



From Grasshoppers to Secondhand Cars: Understanding the Smartphone-Enabled Marketplace in Peri-urban Tanzania

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ABSTRACT

The evolving socio-technical landscape in peri-urban Tanzania has paved the way for a dramatic increase in smartphone-supported micro and small enterprises. We conduct surveys and focus groups with 46 such entrepreneurs, shedding light on the internal mechanisms and external networks of their businesses. We uncover the new trust dynamics encountered in online interactions, the gendered aspects of this emerging business model, and the means through which people with low capital are reclaiming economic empowerment through entrepreneurship.

KEYWORDS

HCI4D; Smartphones; WhatsApp; Entrepreneurship; Tanzania

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1 INTRODUCTION

Lower cost mobile phones coupled with wider network coverage is broadening interactions between mobile technology and society in the Global South; for example, recent HCI and ICTD research [4, 14, 17, 27, 46, 49, 51, 56, 61, 63, 64] notes the utility of applications such as WhatsApp in supporting social and business interactions in education, health, and other sectors. Evidence suggests that the adoption of mobile technologies for personal or entrepreneurial reasons in Low and Middle Income Countries (LMICs) is often self-taught and conducted on shared devices [55, 67]. Beyond access limitations, “authority to use” impacts the usefulness of technology for marginalized segments of society. For example,

women traditionally have less access both to technology and the entrepreneurial opportunities it often makes possible [6, 15, 20, 52, 54].

Though recent HCI literature on East Africa briefly examines technology, gender, and entrepreneurship, it lacks a robust focus on emerging uses of smartphones in *peri-urban areas* (i.e., zones of transition located between the outer limits of urban and regional centers and the rural environment). One third of the population in low-income countries, including many of the world’s poor, live in peri-urban zones that have unique socio-economic and cultural characteristics [8]. With more stable infrastructure and economies, peri-urban areas and technology use therein merit further study.

This research builds on prior work in human computer interaction (HCI) and economics to shed light on peri-urban *smartphone-supported entrepreneurs* (SSEs) who have influenced their surrounding economies by adopting mobile technology. In particular, our first research question (RQ1) asks: How has modern messaging technology enhanced the internal dynamics and external networks of micro and small enterprises (MSEs) in peri-urban Tanzania? Our second research question (RQ2) asks: What are the environmental and societal factors that led to the rise in smartphone-supported MSEs in this area, and what are the effects of this rise on the surrounding market? Our third research question (RQ3) asks: What specific gender-based opportunities and challenges do smartphones open up in this landscape? To address these questions, we take a mixed methods approach, using quantitative surveys and in-depth focus groups with 46 micro entrepreneurs in Bukoba, Tanzania.

Our research illuminates the endogenous mechanisms underlying SSEs’ use of smartphones to start and grow their businesses, in many cases with scant initial capital or assets. We explore the diverse businesses dynamics enabled by smartphones, and subsequent effects that SSEs are having on the overall marketplace. We describe the social ties this entrepreneurial cohort forms, notions of trust that they navigate, and the impacts of the socio-cultural context on their entrepreneurship. Overall, our focus groups reveal that the adoption of smartphones in an environment with *mali kauli* (trust-based credit transactions) enabled the creation of businesses through which many SSEs, especially women, gained economic agency that they are otherwise denied by a patriarchal society. As a mechanism of circumventing barriers to entrepreneurship, this pioneering mode of business could exert a growing influence in LMICs’



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economies and so merits consideration from HCI researchers and designers alike.

2 RELATED WORK

In reviewing literature, we sought papers on basic phone and smartphone adoption by MSEs, women's access to and use of mobile phones, as well as traditional credit transactions known as *mali kauli*. We prioritized literature set in LMICs.

Since the introduction of mobile phones in Sub Saharan Africa, there has been scholarship on the interaction between basic phones and MSEs in the region [10, 12, 13, 16, 23, 28, 29, 50]. Donner and Escobari (2009) [12] provide a review of 14 such studies. They find that basic phones raise the effectiveness of marketing and sales as well as reduce travel time for entrepreneurs. They don't uncover broad use for phones in inbound or outbound logistics, operations, and post-sale relationship maintenance, and find surprisingly little evidence that phones can help people start new enterprises. The authors state "there is currently more evidence suggesting changes in degree (more information, more customers) than for changes in structure (new channels, new businesses)." Regarding entrepreneurs' networks, Donner et al. (2006) suggest that new entrants in call logs were more likely to be business related, but a majority of calls in call logs were to friends and family, showing that basic phones deepen existing trust-based relationships that have been developed face to face [11]. Similarly, Jagun et al. (2008) [22] find evidence that mobile telephony strengthened rather than extended business networks in a case study based in Nigeria.

As smartphone adoption increases in these contexts, literature has emerged describing entrepreneurs' adoption of new iterations of mobile technology. For example, Kapinga et al. (2018) [26] explore the benefits of a smartphone app to both women entrepreneurs and their customers in Tanzania. They identify many challenges to using apps in this context, such as the cost of airtime, phone charging needs, and user training limitations. Modak and Mupepi (2017) [37] list internal team communication, customer support, as well as marketing and promotion as common uses of WhatsApp by small businesses in India. Some studies note that social media platforms have been leveraged to expand entrepreneurial networks [21, 66]. In contrast to Jagun et al. (2008), Wyche et al. (2013) [22, 66] note that the use of smartphones, specifically the Facebook application, can result in an expanded market beyond one's geographic area. Similarly, the use of WhatsApp to interact with social and professional networks has been documented in other domains, such as education [63], agriculture [24], and managing personal contacts [43].

Given the new information and communication behaviors facilitated by smartphone technology, there are several open questions about impacts of smartphone adoption by MSEs in LMICs. For example, most related studies focus on MSEs operating in large urban areas, describing integration of phones into extant entrepreneurial practices. Our work uncovers how smartphones can lower barriers to *starting* businesses, enabling the creation of several new MSEs in this socio-technical context. Further, we show that the smartphone-supported entrepreneurial paradigm is in part a reimagining of existing cultural practices and yet simultaneously alienating in the technology's imposition of Western norms on the community.

