

# Stepping Into Digital Life



The Digital Skills Observatory (DSO) was a 12 month, experimental and participatory design research project which took place from January 2016 to December 2016 in Kenya. It was developed and led by the Mozilla Foundation, in close collaboration with Digital Divide Data and a bit of a data agency.

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## Online version

In addition to this printed report and synthesis, we invite you to dive deeper into the subjects which interest you with our multiple online resources.

Our website [mzl.la/dso](http://mzl.la/dso) is home to blog posts and details about specific parts of the research.

Our online dashboards are our open data sets. They host the six interviews with their analysis as well as a general comparative analysis. Visit them at: [mzl.la/dso-data](http://mzl.la/dso-data)

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# Executive Summary

# Executive Summary

The Digital Skills Observatory was a research project designed to deepen the understanding of low-income first-time smartphone users. With a strong focus on learning and adoption behaviors, the project aimed to study the impact of digital skills training on confidence and agency with respect to the adoption of smartphone technology, mobile applications, the web, and Digital Financial Services (DFS).



## Objectives

The project was designed around three major objectives:

1. Acquire an understanding of the practices, mental models, and environments of low-income, first-time users by following their digital experiences for a year, shortly after they receive their first smartphone.
2. With an iterative, human-centered design approach, create cascading workshops and on-device prototypes that improve digital skills.
3. Drive this research with participatory and open source practices, building capacity within a network of Kenyan communities.

Seated in an economic empowerment framework, one of the hypotheses underlying DSO postulates that smartphones represent the potential for the adoption of Digital Financial Services, and that this potential can only be unlocked by the right set of digital skills and the right methods for teaching them. So, how might we leverage smartphones to increase adoption of Digital Financial Services?

## Methodology

DSO took place in 7 regions in Kenya and included 188 first-time smartphone users<sup>1</sup>. We designed research that was heavily grounded in communities, formative, and with immediately applied results. The project was driven by a community of 30 researchers, developers, designers, and teachers.

- **Treatment and control groups:** Inspired by experimental design, we divided participants into a treatment group and a control group, with balanced representation of gender and region.
- **Interventions and product design:** The treatment group received six digital skills iterative “interventions,” each of which was based on analysis from previous interventions and data from interviews. Interventions included in-person workshops and on-device prototypes.
- **Community-Oriented:** Inspired by Participatory Action Research (PAR)<sup>2</sup>, each intervention was designed and delivered with Mozilla volunteers from the regions in which the project took place, because of their local knowledge and ability to communicate and relate to participants. We aimed to ground product design in communities.
- **Open Source:** The data analysis from and the material produced during this project are publicly accessible and licensed under creative commons. Throughout the year, a community of informal advisors reflected on results and guided next steps.
- **Ethnographic and Quantitative Data Collection:** Data was collected throughout the year using quantitative and qualitative questionnaires, and from visits, discussions, and interactions with participants and their communities. Participants also volunteered records of their mobile banking, phone, and Internet activity.

<sup>1</sup> We started the project with 188 participants and finished with 160.

<sup>2</sup> [https://en.wikipedia.org/wiki/Participatory\\_action\\_research](https://en.wikipedia.org/wiki/Participatory_action_research)

# Findings

**Adoption is socially motivated.**

**Digital Financial Services are a special case.**

**Gambling can drive adoption and in-depth use.**

**Adoption is blocked by faulty hardware, lack of skills, and high costs.**

## Findings

**Adoption is socially motivated.** For low-income earners, there is an ambient desire to be part of society. They can feel left out of society due to difficult living conditions (e.g. unstable jobs, or lack of basic resources). And so with the ubiquity of technology in their communities, it is important for them to feel like they belong. They do not want to be mocked for using a feature phone or not being on Facebook. Owning and operating a smartphone can thereby elevate their status in society, and the resulting sense of pride plays an important role in adoption and learning.

This need to belong is most evident in the demand for social networking platforms. Followed closely by Internet use, and a sense of belonging, social networks like Facebook and WhatsApp are the primary reason DSO participants said they purchased a smartphone.

**Gambling can drive adoption and in-depth use.** Gambling is a popular activity in Kenya, and many people partake with their smartphone. One third of DSO participants gamble, especially on sports. Most people who gamble reported that it motivated deeper smartphone use, such as using apps or the web to research teams, review scores, or learn betting tactics.

**Digital Financial Services are a special case.** For any category of app or service, there are unique motivations and barriers to adoption. The use of Digital Financial Services, however, is shaped primarily by financial literacy,

product awareness, and economical needs and constraints. The latter is of higher consequence than the motivations and barriers specific to other categories of apps and services.

Almost all DSO participants used Digital Financial Services throughout the study, and many used more than one. However, most participants only used USSD-based services<sup>3</sup> like M-Pesa or M-Shwari, which had already been largely adopted by participants before the study began. People cited network problems, fraud, and user error as frustrations, and few participants used newer app-based or web-based Digital Financial Services.

**Adoption is blocked by faulty hardware, lack of skills, and high costs.** The smartphone ecosystem requires a new psychological framework, the complexity of which is compounded by poor device quality and insufficient guidance from Android. Without basic awareness and troubleshooting skills, people cannot be sure of the source of their problems. They might blame battery or storage problems on an innocuous app. On average, DSO participants paid around 40 USD for a smartphone (a significant portion of their salary), and struggled routinely with faulty hardware, incompatible software, and limited storage space. These combined factors force each download or online activity to be considered carefully.

<sup>3</sup> When a service is based on USSD, it means that it sits on the SIM card and not on the mobile phone operating system. As a consequence, they also work on feature phones.

**Without the right skills, smartphones can exacerbate adoption challenges instead of alleviating them.**

**We identified 52 digital skills for leveraging smartphones and adopting new products.**

**First-time smartphone users have little understanding of their role as consumers.**

**Access is influenced by gender.**

**Without the right skills, smartphones can exacerbate adoption challenges, instead of alleviating them.** Smartphones provide access, and along with it, present many new challenges to users. Without the right skills to navigate these challenges and the smartphone ecosystem, the path to product adoption is limited, and existing product problems are amplified.

**First-time smartphone users have little understanding of their role as consumers.** The environment that people discover through their smartphones is controlled by a few powerful organizations who play a big role in the apps and services people use, and shape the way people communicate with one another. Inexperience with this world disrupts confidence in smartphone use and causes confusion about digital identity and content consumption and creation.

As people begin to use and explore their devices, apps pre-installed by manufacturers or operators cause uncertainty. Their origin is unclear, their purpose is mysterious, and their permanence is frustrating.

When users try to go online, join social networks, or download content from the Play Store, they lack experience with digital accounts and the organizations that govern them, and do not understand how to use or maintain them. Also, unfamiliarity with the actors who curate and provide access online limits awareness of how content is created and shared. Without a mental framework of

the open nature of the Internet, people are more vulnerable to fraud, scams, or unfavorable situations when exposed to information on the web or apps in the Play Store.

Without an understanding of this environment and the agency to manipulate it themselves, people rely on the physical social networks they know and trust to hear about products and install them, create or fix accounts, and fix problems. People often pay for these services.

**Access is influenced by gender.** Female DSO participants were more often influenced by their partner in their purchase of their first smartphone than their male counterparts (42% vs. 15%). They were also three times more likely than males to receive their first smartphone as a gift. In some cases, continued access to a device or online activities for female participants were restricted by their male partners.

**We identified 53 digital skills to leverage smartphones and adopt new products.** These skills directly reflect the problems participants faced throughout the year that blocked or restricted them from using their smartphones. They are relatively basic skills, but they make people more confident, able, and aware, and more conscious of the choices they make.

Each skill fits into one of the following categories: Android Operating System, Apps,

**Learning these skills increased confidence, agency and competence.**

**In-person workshops were the most impactful.**

**Mobile apps are less suitable as a teaching method.**

Accounts, Privacy & Security, Data Usage & Costs, Online Ethics, Problem Solving, Searching, Literacy, Scams & Fraud, the Technology Ecosystem, Social Platforms, Creative and Functional Use, and Browsing.

**After learning these skills, the treatment group showed an increase in confidence, agency, and competence.** Self-reports and formal digital skills evaluations at the end of the project showed heightened confidence and performance within the treatment group. They were able to make better use of their smartphones than the control group, and could perform tasks which led to increased adoption (e.g. searching for and downloading mobile apps).

**Out of the three teaching methods we explored, in-person workshops were the most impactful.** The informal setting, community atmosphere, and expert availability made in-person workshops the most impactful method. Participants appreciated the ability to learn with their peers and through participatory activities. They were given opportunities to speak, ask, and learn in ways they did not have within the formal education system.

Low-income novice technology users are a vulnerable population and have limited opportunities to participate in specialized learning like DSO. The pride associated with inclusion in our workshops illustrates a secondary value: not only do participants gain knowledge by attending, but they are excited to attend, and acknowledge its importance for them.

**However, the best approach is a combination of in-person and on-device learning.** On-device experiences can be a powerful compliment to workshops. In combination, they offer a variety of opportunities for learning to suit differences in the population.

Workshops are effective for forging trust and community, and for spreading awareness, but they are difficult to scale and can favor extroverted participants. Our on-device experiences let people practice what they learned on a more regular, in-depth basis, and provided a more comfortable 1-1 atmosphere for those that find public settings unfavorable for learning or otherwise difficult to attend. Participants were able to express their challenges and ambitions and learn by solving problems incrementally through ongoing conversation.

**Mobile applications are less suitable as a teaching method.** Creating and maintaining an app that sustains people's engagement is too disconnected from the reality of smartphone use within the DSO demographic. On average, each time they were surveyed throughout the year, roughly 37 participants (23%) reported lost or broken devices, and 30 participants (19%) needed to purchase a new device. Compounded by faulty hardware, prohibitive data costs, high demand for social media, and lack of digital skills, there is apathy toward and discomfort with new, narrow-purpose mobile applications, especially when their value is not obvious, or when they are not one of the top trendy apps. Even with a well-received app, content updates can be

**Social messaging deserves further experimentation, especially with chatbots.**

**Women engaged and learned more than men through WhatsApp.**

disrupted by various hardware or network problems, and can make an app stale. We recommend thinking about other ways to leverage the smartphone form-factor.

**Social messaging deserves further experimentation, especially with chatbots.** With design constraints from our research and previous curriculum development, we designed bite-sized curriculum for use over WhatsApp. Using a familiar social messaging platform leveraged the smartphone form-factor, and circumvented difficulties with low-quality handsets.

Over six weeks, 79 participants were engaged over WhatsApp on a routine basis. 28% of participants in the treatment group favored this method, and 30% said it taught them the most, citing availability and individualized learning as benefits.

The success of this approach suggests that social messaging can be used in new ways for education and informal learning. Chatbots are increasingly popular and useful, and are part of the design of social platforms like Kik. They deserve further investment and experimentation as a tool for learning, as a channel for discovery, and as a path to adoption.

**Women engaged and learned more than men through WhatsApp.** In situations where women and men play different roles in public, WhatsApp can alleviate barriers to learning. Reports from our WhatsApp operators and data we collected suggest that daily, casual, and conversational learning

**Digital skills are an essential component in the adoption of Digital Financial Services, but they are not enough by themselves.**

contributed to the success of our WhatsApp experiment, especially with women. While less than 45% of participants were female in this experiment, 8 of the top 10 most responsive participants were women, and on average, females were more talkative on both a daily and per-conversation basis.

The gender of the teacher persona we designed (to keep operators anonymous) was implicitly male, which might have played a role in these results. Further investigation is required to be certain.

**Digital skills are an essential component in the adoption of Digital Financial Services, but they are not enough by themselves.** Digital skills make it easier to find and use apps and services generally, but sustained usage and adoption relies on more variables. In our study, digital skills training did have a direct positive impact on the treatment group's ability to leverage their smartphones. Since these skills allow people to perform tasks required for using any application in an empowered way, they also had an indirect positive impact on the adoption of Digital Financial Services.

