navigated use. This includes the nuances of shared device use–now that smartphones have become ubiquitous and feature phones readily available–updating the corpus of research on the dimension of device ownership in developmental contexts.

The lagging policies guiding the Kenyan financial landscape has made it possible for people to be disadvantaged through lack of awareness and choice [43] even as the infrastructure access has provided economic affordances. In this work we specifically sought insights on the complexities wrought by increased smartphone ownership. Understanding how this new landscape impacts usage would build on previously understood dynamics and make distinctions between the nature of feature phones vs smart phone users–thereby contextualizing insights and informing future design.

We conducted an interview-based study with 34 participants who had different devices and ownership patterns. We sought to understand their relationship with the devices, and the opportunities the underlying technology affords their circumstances. The interviews were conducted in Eldoret town, and encompassed users who lived in, commuted to, and/or worked in close proximity to the town. We also sought to understand the issues they face in their ownership especially surrounding existing sharing paradigms, and how the participants navigated the financial infrastructure meld, and the resulting challenges. We additionally sought to understand

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[1]"M" an acronym for Mobile and "PESA" Swahili for Money. The combination "M-PESA" used to describe the mobile transfer service

[2]Unbanked: "meaning that no one in the household had a checking or savings account at a bank or credit union." [17]

how people navigate device ownership, their choice of device types, multiple device ownership, dimensions of device sharing and the observed/perceived affordances [48]. Through this approach, we are able to examine issues of individual and culturally defined privacy [34, 35]–especially in the context of device sharing, and the resulting impact on ownership boundaries and etiquette.

We found that there is nuance in device ownership. While users generally had easy access to feature phones, smartphones have become a necessity due to the increased usage and dependence of applications such as WhatsApp. This adds new challenges for example, to non-literate users who were able to memorize feature phone settings and could not transfer their knowledge to the use of smartphones without asking for assistance–impacting their agency. For those literate users who have to share smartphones, they often have to do so for affordability reasons and leverage various strategies to prescribe communication privacy. They are aided by applications that support multiple accounts and requiring separate password entries, but otherwise they abandon other privacy boundaries out of necessity and lack of means of enforcement. We also observed nuance in multiple device ownership: users who owned smartphones also owned feature phones typically due to safety considerations, but also for the separation of specific financial transactions. This is in addition to the observed multiple SIM ownership and use–not connected to individual devices, and driven by reactions to financial landscape e.g. evading mobile-based microloan repayments.

We make three contributions with this work. First, we expand the Human Computer Interaction for Development (HCI4D) understanding of the nuances of phone sharing, focusing on smartphones, and giving depth to how sharing users operationalize usability workarounds–highlighting sought design utilities. We also explore emerging sharing-related risks–highlighting the importance of enfolding these nuances of device usage for long-term adoption. Second, we discuss how access to money and money-making schemes impacts privacy even more than the utility of workarounds: adding to the discussion surrounding ethics of technologies and the impact of informed consent in the context of day-to-day survival. We specifically elucidate about the lagging protective frameworks and people not taking advantage of available infrastructure to protect their privacy and to seek safety. Finally, we provide a categorization of users based on their device-ownership patterns, model their technology use, and give recommendations on signals to observe in the process of quantifying utilities and identifying harms. We do so to provide guidance for researchers on how to consider steps that do not perpetuate harms that are often made invisible.

2 BACKGROUND AND RELATED WORK

Our research is focused on Kenyan users. In 2023, Kenya's population is estimated to be 50.6 million [53], with a SIM card ownership rate estimated at 124.5% of the population [51]. While the ownership rate has doubled compared to 2011 [18], it is comparable to some African countries: 118.48% for Nigeria (population 223 million) [15]; 150% for South Africa (population 60 million) [52] and 135% for Ghana (population 30 million) [7]. Kenya, however, has a uniquely high rate of registration to mobile-payment service (estimated at 67.1% of the population, with 96.5% of the share subscribed to the M-PESA service. [51]).

2.1 Device Ownership: Access & Independence

The rate of SIM ownership highlights access to a device and possibility of individual ownership. However, the actual device ownership offers some nuance: 66.2% of Kenyans own a feature phone, while 58.2% own a smartphone [51]. This adds complexity to the phone penetration rate, as it aggregates different types of device access, i.e. those who share and those who own multiple devices.

We sought to understand the difference in ownership and the dynamics of sharing. In doing so, we derive insights from works that explain how people share physical devices and online accounts: for example, individual sharing work accounts with colleagues [30], and households sharing communal devices [40]. This is in addition to the use of platforms that affords the use of multiple accounts, e.g. Netflix [60]. Researchers have additionally considered country-specific differences in how devices are owned and shared [4]–noting similarities in the cultural practice of sharing based on necessity.

2.1.1 Access Barriers: Infrastructure, Literacy and Culture. There are significant barriers faced by those who share devices by necessity. We specifically focus on three types of barriers that we summarize from related research work: **infrastructural barriers, literacy barriers** and **cultural and religious barriers**.

Previous studies have found **infrastructural barriers** to accessing and adopting phone devices to be influenced by device affordability [11], access to infrastructure such as electricity [79], technology that is scaffolded upon such infrastructure [14], the expense of maintaining devices (for example topping up airtime) [74], and the onerous documentary requirements needed for Know Your Customer (KYC) compliance [8]. In addition to disadvantaging low-resourced communities primarily in rural areas, infrastructural barriers have also impacted accessibility for users who rely on others for supported interaction with their devices [9].

Beyond infrastructural and affordability limits, **literacy barriers** have impacted how devices are used and shared, making it challenging for users to access phone-aided resources like short messaging service (SMS) [21]. At the time when device adoption was still low in Kenya, these gaps were partly addressed through assisted use of the now phased out communal phones called "*simu ya jamii*" [25]–where users would rely upon the communal phone operator to guide the process of making a call. More recent research-guided approaches have attempted to bridge the literacy gaps and sought to provide guidelines, for example through community collaboration with researchers in the Congo [72], and through learning from designed interventions intended to address literacy gaps in children, by providing voice-based learning interfaces in Côte d'Ivoire [38].

Cultural and religious barriers introduce additional challenges that undermine solutions that ford literacy and infrastructural hurdles. These dynamics emerge from how devices are owned and shared–often reflecting the power differentials according to who relies upon others for access to a device and the willingness of the owner to share [11]. Other challenges involve gender dynamics informed by culture both in Kenya [49], and across different regions (e.g., girls discouraged from owning individual devices, husbands having control over their wives devices, etc.) [1, 10, 21], and gender dynamics informed by religion, that governs individual autonomy to access and control devices (e.g. husbands being the ones purchasing and setting up phones for their wives) [28].

The barriers highlighted in this section reflect disadvantages wrought by lack of access to knowledge and to money–which additionally limits access to infrastructure. We seek to understand how these barriers are faced by users across age groups, literacy, and socioeconomic levels, and addressed in the current Kenyan environment–especially as there is evidence of increased phone ownership attributed to the availability of cheaper feature phones. At the same time, Kenyans are contending with the increased need for internet-enabled devices to access online services [19], raising the likelihood of sharing these devices. The insights have the potential to highlight possible gaps in coverage for the individuals, and our understanding as a research community.

2.2 Mobile Phone Affordances

Owning a mobile phone provides convenient access to communication infrastructure and other technology. Users can leverage their devices to hail app-based taxi services, conduct business, communicate with groups and communities, etc. However, there are groups who are unable to access these mobile-first resources and therefore, the increased assumptions of device ownership have made it difficult for smartphone users that cannot afford data subscription plans to take advantage of the available affordances [20].

In the context of developing economies, mobile phones have been used to connect low-resourced communities, approaches that have had their share of challenges. For example, in answering questions from pregnant and postpartum women through SMS, researchers not only had to deal with the challenge and cost of bulk messaging systems [55], but also contended with the lack of sufficient interventions according to individual needs [69]. The latter has been addressed by more recent approaches that have leveraged smartphone affordances and WhatsApp platform availability to allow for peer support, for example, for youth with HIV [29]. However, the significant percentage of people who share access to a smartphone, and resulting threats to privacy [31], remain a persistent challenge.

The lauded utility that phone ownership has had is in making it possible for people who are unbanked to access banking infrastructure. The high rate of Kenyans' subscription to the M-PESA service [41] reflect the utility and importance of the service in the day-to-day financial operations, as it provides a last mile service to those without ready access to banking infrastructure [27]. It also serves to address issues that other researchers have identified, such as the contextual relationship with money [75], the limit of women not having access to banking infrastructure because of a curb in their movement [28], marital power differentials [33], or limited access to commerce opportunities [59]. M-PESA has made it possible for people to send and receive money, buy and sell goods, and even borrow small loans using the platform [44].

Researchers have repeatedly highlighted the support to personal agency that access to devices for financial empowerment has had, especially for those who deal with cultural and other barriers to participating in formal employment [71]. However, the mismatch between how people interact with the financial platform in contrast to the options that the technology provides has blunted the efficacy of these tools. Alongside understanding how people with little income only leveraged discounted offers on tariffs [80]–closely monitoring their phone data usage [76], researchers have additionally highlighted the high incidences of shared devices when conducting cash transfers in Togo (users swapping personal SIM to shared phones) [3]. Other observed research in Mali found a significant subset of users who used other people to pay/send money on their behalf [12]–adding to the refrain for the increased need to design for multiple users [67]. Scaffolding upon these previous works, we examine the nature of device ownership: where the devices are shared and the types of devices shared, and make comparisons with users who own multiple devices and/or operate multiple SIM cards–seeking to understand the contexts of use, the complications wrought by close coupling of financial services and the resulting impact on user behavior in how they navigate these contexts.