There are additional gaps in the ICTD and HCI4D literature about the nascent barriers to trust & privacy posed by the Internet-enhanced communication necessary to run a smartphone-supported MSE. Our work delves into the concept of trust in a socio-technical environment that is understudied in the HCI4D literature: one where *Mali Kauli* is a common practice. *Mali Kauli* refers to credit transactions based on verbal agreements between middlemen and MSE owners [7, 41, 47, 48]. In Tanzania and other parts of East Africa, it is common for small scale vendors from rural and peri-urban areas to visit and ascertain trustworthiness of middlemen (typically located in larger cities) to gain products on credit, considering the range of products sold, stability of product type per vendor, restocking behavior, source of obtained products, etc. [40]. In middlemen's role as creditors, they decide whom to trust with products, waiting to receive payment until the goods are sold [47]. While trust establishment has traditionally occurred by convening in the same physical place, WhatsApp and WhatsApp groups have now brought it online. We shed light on this new version of *mali kauli*, showing how WhatsApp groups of middlemen and entrepreneurs extend SSEs' networks to include new potential creditors. We delve into how trust is reimagined and identity is revealed in these digital spaces.

There exists a large body of work focusing on challenges to women in LMICs accessing and using mobile technology [20, 58, 65]. Regarding limited access, Bluenstock et al. (2010) found that women are statistically more likely to share a phone with others than men in Rwanda, while Ibtasam et al. describe Islamic contexts where household dynamics influence women's use of technology [6, 20]. Intersecting with these challenges are the social infrastructures that support or deny women the right to become an entrepreneur. A number of studies identify managing both familial responsibilities and running a business, coupled with negative societal perceptions of women entrepreneurs earning their own incomes as deterrents to women continuing to run successful enterprises [25, 34]. Lambin and Nyssölä [31] explore how policy efforts by the Tanzanian government to improve female employment fall short of their objectives due to women's lack of assets, dual work-home responsibilities, and lower education levels. In spite of these challenges, phone ownership and use has been a successful way for some women to navigate entrepreneurship. For example, recent papers set in Uganda and Kenya highlight the use of mobile phones by women entrepreneurs, finding that mobile phones usage increased competitiveness and enhanced information flow in such businesses [16, 28]. Nyajeka et al. (2022) [44] show that vulnerable women farmers in Zimbabwe are able to mitigate risks in livestock keeping through the use of mobile phones. We contribute to the ICTD and HCI4D literature by exploring gender dynamics as they intersect with new definitions of trust and creditworthiness in the expanded social networks that smartphones afford. We add to the Tanzanian scholarship [25, 31, 34] a new narrative in which women form the majority of people using a technology-based modality to circumvent challenges on the path to successful entrepreneurship.

Taking a broader lens, some prior work looks at basic phones' impact on the surrounding economy, exploring the impacts of mobile phones on price dispersion, information asymmetries, and overall market performance [3, 23]. We contribute to the literature by

describing impacts of the smartphone-supported business paradigm on how people view labor, capital and ability to engage with entrepreneurship in this emerging economy.

3 BACKGROUND

In recent decades, phone ownership has risen dramatically in Tanzania. The first phase, until the early 2000s, is characterized by low, predominantly male ownership [42, 57]. Access to mobile phone services was limited to Dar es Salaam (the biggest city in Tanzania, 1,400 kms from our study area) and gradually moved to other urban centers. When mobile phone services were available, air time ("bundle") was expensive, and rural users faced significant challenges in charging phones [39]. Some people did not purchase necessities such as food and scholastic materials in order to keep their mobile phones active [39]. At this time, mobile phones had supported basic features such as text messages and placing calls.

The second phase of mobile phone use, late 2000s to early 2010s, saw mobile phone subscribers growing from 10.4 million to 25 million between 2008 and 2013 [33]. Increasing numbers of service providers fueled competition, which reduced air time costs, and providers began to offer internet access and services with social media, such as Facebook and multimedia messaging. Mobile money services emerged, such as M-Pesa (2008) and Tigo-Pesa (2011).

Between the mid-2010s and 2020, the third phase of mobile technology use witnessed the rapid adoption of smartphones and social media services. For example, WhatsApp became a popular means of communication and multimedia messaging. These services led to the formation of social groups, including family-based groups and groups of peers or business associates. Business information and ads were increasingly communicated via social platforms, and mobile service providers started to provide agricultural market information through mobile phones.

As of 2020, 86% of the population in Tanzania had a mobile cellular subscription, up from 0% in 2000 [1]. A 2019 GSMA report showed 86% of adult men and 77% of adult women in Tanzania owned mobile phones [53]. This gender gap in Tanzania is significantly smaller than in other countries; e.g., Pakistani women's mobile phone ownership is approximately half that of men's [19]. Internet in Tanzania continues to rise at a less dramatic but significant pace: as of 2020, 22% of the population of Tanzania used the internet [1]. In the same 2019 GSMA report, 35% of adult men and 17% of adult women were mobile internet users [53]. Data bundles are among the cheapest in Africa, at 75 US cents per gigabyte [5]. As of March 2022, Tanzania had 35.7 million mobile money subscribers, with M-Pesa having 40% of the market share [32].

Our study takes place in and around Bukoba, a small city in the Bukoba Municipal district in the Kagera region of northwest Tanzania, bordered to the west by Rwanda, to the north by Uganda, and to the east by Lake Victoria. The region is primarily rural, with around 2.2 million people, and 74.9% of the employed population aged 10 and over in the region claim farming as their main occupation. The largest share of the employed population aged 10 and over in the district of Bukoba Municipal (17.4%) include as their main occupation service workers, shop and stall sales workers. Bukoba's open market contains vendors that sell vegetables, clothes, pots and pans, etc. The town has one central post office where people

can retrieve packages, but this is not a typical activity for most households. The standard way for goods to travel around Tanzania is in the storage hold of public buses, where people can deposit items for a nominal fee and the recipient can collect them at another bus stop. This mechanism enables shipment of goods from Mwanza and Dar es Salaam (among other cities) to Bukoba. In Kagera, more than twice as many people are found to move from rural villages to towns/small cities (like Bukoba) than to large cities [9]. This makes it an ideal location to study technology adoption in peri-urban communities around smaller cities.

4 METHODS

This study emerged as a component of a larger development economics project undertaken by our group and other collaborators in northwest Tanzania. Below we describe our research methods.

4.1 Participants

We recruited participants by tapping resources of paper authors Mpogole and Mulisa as well as two staff of an affiliated project, all Tanzanian; they have a combined 30 years of experience working with Tanzania communities. Each staff member posted a WhatsApp status (statuses are described in the next section) through which they recruited participants. In addition, they looked through business-related WhatsApp statuses they saw, asked those business owners to be a part of our survey, and requested that they repost the status soliciting others to participate as well as a means of snowball sampling. Inclusion criteria were currently operating a smartphone-supported MSE that participants started at least 6 months prior to the survey, based in the surrounding peri-urban areas of Bukoba. A sample of 46 participants, 35 women and 11 men, were successfully recruited, and we received survey responses from forty-five of them (34 women and 11 men). Participants received a 5,000 TSh incentive (\$2.14 USD) for engaging in the project. Hereafter, each participant is identified by coupling their focus group, (e.g. Group 4 is noted as G4), and their random id, (e.g. Participant 8 is noted as P8) to maintain anonymity. Gender is listed after identifier to give context where necessary.