**Digital skills are only one part of the equation for the adoption of Digital Financial Services.** Product adoption requires Access, Ability, and Need. By addressing digital skills through DSO, we were able to impact parts of the adoption equation (mainly Ability), but not the whole. Digital Financial Services have another set of challenges in addition to those of general product adoption, like discoverability, financial status, and financial literacy. Not all of these challenges can be overcome by skills alone. Smartphones may be a partial solution to Access, but Need is a very big factor in encouraging adoption. ■



## Implications

Results from the Digital Skills Observatory give us a deeper understanding of low-income, first-time smartphone users and their behaviors with respect to technology through economical and educational lenses.

**To help this population leverage their smartphones and what digital life offers,** these findings should be reapplied to design innovative educational programs with strong community practices and on-device learning experiences that leverage social platforms. Through the digital skills we identified, people should be taught to understand the limitations and faults of their hardware and become familiar with the ethics and mechanics of identity and content online.

**To design products for first time smartphone users,** we need to step outside the mobile application paradigm and think about ways to integrate with the platforms that already drive technology adoption and sustained usage. Social messaging, sports, and entertainment are powerful ways to reach this population, and may serve as a model for more engaging products. They are also areas to explore integration with Digital Financial Services.

**To improve the adoption of Digital Financial Services,** we should try objective-based learning that combines community, digital skills, financial literacy, and product awareness. With a more holistic understanding of digital and financial ecosystems, and a support network to navigate them, people may be better equipped to know when to seek financial services, and how to do so digitally.

**To address gender gaps,** social messaging platforms can be used to provide safe, familiar spaces for learning, especially for women. We recommend more experimentation with this approach. Still, a variety of education methods will let both men and women learn and ask questions comfortably.

**To help people step into digital life,** digital literacy needs to be considered for every product or service. Barriers to entering the digital world affect everything within it. ■

DSO was designed with a general hypothesis, an ambitious approach, and set of questions that framed the research. Along the way, we had to make important choices that impacted our findings. This section details the project and its methodology and the decisions we needed to make.



# Introduction

# Why a digital skills observatory?



Millions of people are coming online today and discovering the Internet through smartphones, whether they are digital natives in the USA or in Kenya. Some of these new users, however, do not have the same opportunities and affordances to learn about the Internet and how to use it.

In the case of first-time smartphone users in Kenya, low-cost smartphones are the only way to connect. As they grow more financially accessible, these smartphones become a gateway to a new world full of digital promises. It is therefore important for these users to develop the necessary skills to take advantage of these devices.

**Millions of people are coming online today and discovering the Internet through smartphones**

Within digital and financial inclusion schools of thought, there is a hypothesis that an increase in smartphone acquisition will lead to an increase in adoption of Digital Financial Services and open doors for people to access the formal financial environment and, thus, more economic opportunities. This led us to ask: **How might we leverage smartphones for the adoption of Digital Financial Services?**

With this project, we wanted to create an **observatory** to better understand the complex relationship between devices, skills, economic life, and digital life.

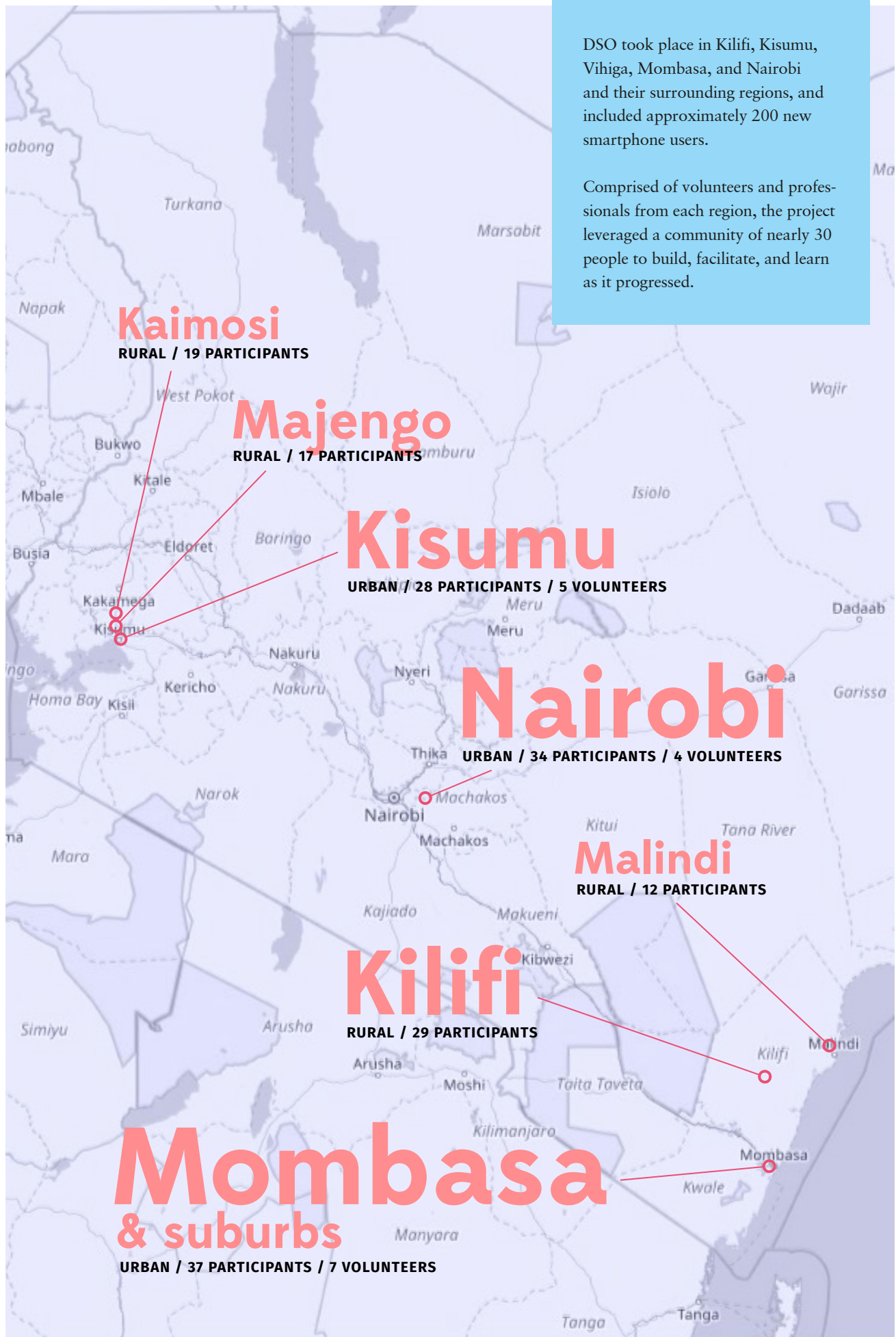
The project aimed to study the impact of digital skills trainings on low-income, first-time smartphone users in Kenya. More specifically, it pursued a positive impact on confidence and agency of individuals with respect to the adoption of mobile applications, the web, and Digital Financial Services (DFS).

## DSO was designed with three major objectives:

1. Acquire an understanding of the **practices, mental models**, and **environments** of people by following their digital experiences for a year, shortly after they have acquired their first smartphone.
2. With an iterative and human-centered design approach, create cascading **workshops** and **on-device prototypes** that improve digital skills.
3. Drive this research with **participatory** and open source practices, building capacity within a network of Kenyan communities.

DSO took place in Kilifi, Kisumu, Vihiga, Mombasa, and Nairobi and their surrounding regions, and included approximately 200 new smartphone users.

Comprised of volunteers and professionals from each region, the project leveraged a community of nearly 30 people to build, facilitate, and learn as it progressed.



# Methodology

## Research Criteria

### **LOCATION**

DSO took place in Kenya, with participants from 7 different regions. We carefully selected a mix of urban, peri-urban and rural locations, to reflect the different environments that people live in.

### **PARTICIPANTS**

Aiming to follow 150 first-time smartphone users, we recruited 188 of them, in order to account for drop-outs. We finished the year with 160.

Because we aimed to focus on low-income users, we recruited people who earned no more than 5 USD per day. The DSO participants were between 18 years old and 35 years old.

### **SMARTPHONES**

We wanted to understand **real** access conditions and behaviors, so we chose to work with people who had bought their first smartphone themselves, no longer than six months before the beginning of the study.

### **ANONYMITY**

To respect participants' privacy, no real names and no individual photos appear in this report.

## Research Methods

We used a research approach that was formative, heavily grounded in community, and with immediately applied results. The project was driven by a community of 30 researchers, developers, designers, and teachers.

**TREATMENT AND CONTROL GROUPS** Inspired by experimental design, we divided participants into a treatment group and a control group, with balanced representation of gender and region.

### **INTERVENTIONS & PRODUCT DESIGN**

The treatment group received six iterative digital skills “interventions”, each of which was based on analysis from previous interventions and data from interviews. Interventions included in-person workshops and on-device prototypes.

### **COMMUNITY ORIENTED AND PARTICIPATORY**

Inspired by Participatory Action Research (PAR), each intervention was designed and delivered alongside Mozilla volunteers from the regions in which the project took place, because of their local knowledge and ability to communicate and relate to participants. We aimed to ground product design in communities.

### **OPEN SOURCE**

The data analysis from and the material produced during this project are publicly accessible and licensed under creative commons. Throughout the year, a community of informal advisors reflected on results and guided next steps.

### **ETHNOGRAPHIC AND QUANTITATIVE DATA COLLECTION**

Data was collected throughout the year using quantitative and qualitative questionnaires, and from visits, discussions, and interactions with participants and their communities. Participants also volunteered records of their mobile banking, phone, and Internet activity.

# 14 Questions



## Research questions

We identified 14 key questions throughout the year: an intellectual framework to help us understand how to leverage smartphones for the adoption of Digital Financial Services.

### **ADOPTION OF SMART- PHONES, APPS, THE WEB AND DFS**

1. What are the immediate and emergent barriers to usage for first-time smartphone users?
2. Does limited general literacy impact the usage and adoption of smartphones and DFS?
3. Who else uses the phone and for what purpose? Our general hypothesis is that smartphones are private and personal, but are there use case exceptions? What are the consequences on the usage of DFS?
4. What is the route to discovery of DFS? What are the different channels?

5. Are entertainment and social media interesting vehicles for learning and adopting DFS?
6. Is there a difference between the way men and women use DFS? What are the consequences of these differences?

### **SKILLS AND AGENCY**

7. Are digital skills more / less / equally important than financial skills when it comes to the adoption of DFS? i.e. digital literacy vs. financial literacy
8. Does improved digital literacy and smartphone adoption change expectations for financial stability?

### **LEARNING METHODS, IN- FLUENCE AND DISCOVERY**

9. Which mediated / non-mediated education methods, including pre-loaded applications, improved device onboarding? Which improved user experience / increase adoption of DFS? (social learning / on-device learning)
10. Most people get help using their new phones. From whom and for what? What other help might be appropriate or more useful?
11. How do they discover new applications? How does this shape their understanding and use of DFS?

12. Is there a difference between men and women in the way they learn and apply their new digital skills?

### **PRODUCT AND SERVICE DESIGN**

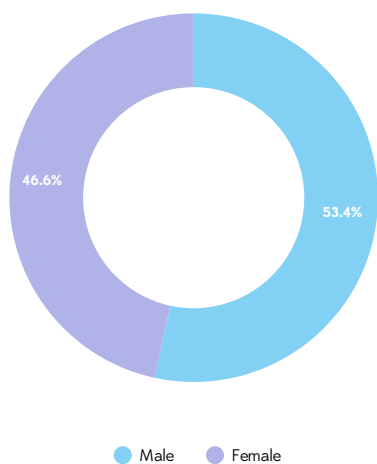
13. How does colloquial / local / online language (e.g. Sheng, emoticons) influence use of services that relate to DFS (e.g. games with monetization built in)?
14. Do new users understand the application metaphor? How do they discover new applications? How does this shape their understanding and use of DFS?