2.3 Available Safeguards: Policies & Governance

Given the close coupling of phones with the M-PESA financial infrastructure, the biggest user risk involves unauthorized account access. In a survey of mobile-first financial platforms' policy documents, researchers found that the users are saddled with liability for any loss incurred [62]. This is compounded by the fact of policy documents being out of reach to non-smartphone users. When obtainable, the documents are written in inaccessible language, and lack uniform enforcement [36]. Because of this, the user faces unbound risks whenever they make decisions regarding finances including borrowing from mobile-based lending platforms [43]. Access to the financial infrastructure through the phone has also made it convenient for governments to remit support-related funding directly to citizens. This has in tandem increased fraud perpetrated in the name of these government-led programs [56]–highlighting the lack of awareness and education about the risks and how subscribers can protect themselves: disadvantaging those facing the highest barriers to technology access [2, 37, 61].

However, government policies that have inexact enforcement structures bring additional challenges. As an example, Kenya enforced the process of SIM registration in 2022, in part to curb the risk of fraud. The service providers were tasked with creating awareness, and enforcing compliance by a set deadline [5]. While the documentary evidence required to register SIM cards were known (subscribers needed to prove their identity using their national identification cards), digital rights groups observed incidences of agents requesting biometric data–which is not required to be compliant with the law [32]. The service providers did not clarify their intent for this unsanctioned data collection.

2.3.1 The Case of Worldcoin. The impact of unclear standards and lax enforcement can be highlighted by the unveiling of the Worldcoin (WLD) in Kenya in 2021. Touted as a means of achieving digital democracy and privacy-preserving identity verification [24], WLD collected facial data including iris scans [22]. Participants were to be offered 25 WLD (equivalent to Ksh 7000/ ≈50 USD) [42], leading to over 350,000 interested participants [45]. Any consideration for potential privacy harms paled in comparison with ready cash. Non-smartphone users leveraged middlemen and proxies to receive the WLD cryptocurrency on their behalf.

The negative optics and increased awareness of harms finally led to the Office of the Data Protection Commissioner (ODPC) to recommend a data collection halt in mid-2023. This was however not effected until the Ministry of Interior and Administration stepped

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Figure 1: Timeline of Worldcoin operations in Kenya. Popularity was aided by the relatively high compensation rate. Though the Office of the Data Protection Commissioner (ODPC) requested ceased operations, compliance did not occur for months–until after the Kenya's Ministry of the Interior and National Administration became involved.

in to suspended Worldcoin operations, an action that was upheld by the High Court [47]. The ministry attributed the lack of proper registration of the local company contracted by Worldcoin to collect data, and lack of proper consent processes due to failure to inform participants about potential security and privacy implications as reasons for the suspension [70] (Figure 1 showcases the timeline).

The case highlight users' encounters with existing policies. We seek to use such cases to contextualize the low rate of reported fraud to the responsible government agency [50], and analyze any processes followed by government agencies to remedy harms and enforce compliance. We also seek to explore barriers, ethical tensions, and the notion of fair compensation/pricing–especially those that involve financial instruments targeted at low-income users.

3 STUDY METHODOLOGY

To understand device ownership, including sharing and contexts of use, we conducted an interview-based study with 34 participants (15 women) between 18 and 79 years. The study was conducted in a six-month period between December 2022 and May 2023, where we recruited participants in two waves. First, we used snowball sampling to recruit participants using social media. Interested participants filled a short screening survey that we used to determine eligibility, and to obtain contact information to schedule interviews. We also used in situ convenience sampling to recruit participants with sparse or no online presence, non-literate participants, and non-smartphone users. The latter sampled group tended towards older adults. We did the recruitment iteratively to ensure that we had representation across age groups (from young adults to older adults), education (from those with no formal education to those who had achieved tertiary education), and socio-economic levels. Given the intent to understand sensitive contexts surrounding money, and to mitigate conflicts omissions aided by familiarity, we sought to recruit participants that had not been a part of any previous and/or ongoing research.

3.1 Study Site and Participants

We conducted the interviews in Eldoret town and its environs. Eldoret is located in western Kenya (≈160km/100mi from Kenya's border with Uganda, and ≈320km/200mi from Nairobi–the capital city) and provided an ideal setting to interview participants who inhabited the town and those who lived in surrounding peri-urban and rural areas but conducted their business in the town and/or its environs. Participants could opt for a sit-down interview at a

location we set up, at their place of business (both indoors and outdoors), cafes, or shopping centers–depending on convenience. All the participants who chose to be interviewed at their workplaces owned or independently operated their business (e.g., kiosk operators, grocers, printers etc.). Our conversations in these workplace contexts often had to flow around the participants assisting customers or conducting sales.

Of the 34 participants, 30 had completed secondary school level education: one participant did not receive formal education, one did not complete primary school education, and two did not complete their secondary school education. Five participants did not proceed beyond secondary school. The rest the participants (n=25) had achieved or were currently in pursuit of tertiary education: nine involved diploma-level education (equivalent to a vocational degree), 14 a bachelor's, one a master's and one a doctoral degree.

Participant occupations were varied from those yet to begin employment to retirees, and included those in school but working part-time, and recent graduates who were either unemployed, or in temporary situations as they sought permanent and/or formal employment. Some participants also pursued more than one occupation (for example, a farmer who also braided hair at a salon). The nature of employment was impacted by the COVID-19 pandemic that caused high number of job losses, raising some sensitivities in how participants wished to be categorized. For these reasons, we use the participant's self-described occupation.

We used a semi-structured interview approach to ask a series of questions seeking to understand their relationship with technology, and the nature of the participant's phone and SIM ownership: the quantity and reasons for ownership for each category, how they operated their devices, if they shared their phones and SIM, and the services they were subscribed to. We also discussed their M-PESA use–this question often leading to discussion on micro and mobile-based loans, personal vs business services, saving strategies, phone-enabled betting, etc., that are afforded by the M-PESA service. If the participant owned a smartphone, we also sought to enumerate the apps and their functions, and their approach to data usage and storage. Other questions were intended to probe participant understanding of available protective infrastructure spanning company policies and government agencies–and experienced gaps in protection and enforcement, amongst other concerns.

All but one participant owned and used at least one active phone, with median phone ownership at two. For participants who only owned one device (n=10): three were feature phones (*f*), and seven

were smartphones (*s*). Of those who owned and operated two devices (n=17): 16 had one of each (1*f*1*s*), and one had two smartphones (0*f*2*s*). For those with more than two devices (n=6): two had two feature phones and a smartphone (2*f*1*s*); two had three feature phones and one smartphone (3*f*1*s*); and two had one feature phone and two smartphones (1*f*2*s*). All participants owned at least one SIM card.

3.1.1 Positionality. Two authors, both women, were involved in the work. The first author who is Kenyan-born, led the interviews and transcribed and translated the audio recordings. Their language fluency in Kiswahili and its variations supported open communications with the participants. The second author, who is American-born, was involved with the project after the translation phase. The analysis was conducted by the two authors.

3.1.2 Analysis and Ethical Considerations. This research received approval by the authors' Institutional Research Board (IRB). The interviews were audio recorded and conducted in a mix of English and Swahili. Younger participants sometimes used *Sheng*, a variation of Swahili that is peppered with repurposed words and vocabulary borrowed from other languages. *Sheng* evolves with each generation and has no formal dictionary, and so we asked for clarification whenever we encountered a new word. We also collected artifacts shared by participants (screenshots, pictures, links, and handouts), and kept observational notes and photos.

Prior to each interview, we explained the consent process, our motivation for conducting the research, the data we intended to collect and how we would use it. We informed participants that they could withdraw their consent at any time and reiterated this at the end of the interview. The interviews were between 30 and 45 minutes, and on completion, each participant received Ksh. 500 (≈$3 USD) in remuneration.

During the interviews, some participants discussed their device and SIM usage that either ventured into ethical gray areas or involved sharing their vulnerability regarding their financial history. In our reporting of these sensitive topics, we have sought to protect the participants' anonymity and dignity by placing a stricter framing: we do not attach pseudonyms or any note of the participant occupation in using the fullness of their quotes in this paper.

The analysis was conducted by two researchers: using a grounded theory approach [16]. We used open coding to categorize participant responses, the first author then extracted overarching themes from this phase and then led a second session that applied axial coding–iteratively reviewing the codes to find emergent themes.

The findings encapsulate three major themes: (i) Device ownership and sharing that involve navigating the complexities of shared smartphones; (ii) multiple device sharing that highlight the separated use and the abiding utility of feature phones even as users owned smartphones and (iii) multiple SIM ownership that highlight the effect of M-PESA, mobile-based loans and other financial impact on user behavior and choices. We expound on these three themes in the following sections.

4 DEVICE OWNERSHIP AND SHARING

First, we report on how the participants handled their devices: covering the sharing contexts (predominantly of smartphones), the nature of ownership, the logistics of sharing, the barriers encountered, and the impact on user behavior.

4.1 Supported Use: Inclusivity and Must-Use Contexts

Beyond asking about phone ownership generally, we were interested in understanding the factors impacting the adoption of smartphones. Often these were explained by necessity of accessing tools for work–especially for younger adults. The quarantine and travel restrictions because of the COVID-19 pandemic has led to adoption of online tools to convey learning materials and to facilitate communications for these young adults, replacing the traditional means of communication for many.