4.2 Study Procedures

We followed a mixed-methods approach to data collection. First, Author 4 and two staff conducted quantitative phone surveys. The surveys were designed by the first 3 authors in English (2 American women (one South Asian and one Caucasian) and one Tanzanian male). Surveys were translated into Swahili before administration.

In addition to age, marital and family status, survey questions asked about income, whether the respondent has a bank account, and employment status prior to starting their first mobile business. We then asked questions specific to a respondent's main smartphone-supported MSE, including how their customer base, profit levels, and productivity have changed for those who had converted from a physical to a mobile business. This section of questions also asked about the likelihood of and barriers to starting a businesses (both mobile and physical) for men and women.

Post surveys, we asked participants whether they would consent to participating in a focus group to discuss phenomena we were seeing regarding gender, economic activity and technology

in smartphone-based businesses. Group discussions would allow the SSEs to connect and brainstorm in person, while helping us understand the dynamics of social processes that typically happened virtually. Forty-five people agreed to participate, and we divided them by gender into five groups of six to ten SSEs each. The three focus groups of women were run by Authors 1 and 4, and the two focus groups of men were run solely by Author 4 due to their smaller size. Discussions captured information using more open-ended questions concerning business practice, phone use and gender. Topics included initial motivation to start a mobile-supported business, sourcing products, advertising, support networks, and challenges to running a mobile business.

4.3 Analysis

Survey responses were analysed using Python and Stata. Focus groups transcripts (in Swahili) were translated to English and reviewed by all authors. We acknowledge that the translation process is inherently limited in the face of culturally relevant terms that don't have an English equivalent, and therefore assume some loss of meaning even from experienced translators. Thematic coding was undertaken, highlighting internal changes to business mechanism, and external changes to business network and markets. The quantitative and qualitative data obtained were corroborated to look for any trends or outliers. An IRB exemption for this study was obtained from Cornell University and the University of Washington.

5 FINDINGS

We organize our findings into the following sections. *Growth of MSEs* describes the rise of smartphone-supported MSEs with diverse internal mechanisms. Each subsequent section describes how individual SSEs interact with the broader market. *Social Networking* explores how WhatsApp groups enable new paradigms of logistics and relationship maintenance. *Trust* describes how the new practices combined with *mali kauli* test and morph traditional dynamics of trust. *Gender* details how opportunities and achievements in mobile-supported business differently impact women and men. *Limitations of Technology* describes the challenges that people face with current technology supporting their enterprise.

5.1 Growth of MSEs

As smartphones become less expensive, and internet connectivity becomes more expansive, WhatsApp is becoming an integral way to communicate with friends, share emotions, pass on photos, etc., in peri-urban Bukoba. G2P8 says: *"I have a phone and can see diverse kids' clothes through WhatsApp status and on TV. But all kids in Bukoba are wearing the same clothes from the market."* She aspires to own different clothing for her children but does not live in a large urban area with a diversity of clothes on offer. As WhatsApp is a familiar carrier of community discourse and imagery, it is uniquely positioned to be adopted for a new style of entrepreneurship in response to the growing desire for differentiated products. This is where our participants and their MSEs come in, endogenously adapting WhatsApp to suit the East African entrepreneurial landscape. Below, we describe the internal mechanisms of smartphone-supported MSEs.

The SSEs we interviewed cite the primary use of their smartphones as interfacing with customers: advertising products through WhatsApp statuses and taking orders through messages and calls. WhatsApp statuses are photos and captions uploaded to the app, visible to all contacts for a duration of twenty-four hours. Each user can post as many statuses as they like; see Fig 1. As G1P1 said, *"It's not easy to tell everyone that you are doing a certain business by word of mouth. Posting everyday creates customers."* G1P7 noted how sharing photos has been a part of marketing in Bukoba prior to smartphone permeation: *"My mom has been a decor person since way back before smartphones existed; and it has always been important to 'see' businesses. [...] we used to have photo albums that display décor projects she has done over time. The only difference now is that lots of work is done with a phone with less weight, so we term this as advancement from the past."* Thus smartphone-based business integrates with practices indigenous to the community that are being adapted to a new socio-technical context. All SSEs use their smartphones as cameras to take photos of their goods, some even using apps like Snapchat to apply filters, before showing their wares off through WhatsApp statuses.

The next most salient use of smartphones is to join WhatsApp groups to source and market products. While some business owners make or grow their own products, with artisans hand making bags and dresses and farmers and livestock owners growing their own poultry or *senene* (grasshoppers), products such as clothing and car parts are sourced by some SSEs through WhatsApp groups from as far away as Dar es Salaam and Kampala, Uganda. Goods come to these large cities from Turkey, China and other countries. This shows WhatsApp's role in substituting travel, whereas before entrepreneurs would have to take the bus or the train to a big city to select wares to resell. Therefore, WhatsApp groups enable businesses to see and source products from much farther away than prior business modalities. In tandem with using their phones for procurement, many SSEs report using their phones to contact *boda bodas* (motorbike taxis) to help with local delivery logistics. Finally, most participants report using their smartphones for M-Pesa and other financial apps which allow them to transact digitally.

Beyond these fundamentals, there is a great diversity in how the smartphone-based business model has been adopted by people of various incomes and various business types. As an example, some SSEs are street vendors, carrying their wares to office buildings, using their phones to amplify advertisement and decide their routes for the day; some SSEs have stores that they own or rent while using WhatsApp purely for procurement; and some SSEs are fully mobile business owners, meaning that they use their phone to procure, show off their wares and interface with customers. The range of products and business strategies available through smartphone-supported MSEs is truly remarkable, especially when we take into account that each SSE sources their own goods and distributes them in the absence of a central online marketplace or postal infrastructure. This means that one's advertisement is limited to their own contacts and their means of obtaining goods is limited to the buses that move between bigger cities and their peri-urban area.