# Recruitment overview

DSO participants are 53% male and 46% female.

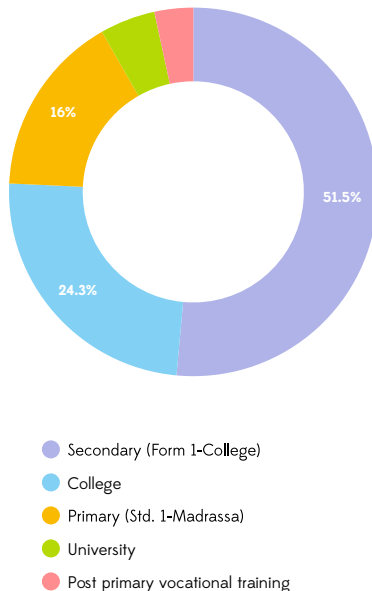
The vast majority of our participants are in their twenties, with an average around 24 years old.

Gender



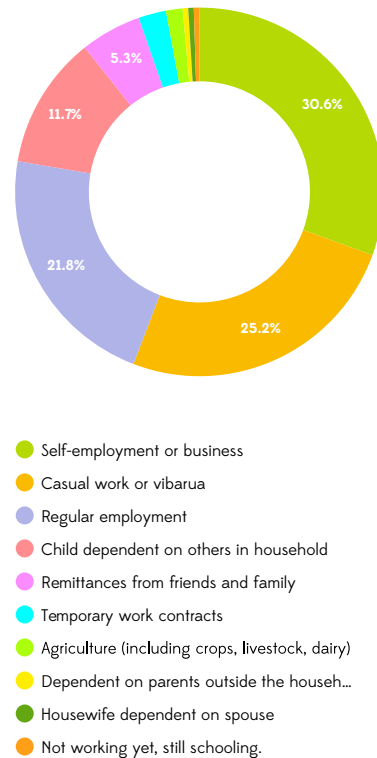
The most common level of education among the participants is secondary education (52%). About one quarter has completed college education, and one tenth university.

Respondents' level of education



About one third of the participants are self-employed or run their own business. Only 21% indicate they have regular employment, with a larger group dependent on casual work. 35 participants (17% of the total) are dependent on others for their main source of income.

Respondents main source of income



Graphs taken from Silk 1 homepage and technology and learning.

SAMSUNG

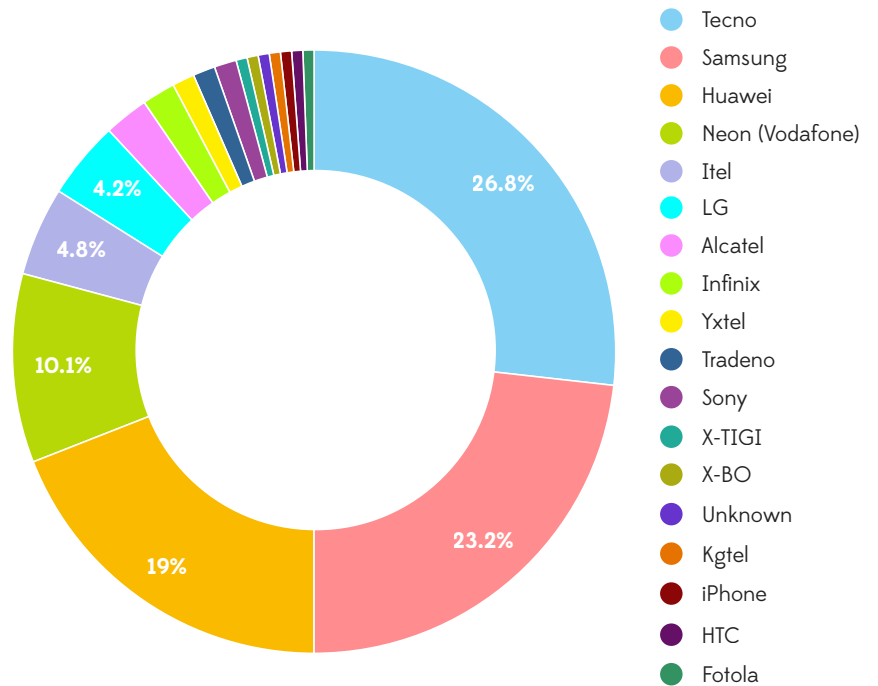
HUAWEI

TECNO

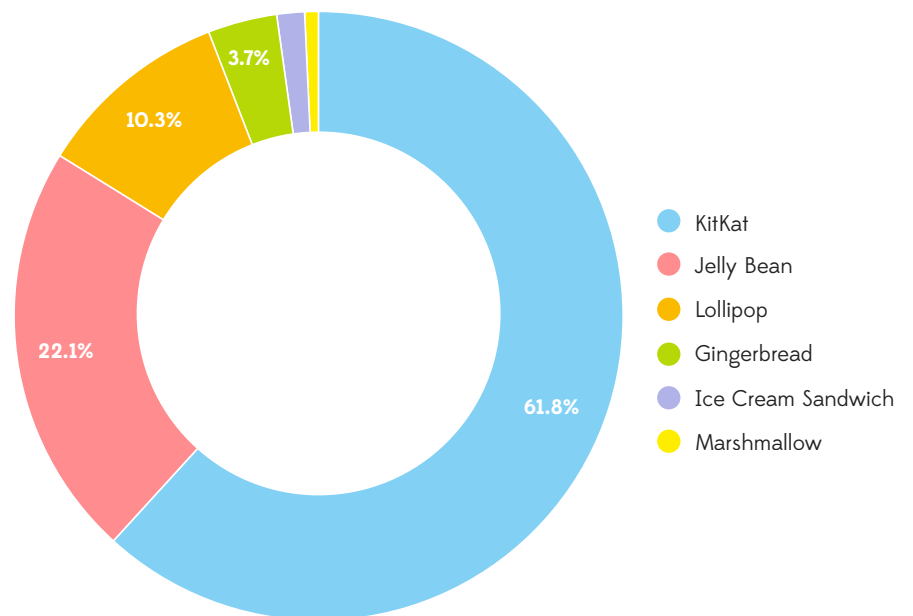
ALPS



The most common devices owned by participants are Samsung, Huawei, Tecno, Alps and ITEL.



The vast majority of DSO participants, 88%, run Android KitKat (4.4) or lower, 61.8% of whom run KitKat. To put this information in perspective, Android usage data from Google in March, 2016 indicated that roughly 38% of the world uses Android 5.0 or higher, and only 34% use 4.4.<sup>1</sup>



**More than 57% of the world uses Android 5.0+**

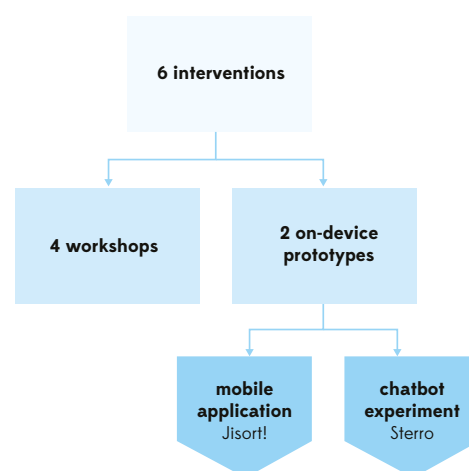
<sup>1</sup> Historical Android usage statistics retrieved from <http://www.droid-life.com/2016/03/08/android-distribution-update-march/>

# Interventions & Product Design

The iterative observatory approach allowed us to rapidly respond to opportunities and learn from them. We tested multiple small ideas to see their combined viability, in a way that would not have been possible via a more static research approach.

Each of the six interventions allowed us to deepen our understanding of the drivers and blockers for adoption, therefore revealing impactful channels for reaching this group, and potentially increasing the adoption of DFS. Each workshop and prototype had a specific set of goals derived from ongoing analysis. Their results were research assets in themselves.

To be able to measure our impact, only the treatment group received the six cascading interventions, in addition to the regular interviews and Android data collection.



## In-Person Workshops

In locations close to their homes or businesses, participants received a full day of in-person training regarding smartphones and the Internet. Each workshop consisted of curriculum based on certain topics derived from observations, followed by a 1-1 problem solving session to help people with various problems they faced. Each workshop was delivered by Mozilla volunteers and in the local dialects.

1. The smartphone ecosystem
2. All about accounts
3. Exploring, searching and downloading with mobile applications and the web
4. Creative problem solving

To read about the findings and the impact of the workshops, go to page 106.

## On-Device Prototypes

Each intervention was driven by what participants expressed throughout the study, which yielded the content and curriculum. This material constitutes important research assets, as they truly reflect people's needs. For example, topics that appear more than once were either very important or poorly understood.

1. Jisort: a mobile application created to improve first-time use and onboarding with various Android difficulties. You can download Jisort at [mzl.la/jisort](http://mzl.la/jisort).
2. Sterro: a chatbot experiment implemented for six weeks to leverage the P2P social messaging interactions enabled by smartphones.

To read about the findings and the impact of the on-device experiences, go to page 106.

# Project timeline

□ Control group

△ Treatment group



## Limitations

Each research study comes with its own limitations, and the Digital Skills Observatory is no exception.

The 188 participants who made DSO possible do not allow us to assert the statistical relevancy of our study.

Our control and treatment groups have sometimes been in contact with each other, in ways that we could not prevent from happening. These interactions were small and infrequent, but when they happened, we know that the treatment group was teaching the control group how to perform some of the tasks they had learned from the study. This knowledge sharing can be interpreted as another positive effect of the study, since it illustrates how communities learn together and how the treatment group shared their experience.

Some participants dropped out of the study, which reduced the numbers we could include in the comparative analysis; our interviews contained recurring questions, allowing us to compare the progression from January to December. We had, however, anticipated this and recruited 188 in order to end up at

150. We finished the study with 160 first-time smartphone users.

The prototypes come with their own sets of limits, too: you can only test and deploy what you have been able to build and put in participants' hands. When we created Jisort, we had to abandon several (good) ideas because of the lack of time and resources in our scope. Would our results have been different? We were able to identify opportunities and to confirm that our ideas were on the right track, but we regret not being able to test more often and with more agility.

Finally, while working with local Mozilla volunteers was undoubtedly one of the most impactful aspects of this project for the participants, it led to some irregular engagements and inconsistencies in workshop delivery.





This section provides a detailed exploration of the lives and situations of first-time smartphone users in Kenya.

Portraits of participants are described throughout, and data from our first interviews paint a picture of their access to technology, DFS usage, learning desires and living environment.



# Who are first-time smartphone users?

# Stepping into digital life

There are many labels for those who are coming online for the first time today: “the next billion” or “the unconnected.” These titles generalize a group of people with various backgrounds, languages, skills, inspirations, livelihoods, and circumstances. They might be 13-year-old teenagers in Chicago or France, or 25-year-old salon workers in Kenya. What they have in common is their shared experience as new smartphone users.

## **FIRST-TIME SMARTPHONE USERS HAVE SKIPPED THE PERSONAL COMPUTER ERA AND LIVE WITH SMARTPHONES AS A FRAME OF REFERENCE**

The first-time smartphone users who took part in DSO are low-income earners in Kenya who are discovering the web, apps, the Internet—digital life—for the first time. They are entering the digital world through smartphones that they likely purchased second hand. Although they may have had access to a computer and the Internet at a cyber café before, they have probably only used them to create a Facebook account, print documents, or access government services.