> *"I need [the smartphone], and I need to have data turned on at all times. If not, I find that things have passed me. I would rather lose money on data that has been absorbed [by unmonitored apps], than to miss out of these opportunities." – DJ, 28*

Must-use contexts extended to the need to own a smartphone. Participants felt like the had to be connected especially to WhatsApp[3], to keep up with their groups and community organizations.

> *"My mom bought [smartphone] because she is in the choir and they posted updates in a WhatsApp group. She used to miss the updates before and felt pressure to get one. She also has to access the community group to contribute."– University Graduate, 23*

The community support groups referred here are geographically inscribed and especially important as a central source of news and updates and support. The support structure works thus: each family in a village contributes a pre-set amount every month. The money is collected by an appointed treasurer and banked. A standard amount is then given to support families within the WhatsApp group in cases of bereavement, and/or during significant ceremonies, e.g., marriage: easing some budgetary concerns. Families can contribute to multiple WhatsApp-organized groups if they can claim some geographic-defined membership.

### 4.2 Helped Use: Literacy and Trust

Phone ownership by older adults has increased over time but remains complicated by literacy necessity. The older adults are over-represented in the non-literate population in Kenya[4], because most of them came of age during the colonial period and did not receive a formal education. The adult literacy programs, while available at the time, were scarce. For the most part, they rely on family members and other trusted individuals to mediate their use of phone devices for communication.

> *"Both our grandparents have phones. Grandmother cannot call by herself. Someone has to be there for her to receive a call or make a call."– Gap-Year Student, 18*

At the beginning of phone adoption in the early aughts, older adults–as with many other Kenyans without access to individual or shared phones, would use communal phones (called "*simu ya jamii*"). The *simu ya jamii* device operator would perform all the tasks necessary

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[3]https://www.whatsapp.com/
[4]UNESCO 2014 survey estimates a 54% literacy rate of Kenyans over 65 years [23]
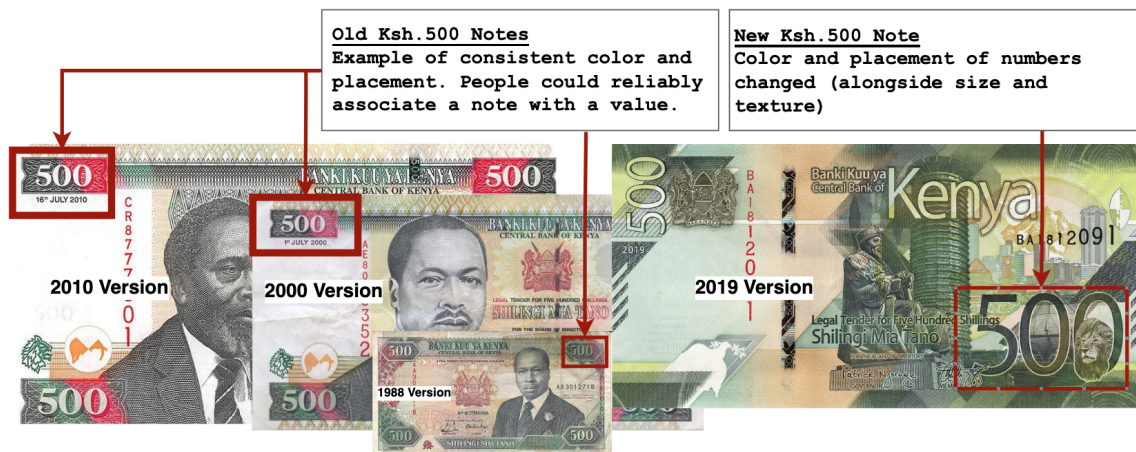
Figure 2: Examples of how the Ksh 500 note design has evolved since it was put into circulation. The color scheme and denomination placement has remained consistent and could be relied upon to give at-a-glance association with the note's value–important for non-literate Kenyans. This has changed since 2019 with the redesign of the note.

to place a call after ascertaining the amount of money the customer wishing to make the call wanted to spend. With the ubiquity of devices leading to increased individually owned phones, *simu ya jamii* has been phased out. However, the necessity for the older members being supported in their device use has remained unchanged.

Compounding this challenge, is the close coupling of the phones as tools for communication with financial infrastructure through the M-PESA service. While extending the access and convenience to banking infrastructure, this has also increased the risk that the non-literate members undertake in each helped use. They need to trust specific individuals to provide the necessary assistance. It is easy for that trust to be undermined.

> *"When [nephew] was found to have deliberately miscounted the money he was in charge of, my father became suspicious of more. So he went to a Safaricom branch to review previous transactions. They verified that [nephew] usually sends money to himself whenever he was asked for help."– Shop Owner, 62*

The non-literate members often have numeracy skills through traditional/indigenous training and have been able to navigate money use by associating the design of a denomination with a number. Figure 2 showcases an example of color association with the Ksh. 500 (≈4 USD) currency note. This association has now been made largely invalid in Kenya with the new currency redesign.

> *"I've not seen my grandmother counting money recently. I think she used to know how to count money before the currency was changed. Now it is difficult for her to recognize that this is a 500 shilling or 1000 shilling note."– College Student, 20*

The helped use requires trust of the helpers, often without having access to the metrics of trust leaving them vulnerable: since the adopted stop-gap approaches by non-literate adults are often temporary.

4.3 Negotiated Use: Shared Devices and Trust Negotiations

For the participants who shared devices, we sought to understand how they navigated ownership: contextualizing the need for sharing, the dimensions of sharing, and the negotiations regarding the etiquette of sharing.

4.3.1 What is Shared. There are applications that support multiple account usage (for example email). We wanted to understand if, and if so, how they leveraged these design affordances. We found that the sharing participants, while aware of these features, did not set up separate accounts. This was due to the lack of privacy offered between the different accounts. This resulted with the default "sharing" of a single account: the non-owner of the account able to view the account contents.

> *"I think we have cultivated enough trust that if she for example wanted to get to my phone and watch TikTok, she doesn't have to ask permission every time." – College Student, 20 (Shares with sibling, 19)*

None of the participants used the popular social media applications (e.g. Facebook) for private messaging. We could not determine if this was due to the necessity for sharing, or the underlying unstated etiquette. Participants only noted their usage preferences.

> *"I have an Instagram account, but there is no need to sign in with it–I just use my sister's [the owner] mostly to browse [...] I use the browser for emails, and she uses the one that comes with the phone." – College student 20 (Shares with sibling, 24)*

Once accessed, the "shared" email and social media accounts did not need periodic or persistent passwords to retrieve content. Access to the device was through shared pin and/or pattern.

4.3.2 What is Private. Each sharing participant navigated the boundaries differently, depending on the existing relationship. For example, siblings who were close in age typically had a similar concept of
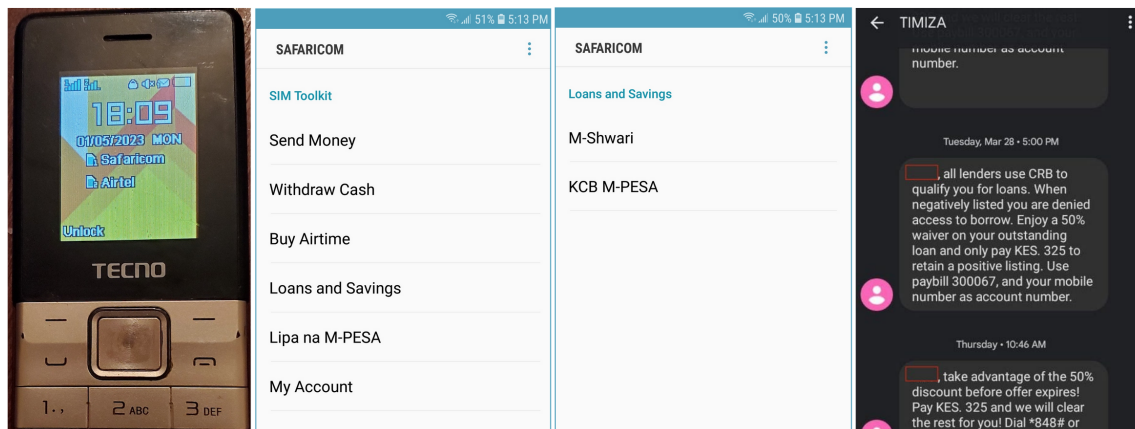
Figure 3: Left screen showcases a feature phone that supports dual sim: Airtel and Safaricom. The middle two images showcases Safaricom Menu, and the specific menu on savings and loans offerings that come natively with the phone (Discussed in Section 5). The rightmost image is a screenshot of incentive discount to repay a mobile-based loan (Discussed in Section 6).

boundaries, compared to the sharing relationship with older members, e.g., parents. Even as the participants shared their accounts, there was need to have overt individual spaces with privacy mechanisms. For every one of our participants, this was limited to the use of WhatsApp: which provides a way to secure an account using PIN or biometrics. However, WhatsApp does not support multiple accounts in one device, but participants found workarounds.