Although people in Bukoba can now more readily access lower cost smartphones, electricity, and Internet, we recognize that we describe the choices of people who want to do business and are able to purchase a phone. For context, our SSEs report monthly incomes

Variable	Women	Men
Age (years)	21-24: 1 25-34: 24 35-44: 6 45-54: 2 55-65: 1	25-34: 10 35-44: 1
Marital Status	Married: 18 Not married: 16	Married: 4 Not married: 7
Number of Children	Has children: 20 Has no children: 14	Has children: 6 Has no children: 5
Income Last Month in TSh (USD)	Min: 50,000 (21.43) Median: 250,000 (107.16) Max: 1,500,000 (640.94)	Min: 20,000 (8.57) Median: 300,000 (128.59) Max: 1,500,000 (640.94)
Education Level	Completed secondary: 9 Technical school/certificate: 6 Some or complete university: 19	Completed secondary: 7 Some or complete university: 4
Bank Account	Has a bank account: 33 Does not have a bank account: 1	Has a bank account: 10 Does not have a bank account: 1
Number of businesses	1 business: 25 2 businesses: 5 3 businesses: 3 4 businesses: 1	1 business: 9 2 businesses: 2

Table 1: shows summary statistics of survey responses.

ranging anywhere between 20,000 TSh (USD 8.57) to 1,500,000 TSh (USD 642.92). From our discussions with street vendors to large-scale car dealers, we find that renting a stall and stocking a variety of products to conduct business is prohibitively costly. Several SSEs in our focus groups mentioned that they purchased a smartphone to circumvent these barriers when beginning an enterprise. G2P6 said *"I used to go shopping and find nice products that I couldn't afford to bring back to customers. If I came back and told people about the products, they wanted to see them. I couldn't show them because I had no smartphone. People advised me to get a smartphone, so I bought one and started posting statuses."* Owning a smartphone allowed SSEs to display goods and services to people without committing the capital to stock them, underscoring that adopting technology proves a cost-effective way for resource constrained individuals to *begin* new businesses. With a slightly different perspective, per G4P3, having a smartphone and posting a status that received several replies was what gave him the idea to start a business: *"One day I saw a car and I really liked it so I took its picture and made it my status; every viewer was asking what is this car, how can I get it, and how much in case I need it... then I saw status as a business opportunity."* Here we see that risks are mitigated through smartphones enabling SSEs to test the market and grow clientele without committing to beginning an enterprise. Recognizing the potential of smartphones, some SSEs report saving for a smartphone over time and sharing phones with family and friends in the interim. Per Artisan G2P4, *"I had no smartphone, I used a basic phone. I used smartphone through my sister, she liked posting and posting. She posted her products and named the price of the product. I was inspired too, so I started trying to post."* When sharing devices wasn't a possibility, some participants noted that they circumvented smartphone costs by buying counterfeits,

known as "copy phones." Per G2P6: *"Funny enough, they look exactly the same, copy and the original, no difference"*.

The adoption of phones into peoples' business practices has had a significant impact on their business outcomes. 100% of participants report that their income and customer base have grown since incorporating smartphones into their business practices. As G5P6 says, *"I was selling 50 trays of eggs before phone business but now I can sell 500 plus trays of eggs a week."*, and G2P8 notes: *"I had no shop. I reached a stage where I could stay online. Through the phone I saw no need to rent a stall because I could sit and collect 60,000 or 100,000 TSh (\$24 to \$40 USD) in a day posting statuses of my products."* Therefore, we see that the smartphone-supported business model allows for sizeable entrepreneurial growth in this area. These effects are magnified for those that were previously engaging in manual labor with little returns. G1P5 describes the physical exhaustion that was mitigated by saving up for a smartphone, *"I started my business as a street vendor; I used a lot of strength walking from place to place displaying my product. After some time at the end of each of day, I ended up so tired."* The reintroduction of images into marketing, as well as their easy transport through WhatsApp to many viewers, changed how our SSEs define labor in business-making. Per G1P2, *"You can't make a cake with no eggs, so it's more like no mobile no business."*

5.2 Social Networking

The underlying theme of participants' use of WhatsApp is communicating ideas to large numbers of people. Verbal greetings are extensive in Tanzania, which translates to people sending "Hello, good morning" messages or posting such statuses regularly. Further, the practice of saving everyone's phone number upon meeting

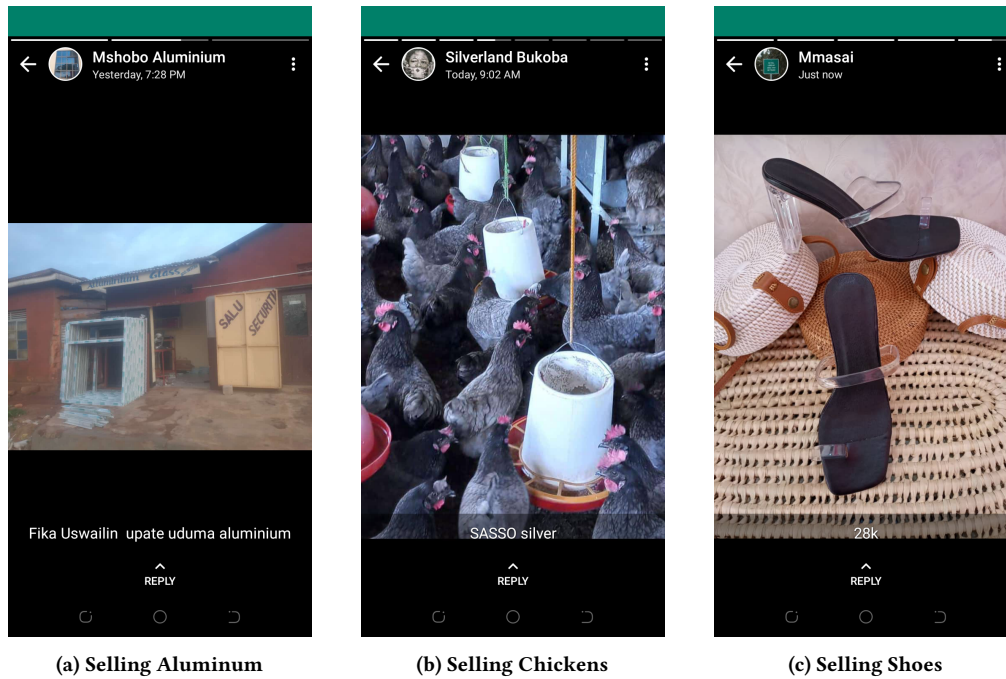


Figure 1: Examples of WhatsApp advertisements in Bukoba from SSEs that are not in our study.

leaves people with hundreds, sometimes even thousands, of contacts on their phones. This makes it easier for SSEs to make and maintain connections through WhatsApp. About half of the participants we interviewed mentioned that their contacts help amplify their messages on WhatsApp to keep new customers coming. As G2P5 notes, “Our daily customers or people close to us will direct customers to my phone number.” This mechanism of smartphone-supported MSEs is therefore a product of unique combination of societal factors that are easily amplified using technology.