Today, they are taking their first real steps into the digital world, having completely skipped the era of personal computers. As a result, their frame of reference is very different from that of people who have lived through and contributed to the advent of personal computing.

They have limited experience with keyboards, screens that will not respond to touch, mice, Windows, or Apple, but they are familiar with small, slow devices, broken screens, tactile keyboards, emojis, and Safaricom. This has a tremendous impact on the way they understand the Internet, what it has to offer, and the role of various actors in its ecosystem.

## **WHETHER THEY ARE IN CHICAGO OR KENYA, FIRST-TIME SMARTPHONE USERS WANT THE SAME EXPERIENCE ON THE INTERNET**

By taking their first steps into digital life, they gain access to the services, opportunities, benefits, and dangers that many people have had before them. And they want the same experience: to use the Internet for fun, to learn, and to improve everyday life. However, the fact that smartphones are their first and primary device for accessing the Internet plays an important role in their understanding of the digital environment.

## **FEELING LEFT OUT IN SOCIETY, BUT NOT NECESSARILY IN THE DIGITAL WORLD**

With less than \$5 USD per day, many of the DSO participants feel vulnerable, poor, and left out. In society, they occupy a difficult place, often with limited access to primary needs such as water and electricity. In such a situation, there is an ambient need to be part of society, not to be perceived as poor, and to be like everyone else. This need is reflected in the behaviors surrounding adoption of new technology. For product designers, it is important to acknowledge in order to not deepen the digital divide.

# Constrained resources

## 1 Halina

Mombasa Teacher



The freshly-cobbled road to Halina's neighbourhood was finished recently by a politician promising better living conditions for the area's citizens. This development suggests prosperity for the people there, but, with a monthly school teacher salary of Ksh5000, **Halina has just \$1.66 per day to pay for rent and food.** Like others, when money is especially tight, she relies on her family for support. Her supply of fresh water is held in large yellow jugs, each of which costs Ksh 5 (5¢) to fill.

Many people in her village were asked to participate in the study, but she was the only one to accept. Local scams and government corruption have left a mark, making people hesitant to speak with outsiders seeking information. Halina is proud of her participation in the project and her learning experiences. The people in her village who initially turned down the offer to participate in DSO now look on with intrigue.

# Gender gap

## 2 Faith

Nairobi Small Business Owner



Even before her first digital skills workshop, Faith had a list of questions prepared to better understand her smartphone. Her lack of formal education did not prevent her from learning about Wi-Fi, buying and selling goods online, and searching for apps to entertain children at Sunday school. These fundamental digital skills are representative of those which many other new smartphone users in Kenya need.

**Like other women, Faith's smartphone use is impacted by the men in her life.** After a spat with her boyfriend, her phone was taken away, so she was forced to purchase her own. Unfortunately, when she received her new phone from a cousin in Rwanda, it was not working and she did not understand how to fix it. Because of an invalid IMEI, she was unable to connect to the cell network, and did not understand why Wi-Fi was still working.

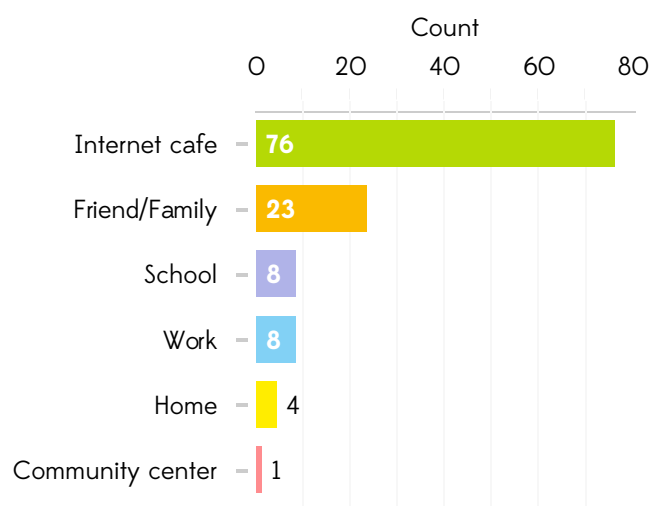
Faith has two young children and sells second-hand clothes for a living. She limits her Internet usage to **35mb per day**, after which she cuts off access. Spending too much money is a high risk for her.

### ACCESS TO TECHNOLOGY

55% of DSO participants can access a computer if they need one. Most of them can go to a cyber cafés, or ask a family member/ friend.

More than half of the participants own multiple SIM cards from different providers. This allows them to enjoy different price offers, services, and to ensure they save money when possible. Safaricom is the most popular operator, closely followed by Airtel and Orange.

### Where do you have access to a computer?



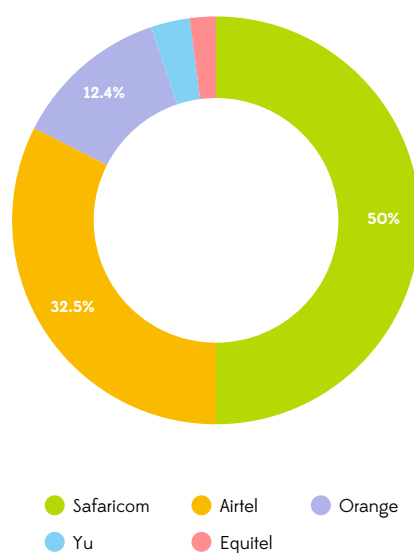
### USAGE OF THEIR SMARTPHONE

To answer the question: “What do you do with your phone regularly?” the vast majority of people answered: Chatting online (124), then Calling (53), then Browsing (31).

### I KNOW HOW TO USE THE INTERNET

When asked if they know how to use the Internet, 93% of the participants answered “Yes”. This number illustrates an overconfidence effect, where people do not know how much else there is to learn about the Internet.

### From which operators do you have a SIM card?



# Agency & skills

## 3 Brian

Kisumu Small Business Owner



In one of the urban pockets of the Kisumu region, Brian operates a car wash and poultry business next to his home.

When he started using his smartphone and the web, he realized they had the potential to help him achieve his goals. After learning about poultry farming online, Brian used social media to find and purchase the materials and equipment he needed.

**“Having information gives you the power. I learned about encryption on BBC. Now I have my documents encrypted.”**

**“In February, I even purchased a small incubator online for eggs. I bought it from Best Touch Incubators in Nairobi.”**

A family tragedy sparked Brian’s interest in using the Internet to find information. Now, he is thinking about producing a documentary based on his research.

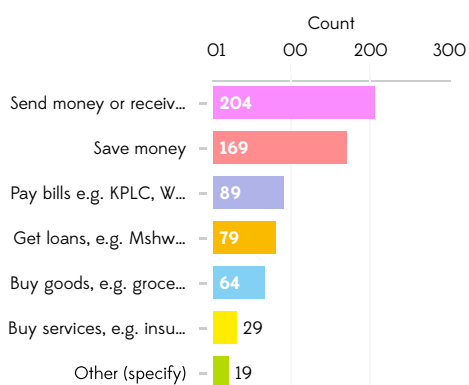
### USE OF DIGITAL FINANCIAL SERVICES AT THE BEGINNING OF THE STUDY

Most participants use DFS for transactions, saving money, and paying bills

A large majority of participants already use Digital Financial Services to send or receive money, to save money, to pay bills, and to get loans. This is already a fairly important usage of various services, accounted for during the first interview, before the treatment group received any intervention.

Kenya's environment is unique in this respect. Cellular technology is already dominant here and has supplanted cash. DSO participants' SIM cards are their key to Kenya's digital banking system, and all the modern social and economical concerns that accompany it.

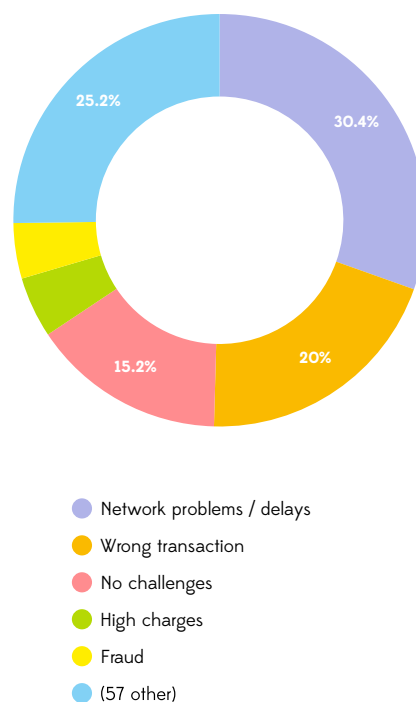
#### How do you use Digital Financial Services?



### NETWORK PROBLEMS MAKE UP MORE THAN 30% OF THE CHALLENGES THAT PARTICIPANTS FACE WITH DFS.

Another problem seems to be transferring money to the wrong person: 20.4% mention this as a challenge.

#### What challenges are you facing with Digital Financial Services?



# Offline networks drive discovery

## 4 Ken

Malindi employee at a video store



For low-income earners in Kenya, network connectivity comes with a big price tag. People find ways to share apps and content through other means, like swapping SD Cards, or via **offline content-sharing apps like Flash Share.**

Ken works part-time at a video store in a remote community in Malindi, where smartphone and English comprehension are low. Instead of struggling with the Play Store, he relies on more knowledgeable peers to receive the latest apps and updates.

**Many—if not all—of the apps on his phone were pre-in-**

**stalled, installed for him, or given to him via offline sharing.** His discoveries are driven by his social network.

**“I already have all the apps.”**

Ken’s limited ability to read and understand his digital world makes him especially susceptible to apps with false promises. Further, his reliance on his friends for knowledge gives him a myopic view of the apps and services available to him on his smartphone.

#### USAGE OF DIGITAL FINANCIAL SERVICES

On a scale from 0 to 100, more than half of the participants rate themselves at 70 or lower regarding their comfort with DFS.

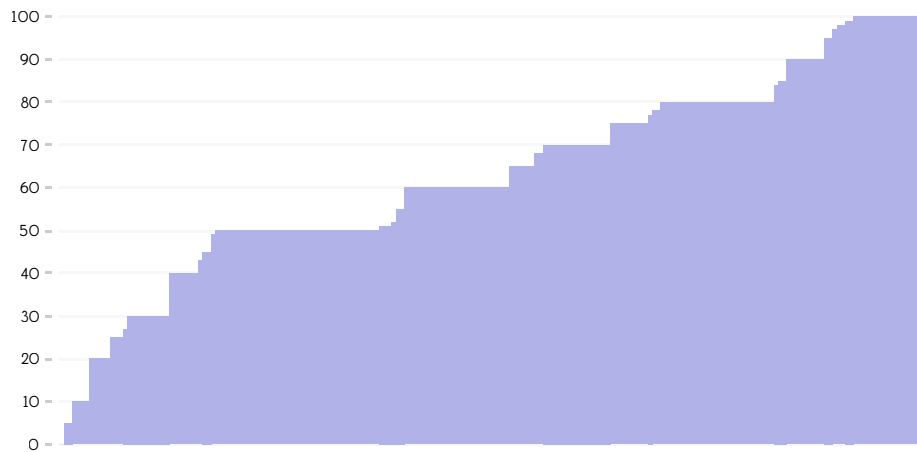
Looking at how participants rate their comfort with Digital Financial Services on a scale of 0% to 100%, the average rating is about 67%. More than half

of the participants ranked themselves lower than 70%.

Most people do not want, or have not received help from anyone on how to use DFS.

From the people that did get help, most received it from an agent, a friend or a family member.

● Between 0% and 100%, how comfortable are you with using Digital Financial Services?



# Critical thinking

## 5 Esther

Mombasa Water Seller



When selling water on the side of the road is your main source of income, every bucket matters. For Esther, this reality makes attending digital skills workshops and participating in interviews difficult. **When her daily salary could be compromised, the opportunity cost of a workshop is just too high.** Yet, she is eager to learn more about her smartphone and the Internet.