> *"We have two [WhatsApp] downloads. I have WhatsAppGB[5], and he has the business WhatsApp. My messages come to my account and his messages go to his account [...] I have a pin for my account, and he has one for his. They are different, and we do not know each other's pins or password only the phone pin."* – Entrepreneur, 21 (Shares with sibling, 24)

Participants who used shared devices also sought and found mechanisms to enforce privacy mechanisms without alerting the phone owner. This found success in sharing contexts where one person was not as proficient in using the smartphone as the other.

> *"She doesn't know this, but when I want to store something locally without her finding out, I create a hidden folder within the phone and set a password on it."* – High school graduate, 18 (Shares with parent, 44)

The participants who shared devices considered their sharing to be temporary. They either did not have the means to afford a smartphone, had lost their device, and/or were in the process of saving to purchase one. There was an accepted hierarchy of phone ownership and phone "borrowers" for the duration, including the careful use of data, and periodic purchase of data top-up and airtime.

5 MULTIPLE DEVICE OWNERSHIP

Feature phones, colloquially called *"mulika mwizi"*[6] or *"katululu"* (onomatopoeia of the typical ringtone) have become cheaper and

more accessible in Kenya. Participants, while sharing a smartphone, sometimes owned a feature phone–operating both devices simultaneously. We found this choice to be informed by the considerations of safety and the intent to separate transactions.

5.1 Separated Use: Business and Personal

Participants' ownership of multiple devices was to keep separate the communication and transactions intended for personal use (smartphone) and business use (feature phone). This allows a business owner to hire assistant(s) that can use the feature phone to accept payments for goods and services on the owner's behalf.

> *"I bought [the feature phone] second hand for less than Ksh 200 [≈2 USD] because it is literally held together by tape and prayer. If someone steals it, it's not going to be profitable to them. It makes it safe to leave it at the shop for Till[7] [business] transactions."* – Printer, 25

The use of feature phones, often with dual SIM capability (Figure 3 shows an example of this) for business purpose is widespread. We observed this at shopping centers, and during market days. The dual SIM capability allowed for handling SIM cards from the major telephone providers: Safaricom and Airtel, and/or to hold a personal and a business SIM card. The merchants have adopted this strategy of having a dual-SIM device specifically for business, because customers expect the availability of these payment options.

> *"These days you can't get by [as a merchant] without a Till."* – Grocer, 38

Business transactions can be done using a personal M-PESA account. However, these personal transactions can be easily reversed without the recipient's knowledge, making it easy for the merchants to be defrauded. Therefore, M-PESA offers a Till service (for general merchants) and *"Pochi la Biashara* (for small-scale merchants [64]) to ensure that transactions cannot be reversed–unless it is with

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[5]This is an unsanctioned modified version of WhatsApp and is typically installed through side-loading or through device-to-device peer download.
[6]"Mulika Mwizi" (translation: reveal/shine the light on the thief) started a popular campaign by the chief electricity provider asking for public support in identifying

transformer oil thieves [58]. This coincided with the adoption of feature phones equipped with flashlights. Every feature phone has been associated with the term.
[7]"Till" in this context refers to M-PESA allowing for business transactions to be done on top of the M-PESA infrastructure [66]

the merchant's approval. Figure 3 showcases the merchant options within the M-PESA menu offerings.

5.2 Physical and Digital Security

5.2.1 Physical Safety. The deliberate ownership of multiple devices had utility beyond business use, providing some safety in situations where device theft is possible.

> *"When you go to public events and concerts, it is very easy to lose your phone. If [the feature phone] stolen, I only have to replace my SIM card, so it's not a huge loss." – Photographer, 24*

We provide an additional anecdote on the issue of physical safety we observed during an interview with one participant. In the first half of the interview, they only presented the feature phone (they had disclosed their ownership of a smartphone). Only later during the interview did they reveal to be in possession of their smartphone by pulling the smartphone they had been hiding in their sock.

We asked about the risk we presented, and the concern they had about their smartphone. They noted that they owed money to several mobile-based loan providers and weren't sure if we were involved with them and would perhaps forcefully retain the smartphone as collateral. This touches on the notion of physical security discussed here, and changes in behavior spurred by mobile-based loan balances that we discuss later in Section 6.

5.2.2 Digital Safety. The calculated risk on physical safety was done constantly and was chiefly related to the use of feature phones in risky contexts. Discussions on digital security universally involved smartphones. While not overt, the concerns over digital security were impacted by the affordances of smartphone applications, especially those that were downloaded through unofficial sources. We sought to find out how people approached the usability-concern trade-offs, if it played a part.

> *"I have WhatsApp Business, the regular WhatsApp and WhatsApp GB. WhatsApp GB is really good. It has a lot of features. For example, regular WhatsApp will send a low quality picture, but WhatsApp GB will send the full resolution." – Photographer, 24*

GBWhatsApp (the nominal title of the "WhatsApp GB" application referred by participants) is an unsanctioned modification of the official WhatsApp application that, while offering the participant-identified features, also bypasses some privacy features included in the official version: for example, by preserving a deleted status update and bypassing call blocking. The participants accessed GB-WhatsApp by either side-loading the application, or via peer-to-peer sharing. Meta, the official WhatsApp parent company, would often ban phone numbers that are detected to be using GBWhatsApp. Participants discussed how they navigated these known risks.

> *"I don't know who the builder is, or about the privacy and encryption [...] for me doesn't matter because nothing competes with the features WhatsApp GB offers. I do know people who were banned by WhatsApp for using this. So I use it in the backup phone." – Entrepreneur, 21*

This isolation of devices was not uniform. Most participants hadn't accounted for any risks, or considered the risk likelihood to be low.

> *"I think the app gets information from a lot of people so there's a crowd. If they can access my information... well, they don't know me personally." – Printer, 25*

In summary, we consider the use of GBWhatsApp to be a bellwether on digital safety. Its widespread use has been in three contexts: (i) where a smartphone is shared, and each user having a need for private access to their WhatsApp account. In this case, GBWhatsApp is used to as a second copy; (ii) in cases where users needed to separate their use of WhatsApp but use both within the same device; and less prominently, (iii) to take advantage of features that are otherwise unavailable in the official WhatsApp application.

6 MULTIPLE SIM OPERATION

The participants discussed device ownership and SIM card/phone line ownership as distinct choices. We sought to understand the number of active SIM cards they possessed. Their stated reasons exceeded the mapping of each SIM to a device, or dual SIM cards to a compatible device. For example, the intent to avoid loan repayment and loan default reminders; with other reasons falling into acknowledged ethical and legal gray areas.

6.1 Evasion of Loan Repayment

One participant operated five active SIM cards. For them, the accumulation of SIM cards was due to evasion. Typically, participants would borrow small loans from high-interest mobile-based loan services, and when unable to pay, and to avoid the phone call reminders, would swap to a different SIM card.

> *"Well these apps are so very easy to borrow from. You just download an app, you fill out a form, and they give you money [...] Say you're at home without any job or any money: what are you gonna do? So you download the app and you ask for money."*

The lack of national policy regulation and guidelines led to many such micro-loan services.

> *"I borrowed Ksh 1000 (≈7 USD) for the first time in 2016 from Branch[8] [mobile loan app], then 1000 from Tala[9], and the same from Timiza[10], and they gave me Ksh 800 [≈6 USD]. I think it is Branch that finally reported me to the CRB [Credit Reference Bureau]."*

The mobile-based loans have high interest rates and short repayment windows. They are also risky to the provider, since there is no collateral. Repayment reminders are sent via texts and then escalated to phone calls on loan default. These phone calls would be made first to the primary borrower, and if unsuccessful, the providers would leverage shame-to-pay strategies by contacting others on the borrower's contact list. The latter harassing behavior became an international incident [46] that led the Kenyan government to finally institute oversight over the mobile-loan services.

> *"Tala tried to get to me. They even called my mother, my uncle and my now ex-girlfriend. But they were trending at the time [for the harassment]. I started blocking their numbers, and finally just took out the SIM."*

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[8]https://branch.co/how-it-works
[9]https://tala.co.ke/
[10]https://www.absabank.co.ke/app-online-and-other-banking/timiza/

The younger participants with lack of steady employment or income, often took advantage of these loan offers, knowing that their likelihood of on-time repayment was low.

> *"I borrowed from Tala and Branch when I was on campus and COVID had hit. There was no way that I would have been able to pay back, cause that was my means of survival. I still get [mobile-based] loan approvals."*

We sought to understand if these practices were to aid evasion of loan repayment since there was no proper oversight. This was unclear. However, there was knowledge on the loan being tied to individual identity rather than to SIM or a device. There was also a consensus that the borrowed was minuscule in the great scheme of things, but even so, it was difficult to repay given their present lack of financial prospects.

> *I know the money is a little. But it is a means of survival. When I'm financially stable I will re-download those apps and pay them up. They gave me money when I was so desperate though I knew that I wouldn't be able to repay. Removing the SIM is like hiding under a blanket."*

The participant operation of multiple SIM to evade calls from the loan provider, and their intent eventually repay are both in flux. The loan amount and the agreement on interest and repayment schedules are all attached to the borrower's identity using the National Identity Card, regardless of the SIM used.

At the onset, defaulters were reported to the Credit Reporting Bureau (CRB), impacting the borrowing power of the individual beyond the mobile-based small-loan sector. However, the institution of government oversight over the mobile-based lending platforms has changed the process by which the loan provider can pursue previous unpaid debts. The effect of this has been felt by the participants, as the methods for repayment are now more muted and incentivized using discounts (Figure 3 showcases an example).

6.2 Ethics of Money-Making

Other explanations of multiple SIM use tend towards both ethical and unethical entrepreneurship.