Beyond messaging, calling, etc., which are accessible to people with basic phones, and beyond posting statuses, WhatsApp allows its users to join groups of up to five hundred people. These groups take different shapes in Bukoba, starting from self-organized groups of business owners who support one another. For example, as G2P1 notes, “You sell perfumes and I sell clothes. I give you my business and you give me yours.” Other groups with external admin ask business owners to pay a fee to the admins (5,000 TSh/week (\$ 2.14 USD) and follow rules that involve posting on behalf of other sellers. According to G2P8, “There are new groups formed with 100 businesses. Each day, admins will select 10 businesses. Each business owner in the group is required to post a status about those 10 businesses to all of their contacts. You are supposed to meet the requirement and post everyday; if you don’t post, you are removed or told to pay a fine.” This unique form of mutually aggrandizing social networking is interesting as it exposes SSEs to new markets and new customers without paying for paper advertisements, which participants say are ineffective. G1P2 says, “I don’t read ads when I pass by various places. [...] It’s simpler to buy a bundle compared to paying for those print ads which involve Tanzanian Revenue Authority (TRA).” Finally, there are groups for individual businesses that resemble

ROSCAs [35], collecting fees through mobile money and giving participants products on a weekly or monthly basis. As G1P4 says, “There is this girl who creates WhatsApp groups based on geographical locations of customers. 1000 TSh is collected from each participant weekly, and each Saturday one participant receives kitchen utensils of her choice.” This example shows an SSE leveraging a subscription working through a ROSCA model on WhatsApp groups to deepen customer relationships and renew sales.

5.3 Trust & Privacy

In focus groups, we explored relationships that demand trust in the entrepreneurial setting, and how these notions have changed given the adoption of smartphones. The first relationship is *between distributor and seller*, which often takes the form of *mali kauli* in Tanzania. Previously, inbound or outbound logistics were handled by an SSE who would travel to the city to establish trust with a wholesaler, viewing goods first-hand. This incurred costs in the form of both bus tickets and time. Some of these costs were mitigated by the use of a basic phone. Now, given WhatsApp’s ample groups containing both sellers and wholesalers, owners can view pictures of new products from faraway middlemen and begin procurement with lower cost and greater ease. They can message these vendors directly on Whatsapp and form long-lasting relationships.

Where people wanting to start a smartphone-supported MSE in other areas would need to buy a phone and subsequently pay up-front for goods, in Bukoba, sellers can leverage *mali kauli* to launch new businesses, getting their initial batch of products on credit while they build capital. Per G1P3, “My reason to start a mobile business is lack of capital. I just posted screenshots of statuses from a wholesaler without owning the products or even having the money

to buy them. When I got five orders from customers, I ordered those products through a WhatsApp group I joined; a bigger wholesaler sends the products based on mali kauli. After I sell them to customers, I pay the vendor back. In the long run, this is how I secured capital." We observe that with smartphones alone, business owners may be unable to subvert their lack of assets and pursue entrepreneurship. However, in the presence of a cultural system that helps low-capital SSEs launch businesses, mobile technology can amplify efforts and begin partnerships to groups of creditors. Therefore, smartphones not only increase information availability but also increase the potential assets that SSEs have access to when they become part of the groups of wholesalers.

However, this "efficient" online system of sourcing can lead to unintended consequences. Several sellers reported negative experiences with online-only wholesalers, with a few saying that they still preferred to vet goods in person before they made purchases. G2P6 notes spending significant money to buy sheets and duvet covers after viewing them on WhatsApp, only to see that they were very small and of poor quality when delivered to her. G2P5 says, *"We lost our money to [Tanzanian distributor]. Tanzanian middle people are thieves."* Thus, in this new paradigm, it is hard for SSEs to know whom to trust, raising the need to uncover ways to ascertain the legitimacy of individuals online.

Next, we consider the *trust between seller and customer*. Participants report that phone-based rather interactions raise issues in cases where pictures may fail to adequately represent products. For example, G2P1 says, *"There is this customer. I delivered the scarf to her; she said in the pictures she saw a different pink color. And I came back with my scarf."* This respondent spoke about how she suffered losses on transportation due to this and other such exchanges. While making sales through posting statuses helps business owners build credibility over time, they suffer losses when customers have alternate expectations of products based on picture quality. Business owners say that "return-related" loss, while inevitable, is especially hard to absorb when the commodity they are trying to sell online is perishable (such as *senene*). In much the same way as SSEs need to build trust over time with wholesalers, customers take time to trust SSEs' statuses. Some of the reckoning with online images might be cultural. Per G5P1, *"Some customers don't trust status business due to fear of fraud. For example, if I post a car on my status, people won't believe that I sell cars; but if I take a physical car outside my shop, everyone will believe that I am selling it. I am ignored because we Africans don't trust and believe in online business."* So, though SSEs can get their products out to many more people, current culture regarding seeing items firsthand might keep customers from making purchases.

Creating trust often involves the exposure of people's identity through posted images online. In the words of G1P7, *"Among the very best strategies to do business online is to show your face. When you advertise with the products and expose your face, this creates a sense of trust for a customer to be eager to purchase a product from you."* However, this greater visibility can have grave repercussions. Government officials from the TRA now use WhatsApp to find unregistered businesses. Per G4P2: *"I sold a car over status, so I decided to post a status thanking the buyer. Then I received a call asking for a meet up to talk about the car business, and I gave the 'customer' directions to where I was. After a short time, TRA agents*

came along asking why I sell cars without a license." Though a similar interaction could have occurred if a TRA agent walked by a vendor, there is amplified exposure that WhatsApp statuses pose, given that people repost one another's statuses and provide contact details of business owners to anyone that enquires. As to why SSEs would not simply register themselves with the TRA, businesses incur a cost to register, and not all businesses qualify given rules surrounding registration. Some of our respondents shared how the registration process was confusing to navigate, and therefore they feared being exposed to significant risk (such as heavy fines) if their statuses were viewed by the authorities. This is one negative impact of advertising mechanisms enabled by WhatsApp groups stochastically expanding networks.

5.4 Gender

When asked about the owners of smartphone-supported enterprises in Bukoba, 97% of women and 100% of men stated that women are more likely to start a mobile-supported business. For context, another study we are conducting in Kagera shows that 58% of all shop owners are men, and in particular, 57% of all of the physical businesses associated with a smartphone are owned by men¹. The fact that more men own smartphones, yet more women seem to start smartphone-supported MSEs directly contrasts the idea that access is equivalent to use. Even though we attempted to sample SSEs without gender constraints, our participants ended up being 75% women. We were curious about why more women seem to adopt the WhatsApp-based business paradigm, given that women are often less likely to adopt and feel authority to leverage new technology.