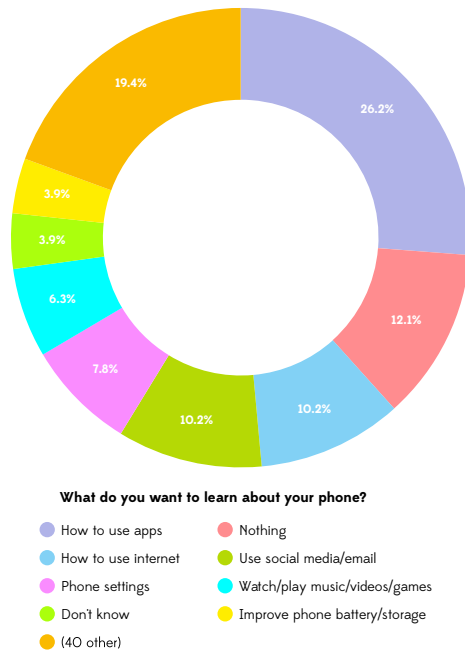
When interviewers visited her road-side workplace, she had a list of questions ready. During her early interviews, Esther was curious about applications she found on the Play Store which claimed to diagnose HIV. These apps randomly display a diagnosis after “scanning” a user’s finger print through the phone’s touch screen. While the descriptions and comments of these apps described them as pranks, she did not use these channels to evaluate them.

Many first-time smartphone users like Esther are not fully aware of the open nature of the Internet, and do not assume that content can be created by anybody with access. **When you do not understand the actors and forces behind the app ecosystem, or the capabilities of your technology, it is easy to believe what your smartphone tells you.**

### LEARNING ABOUT APPS, SOCIAL MEDIA, THE INTERNET, AND PHONE SETTINGS

At the very beginning of DSO, we asked participants to reflect on what they want to learn about their smartphones. We identified that the strongest learning desires were about searching for, downloading, and using apps.

Using social media, using the Internet, and customizing phone settings were next. At the beginning of the study, both the treatment group and the control group were heavy users of peer-to-peer tactics to obtain new apps. Like Ken, they were dependent on their in-person social networks to discover new products. They desired to learn more and to be able to get apps without relying on others.



### IF YOU COULD LEARN ANYTHING RELATED TO YOUR PHONE OR TECHNOLOGY IN GENERAL, WHAT WOULD YOU LIKE TO LEARN?

- Nothing
- He would like to learn how to download WhatsApp application and use it.
- He would like to learn how to operate his current phone better and improve the features of the phone.
- How to minimize bundle expenditure while browsing on social media.
- How technology can be advanced to accommodate both the young and elderly people.
- I cannot think of anything at the moment
- Would like to learn more about computers because she has just done basic computer packages.
- What happens behind M-Pesa to make the transactions a reality
- She doesn't know what to learn
- How to use Instagram
- How to use settings on his phone as he is not able to use all of them

# Privacy

## 6 Tian

Nairobi politician



In one of Nairobi's slums, Tian is a community leader and politician. He pays particular attention to the wellbeing of youth in the area, and is widely regarded as their guardian and mentor.

As an assistant to the area's chief, he is interested in the news and information circulating around the population so he can help local politicians. He is always seeking information, and wants to understand technology better—particularly hacking—to stay on top of current events in the area.

Sometimes, because of his position in the community, he is entrusted with people's phones to help them write or respond to messages they are too busy or otherwise ill-equipped to manage on their own. As such, Tian knows the usernames, passwords, relationships, and other intimate details of citizens he helps.

Concerned about the population he oversees, he believes digital skills workshops can happen within the slum, leveraging local skills and interest to invest in local businesses and people.

### LIVING CONDITIONS

The majority of participants (84.5%) claim that they have money and food to eat every day, but that they do not have enough, and some have to skip meals sometimes.

The remaining participants are comfortable (11.7%) or struggling to eat everyday (3.7%)

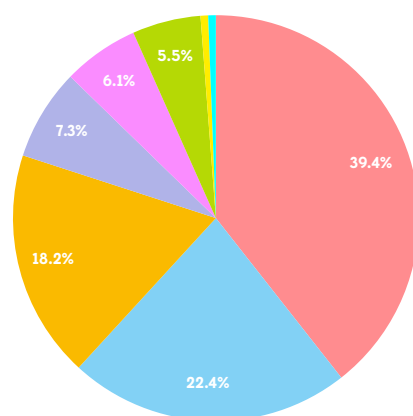
The majority of the participants live in not-contained brick houses (with bathrooms outside), Swahili-type houses, and mud houses.

### WHERE DO YOU SPEND MOST OF YOUR TIME?

About 70% of the participants say they spend most of their time at work. 'At home' and 'Market' are a distant second.

Men more often answer 'Work' to this question, and women have a larger 'At home' segment.

What kind of house do you live in?



- Not contained - Bricks/Blocks/Stone hous...
- Swahili type house
- Mud house
- Self contained - Bricks/Blocks/Stone hous...
- Apartment/flat
- shack / iron sheet/ wood house
- Bungalow house
- Hostels

# Hacking & citizenship

## 7 Evans

Nairobi



With no regular employment, Evans hunts for jobs every day. Often, money he earns is used for betting, which has garnered him a TV and speakers. Even with outstanding debts to Digital Financial Service providers like M-Shwari, his betting continues. In fact, he is defiant of strict loan repayment rules, which may land him on a financial blacklist. He believes the organizations that lend him money are big and wealthy enough that they should overlook the loans he has not repaid.

As with many people like him, he wants to learn to hack, not for any nefarious reasons, but just to gain knowledge—to have power. He is a curious Internet user, and poses questions like, “Who invented the toothbrush?” which he can answer through research on his smartphone.

**“I want to hack your account. I want to see what is there.”**

People like Evans can do research on their smartphones for betting, as well, which gives them an advantage over people that still use print media, or those that bet blindly.

### 25% OF PARTICIPANTS DO NOT HAVE ENOUGH WATER OR ELECTRICITY

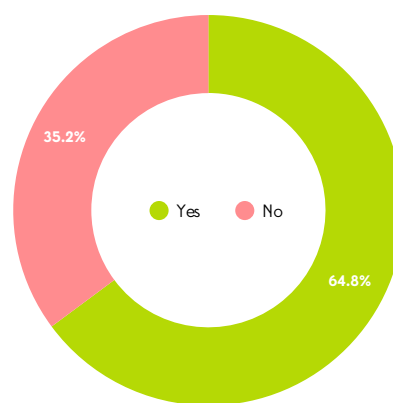
78% of the participants have access to electricity in their house. The 22% who do not have access to electricity explain that either their house is not connected, or it is too expensive to actually use the electricity.

When they can not access electricity, participants refer to their community center, a nearby shop, a neighbor, or other creative solutions.

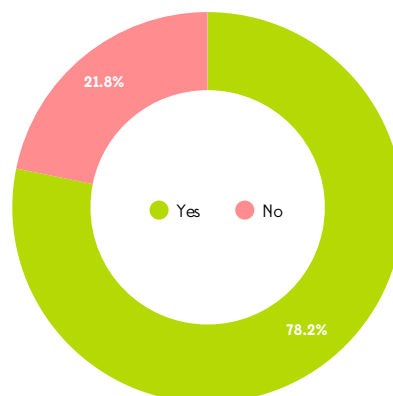
Water access is also unequal, as 35% of the participants are living without regular access to running water. This is also due to disconnected houses or prohibitive costs. To solve this problem, participants have to rely on other sources, such as fetching water from a river or purchasing jugs from vendors like Esther.

Generally speaking, 25% of the participants say that they do not have enough water and electricity, and make compromises.

Do you have regular access to running water in your home or where you stay?



Do you have regular access to electricity in your home/house?



Many people throughout the world are highly motivated to use smartphones, apps, services and the web, but face challenges in doing so. Their environments give rise to the motivations and barriers that shape the way they adopt and use technology.

For low-income first-time smartphone owners in Kenya, these motivations are driven by social and financial desire, while barriers stem from hardware problems, lack of understanding, and prohibitive costs.



# Motivations and barriers to adoption

# Motivations for adoption

## MOTIVATION

### Desire to belong and social motivations

#### SOCIAL MEDIA IS THE PRIMARY MOTIVATOR FOR PURCHASE

The immense popularity of social networks can motivate people to purchase a smartphone. Among their top reasons for buying a smartphone, DSO participants cited social media most often, followed closely by Internet access and the need for belonging and following trends (see graphic on the following page).

Generally, Kenyan society is very community-oriented with establishments like Chamas that distribute financial pressure (lending and borrowing) across members. People bring these social expectations and desires online, and gravitate toward services that support these social needs. Of the 95% of participants who use social platforms, 80% use social messaging and Facebook. While WhatsApp and Facebook are the two most used social platforms, people expressed a strong desire to learn more about Twitter and Instagram.

The need to belong is stronger than the promise of utility

However, while many people express a desire to join new online social platforms such as Snapchat, Twitter or Instagram, they have little or no understanding of what they are and what to do with

them. The need to belong is stronger than the promise of utility. People want to join these services for the sake of belonging, to use the same services as everyone else.

From friends and colleagues, television and radio, and even from DSO interviewers, participants heard references to Twitter, Instagram or Snapchat. This activated their curiosity and desire to be a part of these networks. In these cases, adoption was driven less by features, and more by a desire to not feel left out.

**“A stranger made fun of me for having a feature phone. I was in a matatu when he said that I am a beautiful woman yet I own a very outdated phone.”**

**- DSO PARTICIPANT**



### A SOCIAL STATEMENT WITHIN THEIR COMMUNITY (PRIDE)

This social pressure also extended to participants purchase of a smartphone. When asked, “What was your reason for acquiring a smartphone?” at the beginning of the study, participants often cited their peers as motivation. For example, a researcher in Mombasa recorded, “[His reasons were] curiosity and peer pressure as all his friends have smartphones so he wanted to be like them,” and, “He wanted to feel the way his peers were feeling for having a smartphone when they walk around with it.”

**“I needed to migrate to the digital era.”**

– DSO PARTICIPANT

### WHATSAPP ON FEATURE PHONE?

Knowing that some of these highly sought after social networks are available through feature phones, we wondered if that would be enough to convince people that they do not need to purchase a smartphone.

In fact, the experience of WhatsApp on a feature phone is not quite the one that people are seeking. There are no selfies, cameras, images, videos, etc, which means that even if the service is accessible through feature phones, people need smartphones to take full advantage. Since they do not want to be left behind, a smartphone is much more preferred than a feature phone for a real social media experience. ■

### KEY TAKEAWAYS

When designing products and services for this audience, designers can incorporate the need to belong into their work.

Social pressure and desire to socialize drive adoption not only for products and services themselves (e.g. WhatsApp), but also for the technology needed to use them (e.g. a smartphone).