> *"I have three WhatsApp accounts belonging to each specific numbers I have. One is for work–I'm in the same WhatsApp group with my colleagues and the employer. I'm also a DJ as a second job, so I use the second line to promote my work, and avoid cross-promotion. The third line is personal."–* DJ, 28

The entrepreneurship ventures sometimes tend to ethical gray areas. Multiple SIMs support the maintenance of separate identities.

> *"I have a number attached to Telegram for sketchy money-making ventures. For example this guy was running a [pyramid] scheme. You would open an account with him, and he'll put Ksh 1000 for you to start "trading" with a bonus if you sign other people. We faked some details including the phone number. Since it wasn't attached to M-PESA, they couldn't look us up. "*

M-PESA has a system called "*hakikisha*" (translation: "ensure"), which provides a 25-second delay before sending intended payment: confirming the amount and revealing the name of the M-PESA recipient. The sender can cancel the transaction within the delay period. People use this affordance as a look-up tool to identify SIM/M-PESA ownership without the intent to transact.

We examined the participants' risk thresholds to understand their willingness to sign up for new or other money-making schemes, spanning unanticipated risks from legitimate sources, to ventures and platforms that are in the realm of unethical.

> *"Of course I would sign up for the shady accounts, and so would a lot of people I know. I balance my problems and what the money would solve. If this requires access to my details, sure. On the ground, things are different[11]."*

The participants' economic outlook has been impacted by the pandemic and lack of employment prospects. The foray into the risky entrepreneurship deals is a follow-on effect of this, and we expect this to accelerate and evolve. We deliberate on these in Section 7.

7 DISCUSSION

We sought to understand the current status of how people own, use and share feature phones, smartphones and SIM cards. We explored the motivating factors leading to desired ownership, alongside affordances that enable choice of technology, including the impact of M-PESA and others that are scaffolded on the platform. In this section, we situate our findings primarily in HCI research, to provide insights and updates on the current interactions with technology and their impact. We also recommend steps for researchers, policy-makers, and designers on considering and evaluating technology intended to support people in developmental contexts.

We summarize the participants and their knowledge and use of technology into four broad groups: *baseline users, entrepreneurs, opportunists* and *schemers.* We categorize *baseline users* as encompassing single device owners, and those with a must-use cause (e.g. a smartphone to access WhatsApp). If non-literate, they leverage feature phones through memorization of specific actions. The *entrepreneurs* primarily use their phones (often separate feature phones and dedicated SIM) to conduct business, and access credit. The *opportunists* take advantage of technology affordances to make money, for example through freelance work. They use both formal/regulated and informal/unregulated means to achieve this: often using smartphones and may have separate SIM cards. Finally, the *schemers* describe the tech-savvy, who leverage state-of-art technology to maintain anonymity online. They are likely to own both multiple phones and multiple SIM cards–to keep multiple identities separate. While they may be involved in legitimate business as *entrepreneurs* or freelance work as *opportunists*, the *schemers* also pursue profit-making through gray market schemes. We leverage these user categories to contextualize our discussion.

7.1 Intricacies of Device Ownership

We build on insights presented in previous research exploring the necessity influencing adoption of certain technology (e.g. access to conduct online businesses through WhatsApp [59]), learned use [18], affordability [79], and situational awareness (e.g. concerns for stolen phones) [54]. Our work reflect similar patterns: both in the obliged smartphone adoption by *baseline users*, and in multiple

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[11]This is an attempted translation of "*Kwa ground, vitu ni different*": both a meme and a proverb relating the unexpectedness and often bleaker conditions on experience, than what was said or anticipated. This common refrain inspired the paper title.

device ownership across user bases–the overt use of feature phones and covert use of smartphones to account for security concerns. Situational awareness was also reflected by how the participants understood the underground economy for smartphone spare parts that have been strengthened by stricter import taxation [6] leading to raised smartphone prices [39]. Participants with SIM cards but no associated phone also reflected those who lost their smartphone devices and were only able to bear the cost to restore their SIM.

Our findings also highlight the sustained utility of feature phones. Beyond providing a measure of physical safety for all groups and accessibility for the *baseline users*, the *entrepreneurs* also used the dual-SIM capability to maintain separate business accounts, support multiple mobile providers, and ease concerns on sharing the business feature phone with multiple employees.

7.1.1 Complexity in Sharing. The high incidence of smartphone sharing reflected the missing utility in feature phones: that is, the need to access online platforms and resources. This adds depth to the observed sharing of devices [31] and the utility of online community facilitated through WhatsApp [29]. The prohibitive cost of smartphones being a barrier, necessitates that sharing individuals find workarounds to access the online tools, while leaving the owners accounts undisturbed, yet maintaining their personal communication privacy. We find that *opportunists* who share (or use multiple SIM to maintain separate accounts) have taken advantage of new designs: the availability of password protected WhatsApp, and the availability of other WhatsApp variations (WhatsApp Business and GBWhatsApp), in a bid to retain some autonomy. However, the choices carry other risks.

For the users who are aware of the larger implications on data safety, there was nuance in how this impacted their behavior. The participants who used GBWhatsApp–the unofficial version of WhatsApp considered the utility of the application to be worth any resulting privacy risks. However, the risks were rarely understood, as none of the participants had examples of those who had their privacy violated by the unofficial application. The only risk they referenced involved the possibility of their phone number being banned from accessing the official WhatsApp application, if the unofficial version is detected on the participant's device.

Possible impending security risks are magnified due to the coupling of phone number with M-PESA accounts (worsened in cases of PIN reuse between M-PESA and GBWhatsApp), the technological know-how of the users, and the sharing relationship between the users–the actions and choices of one, having the ability to negatively impact the other.

7.1.2 Device Sharing Implications. The necessity of key applications highlight the necessary affordances that not only support shared use, but also harden the security posture. Key amongst this, is the possibility of supporting two separated accounts that can individually be password-protected. While the participants needed this for other social media platforms and email, they placed an emphasis on WhatsApp. In addition, policy changes in Kenya are reactive–but can serve as a predictor for harms that have reached a critical mass and received possible international attention. The actions necessary to achieve compliance to changes in policies (e.g., registering fake phones in 2012 [13], and unregistered SIM cards in 2022 [5]) impacted the *baseline users* and *entrepreneurs* the most.

The mobile providers, the Communication Commission of Kenya (CCK), and the learning from harms from others have been instrumental in creating awareness. However, these are eroded as every new policy and changes are implemented, advantaging those with the knowledge, literacy, and resources.

7.2 Ethical Tensions: Survival vs Disclosure

We found high incidence of both multiple device and multiple SIM ownership to be influenced by access to money–often through M-PESA. This is also reflected in the number of *opportunists* who filled the screening survey to participate in this study–keeping with the research ethics practice of balancing fair remuneration against overcompensation impacting responses [26, 63]. We further explore the importance of considering money in the Kenyan context, and the implications this has on device and SIM ownership, by extrapolating our findings and describing the registration of participants for the Worldcoin cryptocurrency project–which, in the absence of policy, adults were deemed to have provided informed consent–regardless of whether they were literate.

7.2.1 Ethical Implications. Lack of access to capital and financial instruments underpin the decisions for users: often young adults, to engage with online commerce that are in the ethical gray areas. These are individual actions that are taken in understanding of the repercussions of actions; but fail in comparison to the need for survival and perhaps making a living–mostly as *opportunists* but also *schemers* who may not have ethical boundaries to limit actions that lead to harms of disadvantaged users such as the *baseline users*. This calls for an exploration of user-actions in other contexts: for instance, the role of *schemers* in perpetuating financial scams.

The theme on survival explains the increased SIM ownership observed in some of our participants as they sought not to evade the repayment (that is tied to their identity), but rather the reminders to repay due loans and/or defaulted loans. The challenge of repayment is exacerbated by exorbitant interest rates and associated fees that are not borne by those with access to formal banking infrastructure. People sought to participate in the Worldcoin registration: aware of the privacy concerns as reported in the news, but willing to surrender their privacy for the sake of survival. In addition to enumerating the scale and nature of harms that users–often the *baseline users* and the *opportunists* face in these contexts, their experience shows the dearth of research that have sought to showcase the scale of deliberate technology-aided harms that users face.

7.3 Recommendations: Baseline Users and Money as Bellwethers

M-PESA technology was made possible through the observation of how rural Kenyans: lacking formal banking infrastructure, repurposed the existing frameworks to meet their needs. They did so by selling phone cards to get cash equivalent (evading tariffs and incurring no overheads): practices that have also been observed elsewhere [27, 57]. This ingenious repurposing of technology to address barriers are emblematic of *baseline users* who while instrumental in guiding the understanding of feature phone use, are now overlooked in the design and use of smartphones–where designs and accessibility features have language and literacy as a

default for operating the device. This background influences our recommendations.

7.3.1 Watch the Baseline: Baseline users are disadvantaged when policy is targeted towards smartphones. In this work we enumerated the levels of dependencies in their smartphone need and use: **helped use** (where there is necessity to ask for others' support) and having to determine whom and how to trust; **supported use** (where there is necessity to use smartphone technology); and **negotiated use** (where there is necessity to share devices). Those with difficulty navigating the English-coded menus [78] and the non-literate *baseline users* are vulnerable not only to the systems that leverage written informed consent, but they are also often the ones to suffer the most financial harms that have led to abandoning technology use, and fear of adopting new technologies. Even as policies are implemented, they are not able to support in recouping their losses. They are the least likely to report harms–the CCK highlights only 180 reported complaints in the whole country (that includes fraudulent calls/SMS, privacy breaches, counterfeit phones, and unfair trading practices) [50]. While other opportunities for reporting (e.g. to the mobile provider) are available, the steps often necessitate understanding and interaction with SMS [65].