First, women noted that using smartphones was a key way to begin low-capital businesses. Per G2P1: *"I used to like doing business, but I had neither capital nor a frame. If I was a man, he would take those things and put them in a frame and start doing business. Because he has a lot of capital. But because I had low capital, I decided to start posting; it's very rare to see men posting."* This difference in start-up capital between men and women was referred to by thirteen women and six men in survey responses as a reason that women could not begin a business through traditional pathways. In our study population, the average upfront cost incurred to start a business was 100,000 TSh (50 USD) for women and 200,000 TSh (100 USD) for men. G2P8 describes the cultural underpinning of this difference: *"I can wake up in the morning and buy bananas and start selling them in my street. That is difficult for a man. Do you understand? A man starts their business with big capital. It isn't shameful for me to be cooking, selling bananas or doing other activities."* Further, we see that 94% of our women SSEs primarily use smartphones to run their business, whereas only 36% of men primarily use smartphones, indicating that men are able to rely partially on physical stores to display their products and advertise. This underscores that women are more likely to run fully mobile-based MSEs.

Second, both male and female participants report that they trust women more than men, and this plays out in the form of who benefits from *mali kauli*. G2P8 (female) believes that *"Men are not trusted because they take risks when it comes to money. It is simple for a man*

¹These statistics are from a forthcoming paper, obtained by a census we conducted of business owners in 120 villages in Kagera

to go away from his home, but a woman with kids cannot run; instead, she will take her whole family. It's very easy for a man to risk and say give me 10 million, and the next day he is not there. [...] Because women are emotional, they don't think only about themselves. They will think of the kids, husband, the mother, the father and relatives, but for men they will be thinking only for themselves. They will say, "I have taken 10 million and am shifting, am going to Uganda, and we won't see you, and you get married to another woman." Interestingly, this sentiment was echoed by men, as G5P1 (male) notes "Men are brave so it's normal for them to disappear and destroy their contact number after collecting contributions from group members... How can a woman leave a place so simply? Women aren't as mobile as men." Motherhood is referenced by women as an example of why they are to be trusted, but it also seems to be a reason in men's eyes that mothers are employees rather than owners. In the words of G4P3 (male), "Most women, especially family women who take care of their family, don't have time to open shops in town, but they do their business via their phone by simply posting. It's a normal thing..." In this way, we see that women aren't primarily using smartphones to be able to communicate while they are away from the home, as was seen as the main "mobility" affordance of basic phones when compared to landlines. Rather, they use smartphones to circumvent immobility that is caused by household responsibility, i.e. smartphones allow them to stay within the home and still carry out complex business activities.

While both men and women agree that women are the bigger forces behind smartphone-supported MSEs, many of the reasons they gave beyond trust totally differed from women's reasons. For example, G5P2 (male) says, "It is because a woman has a lot of idle time; she doesn't get occupied by a lot of responsibilities like a man does." and G5P3 (male) concurs, "Most of a woman's time is spent on the phone compared to us men. My Instagram account for my business is operated by my wife because my wife has time and opportunity" G5P4 (male) cites WhatsApp groups being primarily filled with women: "Something like twenty women agree to post a certain business altogether, so women are supporting the business in operation; that's why they are more" he adds, "but shops are owned by men, so we as men believe that [...] women are there to invite and attract customers to make profit." When referencing WhatsApp groups to advertise business, G5P1 (male) says, "No, personally I don't know such groups ... men do like to struggle on their own to solve their own issues."

While many women feel encouraged by their spouse or parents to start a business, some feel curtailed by spouses that do not allow them to do so. Three women cite social pressure in response to our survey questions about why women are less likely to start a physical business in Bukoba; no men cite this as a response. Per G1P6 (female), "There are those women that are married, and their husbands don't want them to even go outside. They ask their friends to do business on their behalf so that their husbands don't know." Per G1P4 (female), "Before we got married, my husband promised to support me in opening a business. But after we got married, he said he gives me all the basic needs, so there is no need for me to work. But I had my important needs, and I wanted to depend on myself." These quotations reveal that many women aspire to start businesses and achieve economic independence; further, per G2P8 (female): "it's because of the kind of men we have these days; we have no option.

We have to go outside and work. The man leaves no money at home. You can buy a single plantain and start selling it on the street. We must do that to sustain the family."

Crucially, businesswomen report exploitation and harassment from both customers and wholesalers. As G4P5 (male) notes, "Most of the middle personnel are men." Therefore, power dynamics along gender lines prevail in many interactions between strangers over the phone. G2P4 (female) says, "When I order my materials in Mwanza, I choose the colors I want for sewing thread. [...] When the order arrived, I found they had sent me wrong colors. And they took me for granted. They knew I was a woman and said she can't say a thing because she is a polite girl." The same is true for interactions with customers; per G2P1 (female), "There was this man who bought things for his wife from me. [...] When you remind him of the debt, he becomes so furious. So what I did was I got another man to talk to him about my money. [...] you can't believe he paid all the money. And I thought he did all that because I was a woman." These issues prove that social context can minimize a women's agency while exploiting her labor. The female business owners themselves feel this deeply, as G1P7 says, "One thing I can say, and I don't say this because I'm a woman, [...] many businesses are owned by women but are not acknowledged or recognized. Women are working so hard in Bukoba", and several women in the group agreed.

5.5 Limitations of Technology

There were several challenges raised with using WhatsApp and related smartphone technologies. Cost-related barriers included phone price and quality. Participants reported difficulty obtaining an smartphone that would take good quality pictures, and they mentioned that copy phones (counterfeits) may not serve their purposes. Lack of formal technological understanding makes it hard for some participants to decide what phone will serve their purposes within their budget, and whether the phone they are buying is genuine. G1P7 described how she uses her airtime to view statuses of her inspirations to learn new techniques to post her products and to follow up with customers. Thus, bundle costs cover day-to-day business costs as well as "training," or the cost of improving the quality of one's own posts. Participants posited that if bundle costs decline or they could post with no bundle (through a free wireless network), it would help them engage more with their network and improve their posts. On top of bundle costs are those associated with charging phones, which has gotten cheaper with the expansion of electricity.