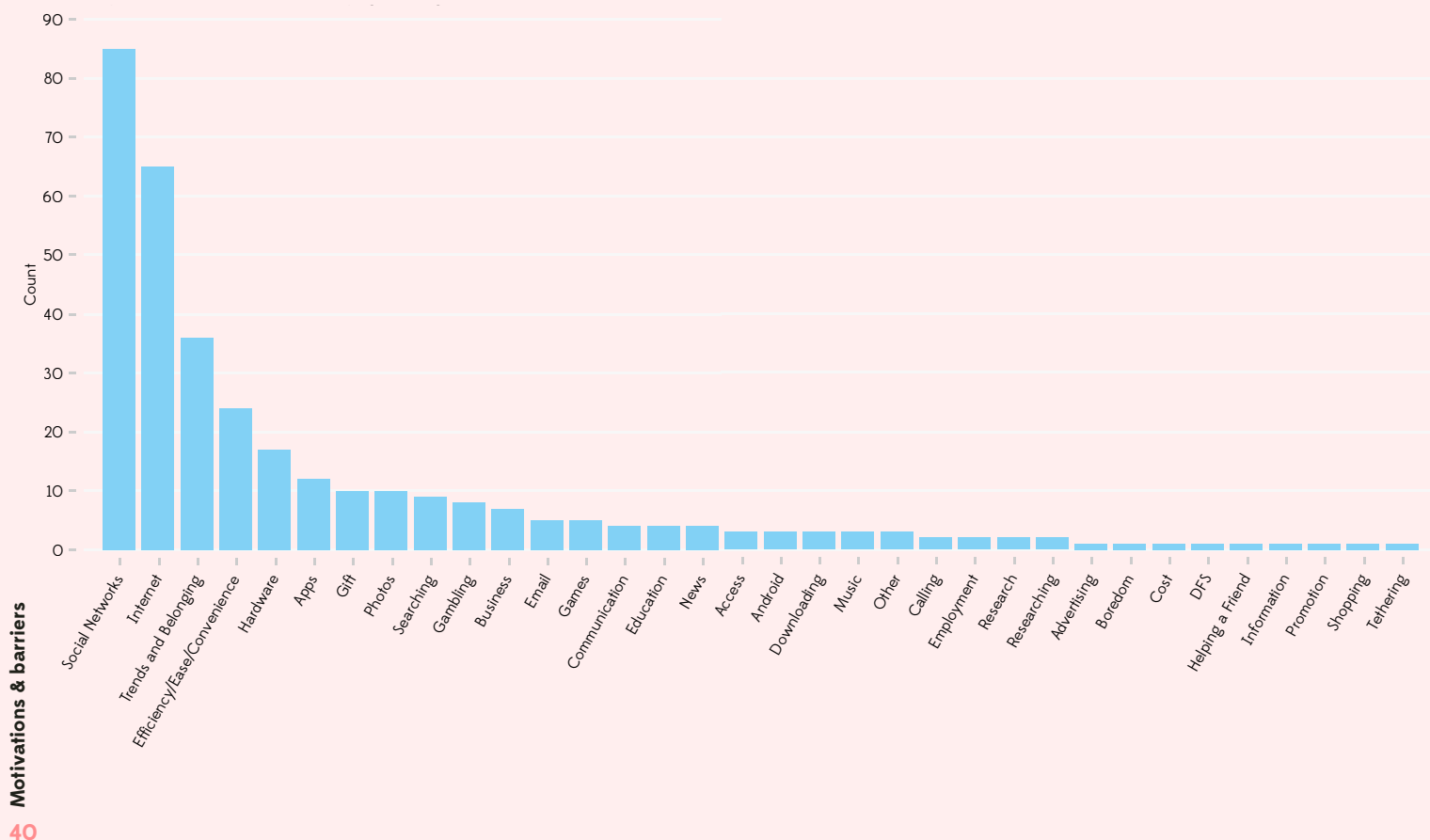
- For further consideration: what can we learn from social media that can be leveraged to accelerate adoption elsewhere (e.g. DFS)?
- How might we design experiences that build on the desire to belong?
- How might we incorporate Digital Financial Services into platforms that are already propelled by this desire? (For instance, Facebook Payments, or WeChat integration.)

# What was your reason/need/inspiration for buying or asking for a smartphone?

**THIS GRAPHIC ILLUSTRATES THE REASONS WHY THE DSO PARTICIPANTS ADOPTED THEIR FIRST SMARTPHONE:**

1. Social media
2. Internet usage
3. Trends and belonging

What was your reason/need/inspiration for buying or asking for a smartphone? (Recoded)



## MOTIVATION

# Pride and value of a smartphone

**“My cousin sold to me this phone. His wife was sick and he needed money for her medication, so I was just helping him.”**

– DSO PARTICIPANT

### THEIR MOST VALUABLE ITEM

Purchasing a smartphone was a very important step for the DSO participants that chose to do so, and usually required saving a significant sum of money. For 35% of them, their phone is “the most valuable item they own, and they would be devastated if they lost it,” with higher numbers for the treatment group than for the control group. 41% of participants, talk about their phone as, “valuable to me, and I would immediately replace it if I lost it.”

On average, participants spent between \$40 and \$50 USD to buy their smartphone.

**“Before I had my smartphone, I used to hide my feature phone so that people in the matatu would not see it. Now I use my smartphone in the matatu, and I feel much better.”**

– DSO PARTICIPANT

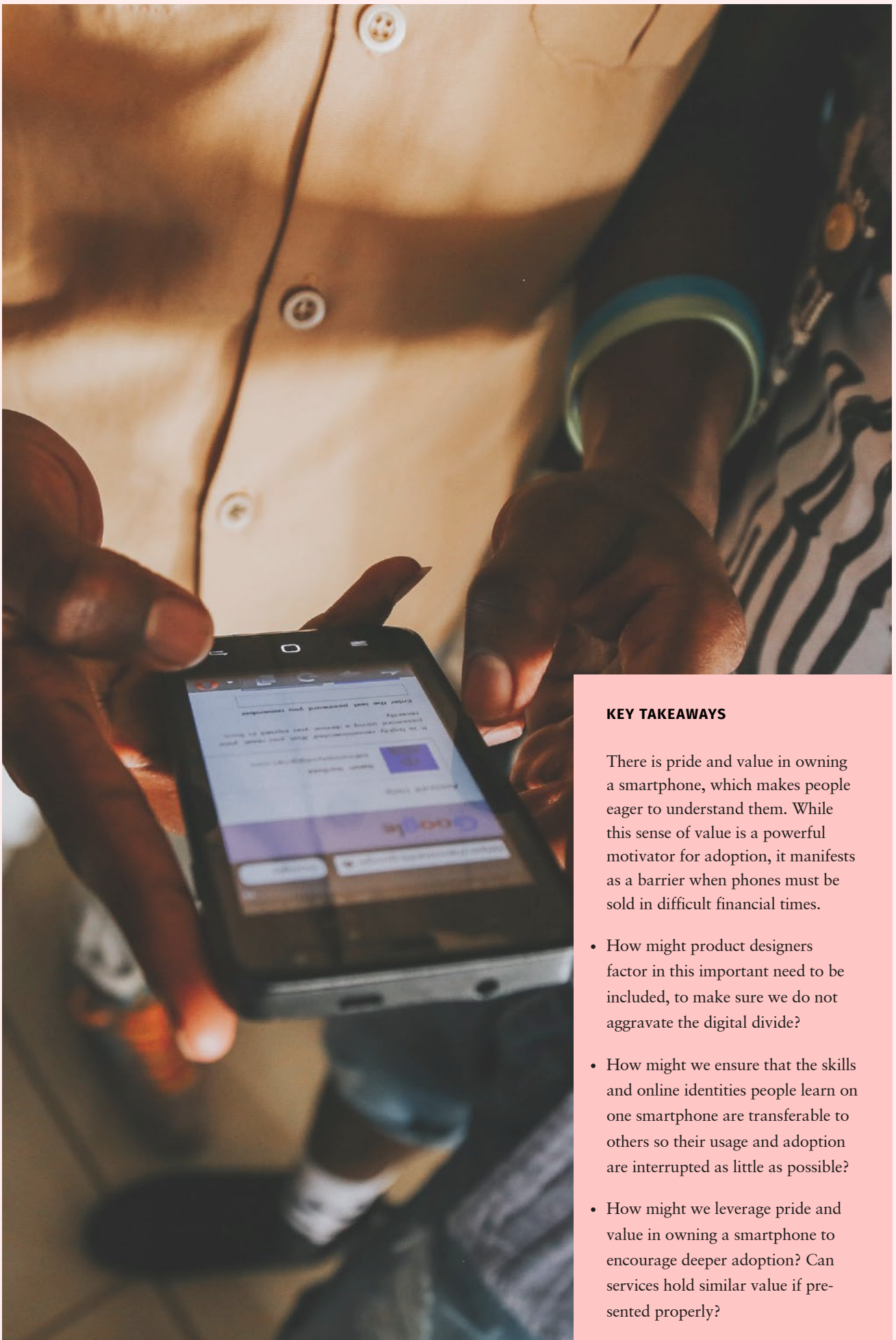
### EMOTIONAL VALUE / STATUS IN SOCIETY

We observed that this value is both financial and emotional. The cost of a smartphone and its symbolic meaning give its owner pride and social status, which combined with lack of understanding or ability, may lead to an appetite for learning smartphone-related digital skills.

Because of its important emotional, financial and utilitarian value, participants will go to great lengths to attend the digital skills trainings in order to master their device.

### SMARTPHONES ARE A GOOD INVESTMENT AND SEMI-LIQUID ASSET

Beyond the emotional value attributed to smartphone ownership, the real market value in a smartphone makes it an important semi-liquid asset to participants: they are easy to resell for cash. Despite the pride and desire associated with owning and using a smartphone, people are sometimes forced to sell them in times of need. For example, when health complications arise, someone might sell their smartphone to friend or relative to cover medical costs. A buyer might not be in need of a phone (or want one, necessarily), but will still purchase one from a friend in need in a gesture of community support. ■



#### KEY TAKEAWAYS

There is pride and value in owning a smartphone, which makes people eager to understand them. While this sense of value is a powerful motivator for adoption, it manifests as a barrier when phones must be sold in difficult financial times.

- How might product designers factor in this important need to be included, to make sure we do not aggravate the digital divide?
- How might we ensure that the skills and online identities people learn on one smartphone are transferable to others so their usage and adoption are interrupted as little as possible?
- How might we leverage pride and value in owning a smartphone to encourage deeper adoption? Can services hold similar value if presented properly?

# Online gambling



Gambling, or “betting” as it is commonly referred to, plays an important role in Kenyan society, especially among low income, new smartphone users as represented by the DSO participant group. Despite its risk and associated consequences, it is perceived as a fun activity that offers financial promise and other benefits. As a result, it can compel people to adopt technology to change their social situation. Some people are able to use the money they win to furnish their houses or buy electronics. People even claim that it has reduced crime rates among males in some areas because they are occupied with researching and placing bets<sup>1</sup>.

Gambling is a recent trend that has strongly penetrated the new smartphone user population. These new users are particularly sensitive to the gambling phenomenon due to their especially irregular incomes and daily life struggles. Gambling provides them with a (false and risky) promise of better days.

## Gambling habits lead to an increase in smartphone adoption and usage

### **A THIRD OF DSO PARTICIPANTS GAMBLE**

From interviews conducted later in DSO, we found that one third of participants reported gambling activity. Gambling was much more prevalent among male participants. More than half of the men in the study said they gamble, as opposed to less than a quarter of the women.

### **GAMBLING ACTIVITY INCREASED AFTER SWITCHING FROM FEATURE PHONE TO SMARTPHONE**

Gambling appears to have an impact on smartphone adoption. With the M-Pesa statements, we could observe a change in the gambling activity: it seems to have increased shortly after people bought their smartphones.

### **THE MAJORITY OF THE GAMBLERS SAID IT LED TO A MORE FREQUENT AND COMPETENT USE OF THEIR SMARTPHONE**

More interestingly, over the course of the study, 73% of the people who gamble said that gambling motivated them to use apps and websites. Seventy-five percent of this group also believes that gambling has improved their ability to use a smartphone.