Entrepreneurs, like *baseline users* have taken advantage of the just-enough capabilities of feature phones to support their ventures: the affordability of feature phones, beyond offering options such as dual-SIM capability, the cheap devices offering a measure of protection against theft. In addition, the *entrepreneurs* actions showcase the duality of dependencies on the M-PESA platform for financial transactions: the continued utility of feature phones in a smartphone-ascendant world, but also the impact of reliance on the monopoly platform as it drives user actions. The latter has been observed in other research as developers faced barriers in how they were able to access users for USSD-dependent applications [19]– an environment that has shifted somewhat due to the increased accessibility (and risk) of smartphone applications.

Designing to support both the *baseline users* and the *entrepreneurs* reflect the need for minimum device utility design threshold and has overarching benefit to other users.

7.3.2 Follow the Money: Considering how users navigate financial and online platforms for making money has served to highlight deeper layers in technology use and needs. *Opportunists* reflect the utility of online technology to make a living [77]–tasks that allow earning, but have little opportunities for advancement (e.g. crowd work and AI annotation [73]). They represent the challenge faced especially by lack of employment by young adults who are educated but lack prospects. We argue that their actions, and their increased representation as they continually seek new sources of financial stability would serve to showcase both promising domains where researchers and designers can work in their service, but also the barriers: where the *opportunists* risk their agency and safety–highlighting areas of lax policy and harms. If unaddressed, we expect that continued exposure and harm encounters would influence those who evolve into *schemers*.

Schemers also reflect the disadvantage of technology. Those who take advantage of user ignorance of policy, but also platforms that take advantage of lack of sufficient policy and enforcement and highlight the lack of impact of reactive harms repair. They also exhibit the importance of surfacing harms in technology designed for and/or intended for low-resourced and marginalized communities, and importantly, explain the nature of the harms, and those that perpetuate them.

Considering finances in the Kenyan context served as a rich source to consider user actions whether towards more exposure in entrepreneurial ventures, or in opposite endeavors–evading loan repayment. Both reactions served to provide distinction on user actions that are informed by external factors, which in other research contexts, may signal responses to barriers and harms.

7.4 Limitations and Future Work

We identified three barriers and described them in Section 2: **infrastructural barriers** (defined by resources), **literacy barriers** and **cultural and religious barriers** (that also encompassed gender and power differentials). The nature of infrastructural barriers was made evident in this work by the impact of (lack of) policy enforcement in the changing financial landscape and the increasing reliance on smartphones. The latter was exacerbated by literacy barriers as design signals and affordances learned by non-literate people when leveraging feature phones are not transferable to the new smartphone contexts: impacting individual agency and autonomy. We did not observe the cultural and religious barriers in this work–we posit that this might be impacted by our population focus: those who live in, close to, or have access to the town, and consider this a possible limitation.

Opportunity for future work involve the comparison of contemporary shared use and multiple device ownership between rural and urban settings–examining the barriers faced and the impact and nature of the user types. We expect the *baseline users* and *entrepreneurs* to also inhabit rural contexts but expect the nature of *opportunists* and *schemers* to be different. The evolution from one user category to another, or the belonging to different user groups would provide additional insights on the scale of impact that the financial landscape has had on users across contexts and age groups.

8 CONCLUSION

We explored the dimension of phone ownership and phone sharing in Kenya. Through an interview-based study, we found that the choice to maintain multiple devices offered a glimpse into useful affordances, and workarounds to support various agency and autonomy needs. These findings provide a glimpse into the importance of protective policies, and the reasoning some people go to in making money in ethically dubious means. We extend the discussion on designing for emerging economic contexts by pointing to lessons from how sharing users leverage workarounds and the new risks they encounter. We also explore how the necessity and use of financial infrastructure has impacted user autonomy and consent, the lack of protective policies and the resulting implication on ethics. We discuss these dimensions in the context of what this means in other environments: highlighting the broader impact on the understanding of privacy, and the nature of compensation vs harm.

REFERENCES

[1] Syed Ishtiaque Ahmed, Md. Romael Haque, Jay Chen, and Nicola Dell. 2017. Digital Privacy Challenges with Shared Mobile Phone Use in Bangladesh. *Proc. ACM Hum.-Comput. Interact.* 1, CSCW, Article 17 (dec 2017), 20 pages. https://doi.org/10.1145/3134652

[2] Syed Ishtiaque Ahmed, Md. Romael Haque, Shion Guha, Md. Rashidujjaman Rifat, and Nicola Dell. 2017. Privacy, Security, and Surveillance in the Global South: A Study of Biometric Mobile SIM Registration in Bangladesh. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) *(CHI '17)*. Association for Computing Machinery, New York, NY, USA, 906–918. https://doi.org/10.1145/3025453.3025961

[3] Emily Aiken, Viraj Thakur, and Joshua Blumenstock. 2022. Phone Sharing and Cash Transfers in Togo: Quantitative Evidence from Mobile Phone Data. In *Proceedings of the 5th ACM SIGCAS/SIGCHI Conference on Computing and Sustainable Societies* (Seattle, WA, USA) *(COMPASS '22)*. Association for Computing Machinery, New York, NY, USA, 214–231. https://doi.org/10.1145/3530190.3534796

[4] Mahdi Nasrullah Al-Ameen, Huzeyfe Kocabas, Swapnil Nandy, and Tanjina Tamanna. 2021. "We, three brothers have always known everything of each other": A Cross-cultural Study of Sharing Digital Devices and Online Accounts. *Proc. Priv. Enhancing Technol.* 2021, 4 (2021), 203–224.

[5] Brian Ambani and Macharia Mwangi. 2022. 264,000 mobile phones switched off over SIM registration, says Chiloba. https://nation.africa/kenya/business/264-000-mobile-phones-switched-off-over-sim-registration-says-chiloba-3988420

[6] Julians Amboko. 2023. Multiple reports of stock outs of smart phones in shops & many citing changes by KRA around treatment of imports as the main reason. What's happening there? https://twitter.com/AmbokoJH/status/1681564479534891008.

[7] National Communications Authority. 2022. Telecom Subscription for March 2022. https://nca.org.gh/wp-content/uploads/2022/06/Industry-Information-MARCH-2022-.pdf

[8] Savita Bailur and Hélène Smertnik. 2021. Making Digital Financial Services More Trustworthy for Women. *Interactions* 28, 2 (mar 2021), 104–107. https://doi.org/10.1145/3448556

[9] Giulia Barbareschi, Catherine Holloway, Katherine Arnold, Grace Magomere, Wycliffe Ambeyi Wetende, Gabriel Ngare, and Joyce Olenja. 2020. The Social Network: How People with Visual Impairment Use Mobile Phones in Kibera, Kenya. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) *(CHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–15. https://doi.org/10.1145/3313831.3376658

[10] Joshua Blumenstock and Nathan Eagle. 2010. Mobile Divides: Gender, Socioeconomic Status, and Mobile Phone Use in Rwanda. In *Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development* (London, United Kingdom) *(ICTD '10)*. Association for Computing Machinery, New York, NY, USA, Article 6, 10 pages. https://doi.org/10.1145/2369220.2369225

[11] Jenna Burrell. 2010. Evaluating Shared Access: social equality and the circulation of mobile phones in rural Uganda. *Journal of computer-mediated communication* 15, 2 (2010), 230–250.

[12] Fatoumata G. Camara, Daouda Traoré, Gaëlle Calvary, and Amal Kali. 2019. Investigating Mobile Banking in Mali: HCI Experience of 'Man in the Street'. In *Human-Computer Interaction – INTERACT 2019*, David Lamas, Fernando Loizides, Lennart Nacke, Helen Petrie, Marco Winckler, and Panayiotis Zaphiris (Eds.). Springer International Publishing, Cham, 34–42.

[13] Wanyama Wa Chebusiri. 2012. Kenya's battle to switch off fake phones. https://www.bbc.com/news/world-africa-19819965

[14] George Hope Chidziwisano and Susan Wyche. 2018. M-Kulinda: Using a Sensor-Based Technology Probe to Explore Domestic Security in Rural Kenya. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC, Canada) *(CHI '18)*. Association for Computing Machinery, New York, NY, USA, 1–13. https://doi.org/10.1145/3173574.3173584

[15] Nigerian Communications Commission. 2023. Monthly Subscriber Technology Data. https://ncc.gov.ng/statistics-reports/subscriber-data#monthly-subscriber-technology-data-3

[16] Juliet Corbin and Anselm Strauss. 2023. *Basics of Qualitative Research (3rd ed.): Techniques and Procedures for Developing Grounded Theory*. SAGE Publications, Inc., Thousand Oaks, Chapter 7-8, 143–192. https://doi.org/10.4135/9781452230153

[17] Federal Deposit Insurance Corporation. 2021. 2021 FDIC National Survey of Unbanked and Underbanked Households. https://www.fdic.gov/analysis/household-survey/index.html

[18] Angela Crandall. 2012. Kenyan farmers' use of cell phones: Calling preferred over SMS. *Proceedings of M4D 2012 28-29 February 2012 New Delhi, India* 28, 29 (2012), 119.