When participants described limitations of WhatsApp as a platform for business, the most common concern was that posted statuses last for only 24 hours, meaning that every day, business owners must use their data bundle to re-upload images to ensure persistence. Further, WhatsApp does not allow people to search through statuses or groups. For example, there is no search methodology to find statuses from used car vendors. Therefore, consumers may remain disconnected from products that they want, potentially favoring SSEs with large pre-existing networks. On the other hand, when viewing statuses, as one contact's statuses finish, the next contact's statuses follow immediately. G4P4 (male) says, "I have Muslim sheikhs as contacts on WhatsApp, but they are not interested in my photos." Per Int1: "How is this different from those who decide to

have physical stores?", and per G4P4: "Someone knows exactly what they are going there to buy before visiting the shop. But in statuses, we force people to see things that are not for them." Therefore, this feature may show contacts unexpected products or advertisements that they do not intend to see. Another challenge with status images is plagiarism, says G4P1, who sells his art on WhatsApp: "When I post on WhatsApp, someone can steal my business. Let's say as I post, my friend reposts them in his account and takes my clients." Copying statuses and posting them as one's own prevents customers from being aware of the creator of the product, who took time to generate the images or source the products.

Unlike the Western context, businesses in Bukoba do not typically rely on any centralized online resources. This is innately a challenge to this nascent form of entrepreneurship. For example, Google Maps is not commonly used by SSEs or customers. This is cultural, in part, as respondent G4P1 (male) says, "White people travel just by Google Maps [...]. This is not an African culture. [...] I decided to have a website for my business for white customers." Int1: "It is for whites so you decided to apply whites' behavior on it?" G4P1: "Yes." This remark shows awareness among participants of how technology supports businesses in the West, and simultaneously an acknowledgement of how it doesn't inherently fit the African customers' expectations. Another example, as mentioned by G2P6 (female): "One day I came across an app and decided to join it to sell my products. [...] I had no knowledge of how to use it, and people asked for my products but I didn't know how to answer. To continue owning it, I was supposed to pay for services by Visa. I couldn't, so I stopped using it." Her quote, and comments from other participants, describe the multiple challenges in using available online marketplaces that are not designed for indigenous peoples, who may be unused to operating apps and online storefronts. G1P7 reports using Instagram for Business with success, but G2P6 cites it as a very expensive way to post. Many participants showed a willingness to pay for an online marketplace, but not by credit card and not at the amounts that Instagram charges. That many of these products were designed in the West, and quote prices in USD, enforce a distance between people and the technology; as G5P4 says, "I think because e-payment on business account are directed on US dollars, and here we have a wrong idea that every amount of money presented in US currency is high, so people do not bother to know it will be how much and how it works." When asked about how technology is integrating into the population, G5P4 notes, "our environment in Africa doesn't show us a way out; all of these medias we are using and networks are not ours; they came from white people and we are only influenced to use it." This indicates a lack of identification with the technology and its creative use due to necessity rather than by choice.

6 DISCUSSION

We compare and contrast our findings with existing literature and provide design recommendations based on the challenges expressed by our SSEs.

6.1 Technology & Infrastructure Affordances

The available technology infrastructure, including expanded internet access, cellular coverage, inexpensive smartphones, and mobile

financial services, meet social acceptance to create a rich environment for smartphone-supported MSEs in Bukoba. For example, over the last fourteen years, various forms of financial services (such as M-Pesa) have become widely available and accepted, and transformed the process of making purchases from vendors.

Each new iteration of mobile technology adopted by a community has led to changes in businesses as well as the surrounding marketplace. Jensen et al. (2007) mention that "fishermen with [basic] phones, often carrying lists with the numbers of dozens or even hundreds of potential buyers, would typically call several buyers in different markets before deciding where to sell their catch." [23]. While smartphones are portable devices like basic phones, they enable new and important facets of information and communication behaviors, i.e. the ability to "see" products on WhatsApp. Such specific affordances of hardware and software allow the internal mechanisms of smartphone-supported MSEs to be different from those of basic phone supported MSEs. In our case, smartphones are leveraged by SSEs to communicate with customers, post advertisements, grow networks, handle logistics, access credit, and redefine labor (ex. averting physical exhaustion faced by street vendors).

While Donner and Escorbari (2009) [12] argue that basic mobile phones did not afford for the creation of new businesses, we observe a growing trend of MSEs established using smartphones. In comparison to traditional methods such as renting a shop and procuring stock, smartphone use circumvents barriers to beginning entrepreneurship, lowering costs of entry especially where phones sharing or availing of lower cost counterfeits is commonplace. This reflects and strengthens claims in previous literature that phone use has economic and risk mitigation impacts [44]. We infer from our results that smartphones, particularly in the hands of women in this context, have the potential to spur entrepreneurship and economic growth.

6.2 Socio-Technical Context & Trust

Smartphones magnify *Mali Kauli's* impact on new market ventures. If not for this existing social support system, many people creating businesses may not be able to afford an initial stock of goods. This aligns with the theory of technology as an amplifier, building on society's infrastructure for letting people enter the market with little or no capital [60]. A further market-level impact made possible by WhatsApp groups is the introduction of products and alternatives in smaller peri-urban areas that may otherwise be less connected to goods in the global market. Now goods are more diverse and available than before, due to specific WhatsApp groups that were created to promote sourcing while also extending SSEs' networks to include new potential creditors. This is an extension of the network impacts of using WhatsApp beyond reaching customer groups in further geographies as noted by Wyche et al. and others [16, 28, 66].

Several parts of this smartphone-supported MSE paradigm hinge upon trust: and in each case, traditional notions are challenged. Pertaining to trust between customers and businesses, Jack et al. [21] state that "shop owners we spoke to have a storefront and referenced the added legitimacy a physical store gave to the business." However, we note that several of our participants report being unable to afford a storefront to imbue confidence with customers. In most business relationships, building trust is reimaged through

revealing one's facial identity in statuses. For SSEs that have one phone, personal and private statuses intermingle. There are risks in this, whether it is neighbors getting a sense of a growing enterprise, or TRA agents who take legal action against unregistered sellers with the intersection of the digital and informal economies. We emphasize that in revealing identity details, SSEs are trusting society to see their business and invest in them so that they can make good on promises they make to wholesalers through *mali kauli*. In doing so, SSEs open themselves up to larger, unknown markets, and are left vulnerable in the face of non paying customers or large wholesalers looking to scam.

A different challenge in fostering trust is the inability for parties to vet products physically. Since no infrastructure or social understanding is in place to allow for the return of products (such as Amazon provides), SSEs must often absorb costs relating to customers changing their mind or middlemen sending defective products. It is easy to see why customers and business owners alike are put off by the differences between product and picture. In Bukoba, this leads to a distrust in technology, where some business owners say that they will always travel to pick up their products in person from wholesalers that they know rather than buying them through WhatsApp groups, even though they themselves sell products online.