This self reported statement by participants concurred with our quantitative data collection from Android over the year. The top five, most frequently visited URLs by participants are:

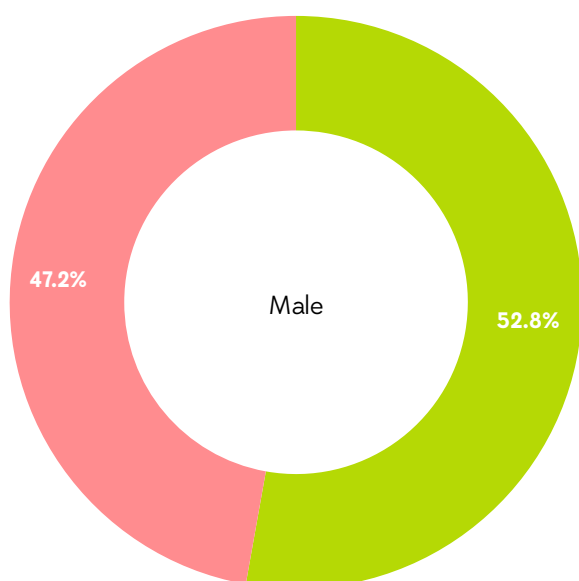
1. Google
2. SportPesa (Kenya-based sports gambling website)
3. Facebook
4. Safaricom
5. AF1234 (mobile web portal with entertainment, sport, adult content etc)

Closely following these URLs are entertainment websites, adult content, and three more gambling websites (Betin, Betclic and Betway). Soccer live results (instrumental to gambling) are also in the top 20 URLs.

Do you bet?

● No

● Yes



Additionally, 70% of participants would recommend using a smartphone to a friend for betting.

**FOR A SMALL GROUP, IT WAS EVEN THE PRIMARY REASON FOR PURCHASING A SMARTPHONE.**

Some people invested in technology to make their gambling experience even better. In a few cases (for 21.7% of the participants), gambling was the one of the primary reasons they bought a smartphone.

DSO researchers noted that one participant “used part of the money he won from gambling to buy his smartphone,” after being fatigued by gambling over SMS. More often, people cite their ability to do better research for their bets with a smartphone. One participant explained:

**“Diligence and research are required for successful betting, and, since it entices people to find and install apps and use the web, it might be the reason people feel that betting has made them better smartphone users over time.”**

– DSO PARTICIPANT

**Gambling can be a model or interesting driver for adoption of other products**

**IT REQUIRES A LOW BARRIER TO ENTRY AND BRINGS POTENTIAL REWARDS**

Its mixture of motivators makes gambling an interesting case study for modeling adoption in other fields, like financial technology. For instance, gambling is accessible to a broad

audience: it captures and retains their interest, and integrates well into society. With accepted bets as low as Ksh 10,

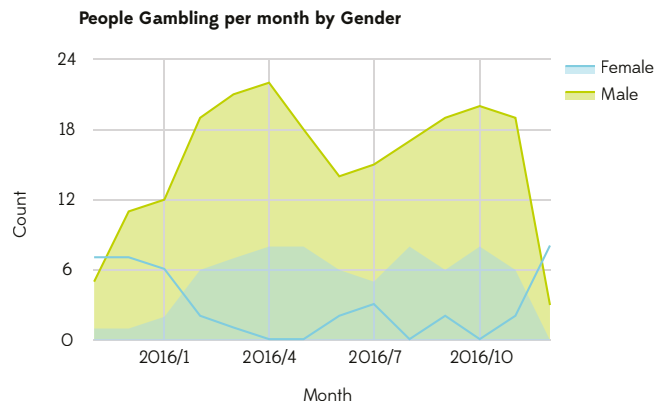
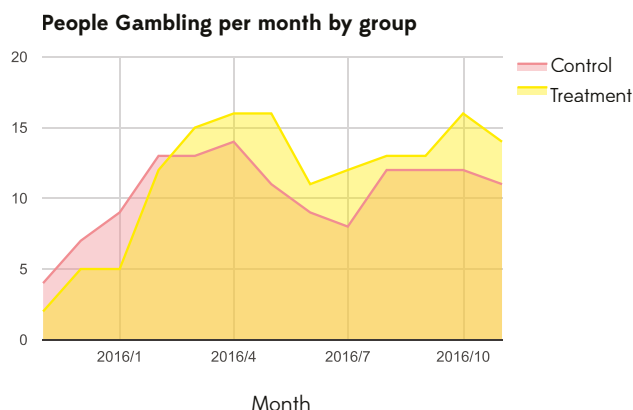
gambling has a low barrier to entry that most low-income earners can appreciate. To be successful, people need to stay mentally engaged, and are more likely to receive rewards when they do.

**“I actually bought the phone so as to bet.”**

– DSO PARTICIPANT

**BETTER TOGETHER: GAMBLING LEVERAGES COMMUNITY DYNAMICS**

When people seek out community to strengthen their skills, they reinforce their gambling activity and make it a bigger part of their lives. Some people entirely change their social practices to match their interest in gambling. For instance, a DSO participant, Naomi, stopped spending her weekends with her mother and



sister, and instead found groups in her neighborhood from whom she could learn tips or strategies for more effective gambling.

#### PEOPLE KNOW IT IS RISKY, BUT HAVE AN IMPRESSION OF WINNING MORE (OFTEN UNTRUE)

It is mainly the promise of (big) rewards that makes gambling attractive as well. Another DSO participant, Mark, has furnished his house through winnings from gambling. According to our data, 55% of participants believe they win most of the time, but our data shows that more than 50% have spent more on gambling than they have gained.

#### SOME PARTICIPANTS LEVERAGE DIGITAL FINANCIAL PRODUCTS TO GET LOANS ALLOWING THEM TO DO MORE GAMBLING

In fact, while Mark has found some success in gambling, his story is also a cautionary one. He has become such a gambling fanatic that he uses Digital Financial Services to take out loans to finance his bets—a strategy that is not uncommon. Since Mark does not like paying back these loans, he is at risk of being blacklisted by the Credit Reference Bureau. If that becomes the case, Mark would rather acquire a new SIM card (which might require using someone else's identity), and continue to bet. Another participant who has fallen into the same situation feels that banks have no right to ask him to pay back his Ksh 500 (USD \$5) loan, because they already have plenty of money.

#### A PRACTICE ALREADY USED AROUND THE WORLD WITH PRIZED-LINKED SAVINGS ACCOUNTS (PLSA)

We know that gambling is a concern for people and organizations working with low-income first time smartphone users. It becomes even more alarming when we see people getting into debt cycles in order to place bets.

Looking at consumer protection solutions, we can imagine DFS products modeling their design from the success of lottery and gambling. Its strong adoption could lead to interesting opportunities for inclusive FinTech product design.

For example, we know that Prized-Linked Savings Accounts (PLSA) have been created with a similar approach and exist around the world. They were recently authorized in the USA and represent a new area of study. Early research by Cole, Iverson and Tufano indicates that PSLAs “attract new people into the banking system who do not have other savings accounts” and are particularly interesting for a “financially vulnerable population”<sup>1</sup>.

**“It is easier to use a smartphone simply because it has variety of ability [for] enhancing betting. These are things like getting analysis apps from Play Store, seeing updates through Internet and also even watching the actual games that are being played at that particular moment.”**

– DSO PARTICIPANT

- In the case of Kenya, it might be especially interesting to prototype inclusive financial tools inside of the SportPesa customer journey. Providers could leverage the smartphone form factor, while refraining from building new native mobile applications.
- Similarly, DFS providers and product designers can think about designing systems and products where the user always wins, but where there is still a perceived risk. Such products would generate a similar feeling to the one generated from gambling. ■

<sup>1</sup> <https://insight.kellogg.northwestern.edu/article/using-the-lure-of-a-lottery-to-spur-savings>



### Smartphones for Wiser gambling

Jacob is a big football fan, and his love for the game has turned him into a self-professed gambling “addict”. He has a SportPesa account, where he bets almost on a daily basis.

His smartphone has helped Jacob watch games or follow scores of games as they happen, which lets him place better bets. Before owning a smartphone, he would bet blindly using a USSD code and would not follow games to know whether he had won or lost. Now, equipped with a smartphone, Jacob makes more informed bets since he can follow games and over-all team performance.

**“For SportPesa, I must use this kind of phone to open the Internet, see today matches, tomorrow matches.”**

### KEY TAKEAWAYS

With unprecedented traction among low-income, new smartphone users, gambling should be studied more in depth, as a case study for product design for this audience.

Gambling increases smartphone usage and comfort, and can even motivate people to purchase a smartphone.

- How might we design DFS entry/exit points inside of gambling apps and services? E.g. locked M-Shwari savings accounts in SportPesa to store fractions of winnings?
- How might we leverage the social aspects of gambling to improve learning or DFS experiences?
- How might we apply social and gaming mechanics, such as competitions and rewards (monetary or not), to digital financial products?
- How might we design learning experiences within gambling apps and services?

# Barriers to adoption

## BARRIER

### Hardware and Android difficulties

#### **FOR LOW-INCOME USERS, THEIR FIRST SMARTPHONE EXPERIENCE RESEMBLES THAT OF A FEATURE PHONE**

The ecosystem of product design for first-time smartphone users often refers to the global trend of rapid smartphone uptake. In reality, for this group of users, progress is slow, and device quality and digital skills can be poor enough to reduce the use of a smartphone to that of a feature phone. Limited financial options, availability and understanding cause DSO participants to acquire poor quality smartphones that run any one of a

**“Since it fell down, its Internet connection speed slowed.”**

**- DSO PARTICIPANT**

wide array of Android versions. (The average smartphone costs participants around \$40.) Some are second- or third-hand devices that have been purchased at a market or from a friend. Many of them present significant obstacles to leveraging and exploring the Internet beyond WhatsApp and Facebook, and can stifle adoption.

Among the problems people complain about are lack of storage space, broken screens, corrupted memory, software bugs and general unpredictability. These problems make many tasks difficult, such as downloading and using new applications, and prevent people from exploring. When attempting to install a new app, storage

limitations can be such a concern that users might have to delete an important social app, like Whatsapp or Facebook, or another beloved app, like The Bible or Temple Run.

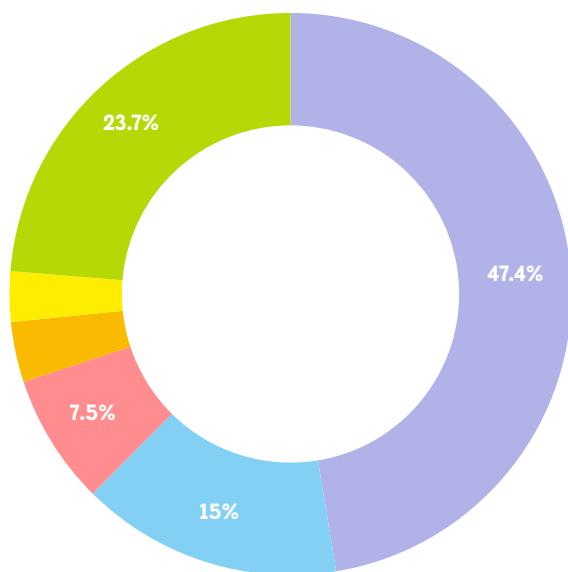
On average, around 18% of DSO participants (roughly 30 people) acquired a new smartphone between each interview, mostly due to hardware issues.

#### **ANDROID DOES NOT PROVIDE A FRIENDLY EXPERIENCE TO NEW SMARTPHONE USERS**

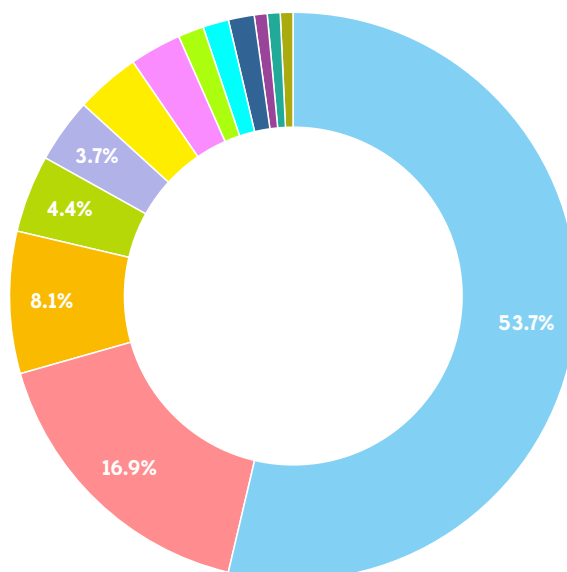
People with old, unsupported smartphones may still run Android 2.3, but many use 4.4 and a few lucky users have 5.5. (For reference, the latest Android version is 7). This wide range, and inability for some users to upgrade their Android version, exacerbates existing versioning problems that arise from people trading APKs rather than using the Play Store to download and update apps. Different versions of Android also have different default web browsing experiences, some of which are very poor by today's standards, and limit functionality.