[19] Christopher Csikszentmihalyi, Jude Mukundane, Gemma F. Rodrigues, Daniel Mwesigwa, and Michelle Kasprzak. 2018. The Space of Possibilities: Political Economies of Technology Innovation in Sub-Saharan Africa. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC,

Canada) *(CHI '18)*. Association for Computing Machinery, New York, NY, USA, 1–13. https://doi.org/10.1145/3173574.3173880

[20] Tawanna R. Dillahunt, Vaishnav Kameswaran, Linfeng Li, and Tanya Rosenblat. 2017. Uncovering the Values and Constraints of Real-Time Ridesharing for Low-Resource Populations. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) *(CHI '17)*. Association for Computing Machinery, New York, NY, USA, 2757–2769. https://doi.org/10.1145/3025453.3025470

[21] Leslie L. Dodson, S. Revi Sterling, and John K. Bennett. 2013. Minding the Gaps: Cultural, Technical and Gender-Based Barriers to Mobile Use in Oral-Language Berber Communities in Morocco. In *Proceedings of the Sixth Int'l Conf. on ICT and Development: Vol 1* (Cape Town, South Africa) *(ICTD '13)*. ACM, New York, NY, USA, 79–88. https://doi.org/10.1145/2516604.2516626

[22] Tools for Humanity Corp and Tools for Humanity GmbH. 2023. TFH Production Legal Center. https://worldcoin.pactsafe.io/legal.html#contract-hkjhpswyc

[23] UNESCO Institute for Statistics. 2014. Education and Literacy: Kenya. https://uis.unesco.org/en/country/ke?theme=education-and-literacy.

[24] Edd Gent. 2023. A Cryptocurrency for the Masses or a Universal ID?: Worldcoin Aims to Scan all the World's Eyeballs. *IEEE Spectrum* 60, 1 (2023), 42–57.

[25] Prince K Guma. 2020. Incompleteness of urban infrastructures in transition: Scenarios from the mobile age in Nairobi. *Social Studies of Science* 50, 5 (2020), 728–750.

[26] Emma Head. 2009. The ethics and implications of paying participants in qualitative research. *International Journal of Social Research Methodology* 12, 4 (2009), 335–344.

[27] Nick Hughes and Susie Lonie. 2007. M-PESA: mobile money for the "unbanked" turning cellphones into 24-hour tellers in Kenya. *Innovations: technology, governance, globalization* 2, 1-2 (2007), 63–81. https://direct.mit.edu/itgg/article/2/1-2/63/9485/M-PESA-Mobile-Money-for-the-Unbanked-Turning

[28] Samia Ibtasam, Lubna Razaq, Haider W. Anwar, Hamid Mehmood, Kushal Shah, Jennifer Webster, Neha Kumar, and Richard Anderson. 2018. Knowledge, Access, and Decision-Making: Women's Financial Inclusion In Pakistan. In *Proceedings of the 1st ACM SIGCAS Conference on Computing and Sustainable Societies* (Menlo Park and San Jose, CA, USA) *(COMPASS '18)*. Association for Computing Machinery, New York, NY, USA, Article 22, 12 pages. https://doi.org/10.1145/3209811.3209819

[29] Naveena Karusala, David Odhiambo Seeh, Cyrus Mugo, Brandon Guthrie, Megan A Moreno, Grace John-Stewart, Irene Inwani, Richard Anderson, and Keshet Ronen. 2021. "That Courage to Encourage": Participation and Aspirations in Chat-Based Peer Support for Youth Living with HIV. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (Yokohama, Japan) *(CHI '21)*. Association for Computing Machinery, New York, NY, USA, Article 223, 17 pages. https://doi.org/10.1145/3411764.3445313

[30] Joseph 'Jofish' Kaye. 2011. Self-Reported Password Sharing Strategies. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Vancouver, BC, Canada) *(CHI '11)*. Association for Computing Machinery, New York, NY, USA, 2619–2622. https://doi.org/10.1145/1978942.1979324

[31] Brenda Kharono, Anne Kaggiah, Cyrus Mugo, David Seeh, Brandon L Guthrie, Megan Moreno, Grace John-Stewart, Irene Inwani, and Keshet Ronen. 2022. Mobile technology access and use among youth in Nairobi, Kenya: implications for mobile health intervention design. *Mhealth* 8 (2022). https://doi.org/10.21037/mhealth-21-23

[32] Jaimee Kokonya, Bridget Andere, and Isedua Oribhabor. 2022. Open letter: Safaricom must delete all biometric data collected unlawfully during Kenya's SIM card registration exercise. https://www.accessnow.org/press-release/open-letter-safaricom-privacy-kenya/

[33] Leah Jerop Komen and Richard Ling. 2021. 'NO! We don't have a joint account': mobile telephony, mBanking, and gender inequality in the lives of married women in western rural Kenya. *Information, Communication & Society* 25, 14 (June 2021), 2083–2100. https://doi.org/10.1080/1369118x.2021.1927137

[34] Lindah Kotut, Neelma Bhatti, Taha Hassan, Derek Haqq, and Morva Saaty. 2024. Griot-Style Methodology: Longitudinal Study of Navigating Design With Unwritten Stories. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) *(CHI '24)*. Association for Computing Machinery, New York, NY, USA, 1–13. https://doi.org/10.1145/3613904.3642682

[35] Lindah Kotut, Neelma Bhatti, Morva Saaty, Derek Haqq, Timothy L. Stelter, and D. Scott McCrickard. 2020. Clash of Times: Respectful Technology Space for Integrating Community Stories in Intangible Exhibits. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) *(CHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–13. https://doi.org/10.1145/3313831.3376354

[36] Lindah Kotut and D. Scott McCrickard. 2022. The TL;DR Charter: Speculatively Demystifying Privacy Policy Documents and Terms Agreements. *Proc. ACM Hum.-Comput. Interact.* 6, GROUP, Article 23 (jan 2022), 14 pages. https://doi.org/10.1145/3492842

[37] Lindah Kotut and D. Scott McCrickard. 2022. Winds of Change: Seeking, Preserving, and Retelling Indigenous Knowledge Through Self-Organized Online Communities. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 257, 15 pages. https://doi.org/10.1145/3491102.3502094

[38] Michael A. Madaio, Vikram Kamath, Evelyn Yarzebinski, Shelby Zasacky, Fabrice Tanoh, Joelle Hannon-Cropp, Justine Cassell, Kaja Jasinska, and Amy Ogan. 2019. "You Give a Little of Yourself": Family Support for Children's Use of an IVR Literacy System. In *Proceedings of the 2nd ACM SIGCAS Conference on Computing and Sustainable Societies* (Accra, Ghana) *(COMPASS '19)*. ACM, New York, NY, USA, 86–98. https://doi.org/10.1145/3314344.3332504

[39] Samuel Maina. 2023. Traders Counting Losses As Mobile Phone Shortage Bites. https://www.kenyanews.go.ke/traders-counting-losses-as-mobile-phone-shortage-bites/

[40] Tara Matthews, Kerwell Liao, Anna Turner, Marianne Berkovich, Robert Reeder, and Sunny Consolvo. 2016. "She'll Just Grab Any Device That's Closer": A Study of Everyday Device & Account Sharing in Households. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (San Jose, California, USA) *(CHI '16)*. Association for Computing Machinery, New York, NY, USA, 5921–5932. https://doi.org/10.1145/2858036.2858051

[41] Indrani Medhi, S.N. Nagasena Gautama, and Kentaro Toyama. 2009. A Comparison of Mobile Money-Transfer UIs for Non-Literate and Semi-Literate Users. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Boston, MA, USA) *(CHI '09)*. Association for Computing Machinery, New York, NY, USA, 1741–1750. https://doi.org/10.1145/1518701.1518970

[42] David Meyer. 2023. Kenya becomes the first country to suspend Sam Altman's Worldcoin A.I.-crypto scheme. https://fortune.com/2023/08/02/kenya-first-country-to-suspend-worldcoin-altman-privacy-orb-iris-crypto-ai/

[43] Collins W. Munyendo, Yasemin Acar, and Adam J. Aviv. 2022. "Desperate Times Call for Desperate Measures": User Concerns with Mobile Loan Apps in Kenya. In *2022 IEEE Symposium on Security and Privacy (SP)*. IEEE, New York City, New York, 2304–2319. https://doi.org/10.1109/SP46214.2022.9833779

[44] Charity Muthoni Muriuki. 2021. *Effect of Mobile Lending on the Level of Nonperforming Loans in the Kenyan Banking Industry.* Ph. D. Dissertation. University of Nairobi.

[45] Irene Mwangi. 2021. Worldcoin began collecting data in Kenya from May 2021 - Kassait » Capital News. https://www.capitalfm.co.ke/news/2023/08/worldcoin-began-collecting-data-in-kenya-from-may-2021-kassait/

[46] Waihiga Mwaura. 2021. Kenya outrage over debt collectors' shaming tactics. https://www.bbc.com/news/world-africa-57985667

[47] Annie Njanja. 2023. Worldcoin ignored initial order to stop iris scans in Kenya, records show. https://techcrunch.com/2023/08/15/worldcoin-in-kenya/

[48] Donald A. Norman. 2002. *The Design of Everyday Things.* Basic Books, Inc., USA.