6.3 Gender-Based Realities in the Marketplace

Our survey results show that Bukoban women have lower capital and more familial obligations than men when starting a business. From related work [45, 53] we know that men have more access to smartphones in this region. However, in Bukoba, we see women starting smartphone-supported businesses at greater rates than men. What is especially important is that many women are entering the workforce for the first time through beginning a smartphone-supported MSE. While there are similarities with the environment in Pakistan as described in the work of Ibtasam et al. [20], the barriers to business creation are much less severe.

There are specific facets of smartphone-supported MSEs that benefit women looking to start an enterprise: they require less risk, lower startup capital, and can be carried out wherever SSEs are. These factors may not be as impactful to men who have increased access to capital and lower societal restrictions. For example, while some of our participants say motherhood disempowers them from starting a physical business in Bukoba, they agree that technology helps them take ownership of their time away from household or maternal responsibilities. These results are consistent with the view of Suri and Jack [59] who argue that mobile money (specifically M-Pesa in Kenya) has "increased per capita consumption levels" with impacts "more pronounced for female-headed households."

Upon commencement of the smartphone-supported MSEs, socio-cultural dynamics cause women SSEs to be looked upon both as more trustworthy in online settings, while simultaneously diminishing their creative uses of technology in making social support structures. Notions in society of a women's role as immobile mothers inspires greater trust with faraway customers and easier integration with *mali kauli* as middlemen don't believe that women would escape with credit given to them. However, women contend with harassment from customers and middlemen alike, and view this

is just another part of doing business. Men do not report needing to contend with this challenge when doing business online. This "restricted agency" conferred by smartphones is consistent with prior work in Vietnam [18].

The idea that women in business gain profits and leverage by "attracting" new customers exists in the eyes of all SSEs, but this reduces and objectifies women and diminishes their entrepreneurial efforts. Further, men view women working together using WhatsApp groups to promote each other's businesses as not solving problems on their own as men would. In reality, we see women creatively leverage their chief assets: each other; promoting the MSEs of friends, family, acquaintances, and other business owners in order to collectively gain economic empowerment while helping other women who want to enter the new economy. This phenomenon mirrors economic and HCI4D findings in related domains where women form and lean on support groups in the face of complex challenges [30].

Although WhatsApp proves to increase profits and customer base across all businesses we observed, the impacts of entrepreneurial success differ along gender lines. To men, women's success in this business is defined by their limited resources, i.e., they are succeeding at a lesser activity meant for people with no capital, lots of free time and limited mobility. This cultural devaluation is echoed in women reporting that their husbands feel insulted or angry about some of their interactions with customers online. Men, however, report that the main negative consequence of running an online business is that friends and families assume that their business makes them rich. A similar phenomenon is visible in the literature where women's work and achievements in different domains are invisible and undervalued in a patriarchal society [36, 62]. On balance, the new smartphone-supported paradigm is a result of women capitalizing on their assets to gain employment, freedom from physical labor, greater economic agency. That women often begin MSEs with lower capital and yet have a defining role in the smartphone-supported business economy should be considered and supported in designing policy surrounding the employment of women.

6.4 Design Recommendations

The success of the smartphone-supported business paradigm lies in people endogenously creating mechanisms to morph a Western technology to serve them, reminiscent of "hacking, repurposing and repair" [2] that often characterizes technology use in postcolonial environments. Participants describe associating online business and technology with the West, which impacts their sense of trust and agency. However, when considering high costs associated with traditional entrepreneurship, people turn to these technologies for economic opportunity. Jack et al. (2017) studied Facebook-supported enterprises in Phnom Penh, and coined *creative infrastructural action* as people working within the limits of culture and technology that were not designed for them. Our broad findings show SSEs using their entrepreneurial spirit to help them come up with ways to circumvent limitations embedded in technology. We echo Jack et al. findings in encouraging HCI4D researchers to recognize "agents of technological change and infrastructural development outside of professional design knowledge and expertise." [21]

In spite of the features that make WhatsApp useful for business, there is friction between the platform and what SSEs desire. For example, statuses posted by SSEs disappear every twenty-four hours. For SSEs that post a multitude of products, buying bundles became a large portion of the costs incurred, and when consistent internet was not available, they lost sales. The design takeaway here would be to build technologies that cache data as much as possible to avoid users needing to use internet to carry out repeated tasks. Broader advocacy would involve providing zones of free wifi in peri-urban settings, where SSEs could use the Internet when they want. This would go far to impact the utility of services like WhatsApp that are "free" only in name.

There is currently no utility to search through WhatsApp statuses and this means SSEs' advertisements are only broadcast to their own contacts. Concurrently, the process to limit status visibility to a set group of contacts is complex, and there is no way to restrict the kinds of statuses that are shown to a user from their contacts. These two limitations in tandem show a lack of privacy affordances for SSEs, as well as a lack of cultural sensitivity shown to customers who may not be interested in some genres of status, while wanting to remain connected to personal statuses of a given SSE. Designers should attempt to center user privacy, affording users control of what they see and what they avoid.

As noted by other researchers, credit cards are not widely used and present a significant barrier to paid app use [21, 26]. Further, apps quoting prices in USD reinforce that technology is meant for the West. Creating country specific modifications of applications that convert prices to local currency is a straightforward means to ensuring less alienation. Further, pricing differentially depending on the country would benefit SSEs that choose to upgrade to paid plans as they grow their enterprises. Greater integration of apps with regional financial services (such as M-Pesa) would enhance use by African businesses.

To support women SSEs better, organizing courses on how to better barter with middlemen and push back against exploitation would structurally provide support in online environments. There are notions of trust in online commerce developed through the lens of *community commerce* defined by Moser et al., [38] however they limit the growth of business networks by imposing closed groups that are moderated by admins. Enabling trust through design is a challenge that needs to be further studied. WhatsApp is connected to one's phone number, but there is no verification of identity visible to users. Designers could enable trust building through displaying verification and demarcating who the first person to post a status is to avoid plagiarism of statuses. There is currently awareness in Tanzania surrounding online scams and the need to be wary of transacting with unknown individuals online. To enable trust would be to systematically reduce the number of crimes that occur through digital transactions.

7 CONCLUSION

The proliferation of smartphone-supported MSEs in Bukoba has emerged as a significant driver in the local economy. Primarily led by women utilizing *mali kauli*, these MSEs challenge traditional ways of starting and running an enterprise. Through the use of mobile technology, particularly WhatsApp, people launch and grow

successful businesses with scant initial capital or goods. Through in-depth analysis of the internal workings and external networks of smartphone-supported MSEs, we present new forms of trust-building in the digital realm, uncover unexpected interplay between gender and the digital economy, and provide recommendations to improve Western-centric technologies to serve emergent use cases in periurban socio-technical contexts.

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