[49] Erick Oduor, Carman Neustaedter, Tejinder K. Judge, Kate Hennessy, Carolyn Pang, and Serena Hillman. 2014. How Technology Supports Family Communication in Rural, Suburban, and Urban Kenya. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Toronto, Ontario, Canada) *(CHI '14)*. Association for Computing Machinery, New York, NY, USA, 2705–2714. https://doi.org/10.1145/2556288.2557277

[50] Communications Authority of Kenya. 2023. Report of Consumer Complaints &Enquiries (4th Quarter - FY 2022/2023). https://www.ca.go.ke/sites/default/files/2023-07/ConsumerComplaintsReportQ42022-2023.pdf

[51] Communications Authority of Kenya. 2023. Third Quarter Statistics Report for the Financial Year 2022/2023. https://www.ca.go.ke/sites/default/files/2023-06/SectorStatisticsReportQ32022-2023.pdf

[52] Independent Communications Authority of South Africa. 2023. State Of ICT Sector Report 31 March 2023 Updated. https://www.icasa.org.za/legislation-and-regulations/state-of-ict-sector-report-2023-report

[53] Kenya National Bureau of Statistics. 2023. Economic Survey 2023. https://www.knbs.or.ke/download/economic-survey-2023/

[54] Jennifer Pearson, Simon Robinson, Matt Jones, Anirudha Joshi, Shashank Ahire, Deepak Sahoo, and Sriram Subramanian. 2017. Chameleon Devices: Investigating More Secure and Discreet Mobile Interactions via Active Camouflaging. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) *(CHI '17)*. Association for Computing Machinery, New York, NY, USA, 5184–5196. https://doi.org/10.1145/3025453.3025482

[55] Trevor Perrier, Nicola Dell, Brian DeRenzi, Richard Anderson, John Kinuthia, Jennifer Unger, and Grace John-Stewart. 2015. Engaging Pregnant Women in Kenya with a Hybrid Computer-Human SMS Communication System. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (Seoul, Republic of Korea) *(CHI '15)*. Association for Computing Machinery, New York, NY, USA, 1429–1438. https://doi.org/10.1145/2702123.2702124

[56] Fahad Pervaiz, Rai Shah Nawaz, Muhammad Umer Ramzan, Maryem Zafar Usmani, Shrirang Mare, Kurtis Heimerl, Faisal Kamiran, Richard Anderson, and Lubna Razaq. 2019. An Assessment of SMS Fraud in Pakistan. In *Proceedings of the 2nd ACM SIGCAS Conference on Computing and Sustainable Societies* (Accra, Ghana) *(COMPASS '19)*. Association for Computing Machinery, New York, NY,

[57] USA, 195–205. https://doi.org/10.1145/3314344.3332500

[57] Kelsey Piper. 2020. What Kenya can teach its neighbors — and the US — about improving the lives of the "unbanked". https://www.vox.com/future-perfect/21420357/kenya-mobile-banking-unbanked-cellphone-money

[58] Kenya Power and Lighting Company. 2018. Mulika Mwizi. https://www.youtube.com/watch?v=KTc3susHsxo

[59] Ananditha Raghunath, Laurel Krovetz, Hosea Mpogole, Henry Mulisa, Brian Dillon, and Richard Anderson. 2023. From Grasshoppers to Secondhand Cars: Understanding the Smartphone-Enabled Marketplace in Peri-Urban Tanzania. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) *(CHI '23)*. Association for Computing Machinery, New York, NY, USA, Article 869, 13 pages. https://doi.org/10.1145/3544548.3580647

[60] Eric Ravenscraft. 2023. What to Do When Netflix Won't Let You Share Your Password. https://www.wired.com/story/netflix-password-crackdown-what-do/

[61] Lubna Razaq, Tallal Ahmad, Samia Ibtasam, Umer Ramzan, and Shrirang Mare. 2021. "We Even Borrowed Money From Our Neighbor": Understanding Mobile-Based Frauds Through Victims' Experiences. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW1, Article 41 (apr 2021), 30 pages. https://doi.org/10.1145/3449115

[62] Bradley Reaves, Jasmine Bowers, Nolen Scaife, Adam Bates, Arnav Bhartiya, Patrick Traynor, and Kevin R. B. Butler. 2017. Mo(Bile) Money, Mo(Bile) Problems: Analysis of Branchless Banking Applications. *ACM Trans. Priv. Secur.* 20, 3, Article 11 (aug 2017), 31 pages. https://doi.org/10.1145/3092368

[63] Margaret L Russell, Donna G Moralejo, and Ellen D Burgess. 2000. Paying research subjects: participants' perspectives. *Journal of medical ethics* 26, 2 (2000), 126–130.

[64] Safaricom. 2022. Pochi La Biashara. https://www.safaricom.co.ke/personal/m-pesa/lipa-na-m-pesa/pochi-la-biashara

[65] Safaricom. 2022. Types Of Fraud And Tips To Protect Yourself. https://www.safaricom.co.ke/fraud-awareness

[66] Safaricom. 2023. M-PESA Business Till. https://www.safaricom.co.ke/personal/m-pesa/lipa-na-m-pesa/m-pesa-business-till

[67] Nithya Sambasivan, Ed Cutrell, Kentaro Toyama, and Bonnie Nardi. 2010. Intermediated Technology Use in Developing Communities. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Atlanta, Georgia, USA) *(CHI '10)*. Association for Computing Machinery, New York, NY, USA, 2583–2592. https://doi.org/10.1145/1753326.1753718

[68] SpiceFM. 2022. The War For Software Developers In Kenya George Njuguna, CIO, Safaricom PLC. https://www.youtube.com/watch?v=KTc3susHsxo

[69] Elizabeth Stowell, Mercedes C. Lyson, Herman Saksono, Reneé C. Wurth, Holly Jimison, Misha Pavel, and Andrea G. Parker. 2018. Designing and Evaluating MHealth Interventions for Vulnerable Populations: A Systematic Review. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC, Canada) *(CHI '18)*. Association for Computing Machinery, New York, NY, USA, 1–17. https://doi.org/10.1145/3173574.3173589

[70] Shane Tews. 2023. Worldcoin's Introduction to the Kenyan Market Is Temporarily Halted Due to Privacy Concerns. https://www.aei.org/technology-and-innovation/worldcoins-introduction-to-kenyan-market-temporarily-halted-due-to-privacy-concerns/

[71] Rama Adithya Varanasi, Divya Siddarth, Vivek Seshadri, Kalika Bali, and Aditya Vashistha. 2022. Feeling Proud, Feeling Embarrassed: Experiences of Low-Income Women with Crowd Work. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 298, 18 pages. https://doi.org/10.1145/3491102.3501834

[72] Michalis Vitos, Julia Altenbuchner, Matthias Stevens, Gillian Conquest, Jerome Lewis, and Muki Haklay. 2017. Supporting Collaboration with Non-Literate Forest Communities in the Congo-Basin. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Portland, Oregon, USA) *(CSCW '17)*. Association for Computing Machinery, New York, NY, USA, 1576–1590. https://doi.org/10.1145/2998181.2998242

[73] Ding Wang, Shantanu Prabhat, and Nithya Sambasivan. 2022. Whose AI Dream? In Search of the Aspiration in Data Annotation.. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 582, 16 pages. https://doi.org/10.1145/3491102.3502121

[74] Amy Wesolowski, Nathan Eagle, Abdisalan M Noor, Robert W Snow, and Caroline O Buckee. 2012. Heterogeneous mobile phone ownership and usage patterns in Kenya. *PloS one* 7, 4 (2012), e35319.

[75] Mesfin F Woldmariam, Gheorghita Ghinea, Solomon Atnafu, and Tor-Morten Groenli. 2016. Monetary practices of traditional rural communities in Ethiopia: Implications for new financial technology design. *Human–Computer Interaction* 31, 6 (2016), 473–517.

[76] Susan Wyche. 2017. Exploring women's everyday mobile phone experiences in Nairobi, Kenya. *Interacting with Computers* 29, 3 (2017), 391–402.

[77] Susan Wyche. 2022. Reimagining the Mobile Phone: Investigating Speculative Approaches to Design in Human-Computer Interaction for Development (HCI4D). *Proc. ACM Hum.-Comput. Interact.* 6, CSCW2, Article 535 (nov 2022), 27 pages.

https://doi.org/10.1145/3555648

[78] Susan Wyche and Charles Steinfield. 2016. Why Don't Farmers Use Cell Phones to Access Market Prices? Technology Affordances and Barriers to Market Information Services Adoption in Rural Kenya. *Inf. Technol. Dev.* 22, 2 (apr 2016), 320–333. https://doi.org/10.1080/02681102.2015.1048184

[79] Susan P. Wyche and Laura L. Murphy. 2012. "Dead China-Make" Phones off the Grid: Investigating and Designing for Mobile Phone Use in Rural Africa. In *Proceedings of the Designing Interactive Systems Conference* (Newcastle Upon Tyne, United Kingdom) *(DIS '12)*. Association for Computing Machinery, New York, NY, USA, 186–195. https://doi.org/10.1145/2317956.2317985

[80] Sarah Yu and Samia Ibtasam. 2018. A Qualitative Exploration of Mobile Money in Ghana. In *Proceedings of the 1st ACM SIGCAS Conference on Computing and Sustainable Societies* (Menlo Park and San Jose, CA, USA) *(COMPASS '18)*. Association for Computing Machinery, New York, NY, USA, Article 21, 10 pages. https://doi.org/10.1145/3209811.3209863