Generally, new smartphone users have a hard time understanding what Android is, what an operating system is, and how it differs from apps or services. Being cognizant of the operating system governing a smartphone seems like a fairly technical skill: why would a first-time user need to understand it? A good grasp of

## What kind of trouble have you been having with your phone/technology/internet?



- Nothing
- Hanging phone
- Network problem
- Phone broken
- Battery issues
- (36 other)



- 4.4.2
- 4.2.2
- 4.4.4
- 5.1
- 5.0.2
- 4.1.2
- 2.3.6
- 5.1.1
- 4.3
- 4.0.4
- 6.0
- 5.0
- 2.3.5

**“Phone has been problematic, he had to flash it hence lost all his downloaded apps and files.”**

– DSO KILIFI RESEARCHER

basic OS knowledge can be useful for users to identify, discuss and manage their problems.

Aside from desktop operating systems at cyber cafés, Android is likely the only operating system with which first-time

smartphone users have regular experience.

At the beginning of our study, many of the DSO participants came to the first workshop with questions about practical tasks and curiosities, such as turning on Bluetooth or managing apps—ostensibly basic aspects of Android. Without knowledge and comfort using Android—or indeed many aspects of technology that veteran smartphone users take for granted, like Wi-Fi—their sense of exploration and agency were stunted.

Lack of knowledge causes people to mis-attribute problems. In an attempt to troubleshoot a problem, people will often ask themselves, “What changed?” A new app may have been installed or the phone may have been dropped, either of which people could assume to be the source of their problems. Sluggish UI response and malfunction are inevitable, and people have grown accustomed to formatting their devices at the first sign of trouble in an attempt to regain a consistent experience.

Like any modern operating system, Android attempts to give users a consistent and fluid experience, even under the unfavorable hardware or software conditions first-time smartphone users are likely to have. However, error messages like “Unfortunately, [insert app name] has stopped” are common and hardware faults cause problems with no explicit warning or error message (and instead, may simply write black rectangles to memory instead of pictures someone

took). Since Android offers no explanation of what happened or what to do next, the user can not tell if the problem is their hardware, the software, or themselves.

Blogs and forums offer explanations and less disruptive alternative methods to fix problems. However, new smartphone users may not know how to search for a solution on the web, or even that they could.

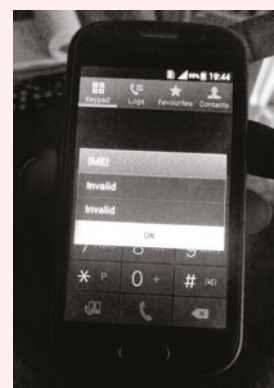
#### **WITHOUT AN UNDERSTANDING OF THE FUNDAMENTALS OF ANDROID AND SMARTPHONES, NEW USERS CAN FALL VICTIM TO SCAMS**

Phone resellers might take advantage of this lack of knowledge to advertise properties of the phones, which are sometimes wrong or exaggerated. For example, many phone resellers advertise that their smartphones support WhatsApp—just as any smartphone should—or have it pre-installed. They are trying to leverage people's desire to use popular products, and take advantage of their lack of knowledge that any Android smartphone is capable of downloading apps from the Play Store, including WhatsApp.

“Android clones” that appear to have the same features as an Android smartphone are also prevalent in markets, but in reality these clones run a different proprietary OS. We have observed people with clones, not knowing the OS that their phone was running.<sup>1</sup>

Many non-Android Itel phones are featured alongside their Android counterparts in markets, all with stickers listing similar features. Without prior knowledge, and without trying them out, it is difficult to distinguish which ones really run Android.

Not only does this practice perpetuate the circulation of out-of-date apps that may contain security risks and lack important features, it also makes people reliant on their physical social networks for digital content. ■



A participant has bought a replacement phone from a reseller from Rwanda, which shows an IMEI error and will not connect to any networks. She can still use the phone to play games, but needs a Wi-Fi connection to use WhatsApp.

She does not understand why a foreign phone would not connect to the network.

#### **KEY TAKEAWAYS**

When building products for first-time smartphone users, we need to pay special attention to low-quality smartphones, and the variety of Android versions, because that is the reality of affordable and accessible smartphones in today's market.

Any modern basic technology curriculum should cover Android, operating systems, apps, and common phone features.

- How might we work with Google, phone manufacturers and other Android advocates, to design first-time-user experiences that effectively teach basic Android concepts with little prior technology experience?
- How might we increase public awareness of the capabilities of Android devices?

<sup>1</sup> <https://mozilla-foundation-research.herokuapp.com/do-first-time-smartphone-users-know-their-phones-operating-system-evidence-from-field-recruitment-report/>

## Prohibitive usage costs

### COST IS A SURPRISE!

After purchasing a smartphone, people are often surprised by the cost of being connected and continuing to use social media apps that will keep them in contact with their friends, family, businesses and hobbies. In Kenya, mobile data comes in the form of “data bundles” which come in various denominations of MBs and last for a certain period of time depending on price—a day, a week, or a month. Modern smartphone apps use a lot of data, so people need to regularly purchase data bundles, and this process can be prohibitively expensive. Many people thought that purchasing their device was the major cost, but when stepping into digital life, they realized they also need to make room for Internet costs—**everyday**.

### A DAILY TRADE-OFF BETWEEN INTERNET COST AND OTHER NECESSITIES

On the Safaricom network—the most expensive, but robust network—a 65MB data bundle costs Ksh 50<sup>1</sup>, which could also be used to buy dinner or water, or pay for rent. (For reference, Ksh 500, or USD \$5, is a DSO participant’s daily income, and will buy 1GB of data, a substantial dinner for five, or rent for a week.) This financial decision is difficult to make on a daily basis, so people

**“Sometimes apps do not completely download even if there are enough data bundles..”**

– DSO PARTICIPANT

find systems to spend as little data as they can online. For example, Faith from Nairobi limits her Internet usage to 30MB per day to make sure she is within budget. If this limit prevents her from being online, then she will simply be disconnected until she can afford another data bundle. Among others, her participation in Sterro, our WhatsApp experiment, was disrupted by this problem. Participants are frequently cut off from smartphone activity because of data costs.

This high cost of Internet usage is an important barrier to the adoption of products and services.

### BLOCKING EXPLORATION AND AGENCY

People do whatever they can to avoid spending money unnecessarily, which leads to usage patterns based on

avoidance. Instead of using the Play Store to download apps, people share them with one another over Bluetooth using Flash Share (or Xender). If they can not rely on a friend, they might go to a cyber café where installing an application costs Ksh 100 per app. Creating accounts or resetting passwords costs between Ksh 50 and Ksh 100.

**“Chatting on a daily basis is expensive in terms of data bundles.”**

– DSO PARTICIPANT

Limiting people’s agency to explore, this high cost of Internet usage becomes a blocker for the adoption of new products, including digital financial service applications.

### ANDROID DOES NOT HELP PEOPLE UNDERSTAND AND MANAGE THEIR EXPENSES

Additionally, Android makes it difficult or impossible for users to understand where their money goes and how to manage it. The interface provides limited information about which applications consume the most data, but people are left wanting and need more agency. Questions around how to limit or optimize consumption were frequent throughout the project. ■

### KEY TAKEAWAYS

Internet access is too expensive and hinders new smartphone users. The lack of understanding of how data is consumed does not help users make informed decisions.

- How might we make the Internet less expensive for this demographic without sacrificing range or freedom of choice?
- How might we integrate better support for data and money management into Android?
- How might we help users understand their options to control their data expenses?

<sup>1</sup> Based on “Weekly Daily Bundles” from <https://www.safaricom.co.ke/personal/my-internet/new-to-the-internet/data-plans>

## BARRIER

# Literacy, language and education

### LITERACY AND FORMAL EDUCATION IMPACT USER CONFIDENCE

Literacy and formal education levels affect people's confidence and the way they learn about and use technology. Styles and methods of learning differ across regions, cultural groups and classes, which make special-interest education difficult to administer. Where dialects and societal norms had a direct impact on atmosphere and attendance, it was essential that local community members ran DSO's digital skills workshops. They navigated hyper-local differences in culture and language.

For example, participatory workshop practices involve people being in circles, talking to each other, and publicly sharing thoughts. Generally, these practices are recognized to have a positive impact on learning, but they can shake the confidence of participants who are not familiar with the approach and language used to discuss topics. Since Kenyan society is so community-oriented, this finding was surprising.

### SMARTPHONES INTRODUCE A NEW VOCABULARY AND TECHNICAL LANGUAGE

While people can find their way around English or Sheng despite their literacy or education levels, it is the new technical vocabulary that makes smartphones difficult to understand. People are genuinely interested in learning about smartphones, but want to maintain their pride in the face of difficult topics and technical language. Many DSO participants had trouble with English (but would not easily admit it), and would prefer to use Sheng or Swahili, in which technical language is more difficult to use.

**“Since it fell down, its Internet connection speed slowed.”**

– DSO PARTICIPANT

These concepts extend into smartphone and Internet use. Generally, low literacy levels can prevent smartphone use, exploration or even purchase, but language, pride and confidence can be more of a problem when users find their way online. Confusion can lead to shyness and limit Internet use to passive activities. ■

### KEY TAKEAWAYS

Literacy and local cultural norms shape the way people feel about technology and the way they learn. Technical language and new vocabulary make the experience more difficult and unfamiliar for people.

- How might we help people understand the language on their phone while they use it?
- How might we create useful iconography and visual language to avoid language barriers when teaching digital skills?
- How might we provide digital skills training using local knowledge and culture?



## BARRIER

# Gender gap

Gender effects technology use in many countries, including Kenya<sup>1</sup>. In DSO, we saw that it affected the way people use their smartphones and the Internet, and the methods they use to learn about both.

### WOMEN'S ACCESS TO SMARTPHONES CAN OFTEN BE INFLUENCED BY MEN

Among DSO participants, women's initial access to smartphone technology was more often administered by a man. Female DSO participants were three times more likely to receive their smartphone as a gift, and generally, women were almost three times more likely to be influenced by their partner when purchasing a smartphone, usually in the form of financial support.

There are societal expectations on the way women spend their time and money, usually making them financially dependent on men for large purchases. This financial reliance can severely limit technology adoption by women, as they have less decision-making power and fewer opportunities to access technology.

### WOMEN'S ONLINE BEHAVIORS CAN BE INFLUENCED BY MEN

As they come online, women's smartphone usage is continually affected by the men in their lives. Generally, female DSO participants are somewhat more likely to be influenced by their partner in their smartphone activity, and women receive advice from their partner about how to use their smartphone more often than men.

This imbalance must have an affect on the mindset of women as they are exposed to smartphone technology for the first time, but it shows up in other ways as well. For example, when asked about opportunities to learn about technology products and services, most DSO participants agreed that men fare better. With

such expectations, there is an implicit barrier to discovery and access for women.

Both men and women admit that their partner inspects their phone usage, but more men admit to keeping smartphone-related information from their partner, like secret SIM cards, messages, or photos.

Through DSO, we collected several stories of how men directly impact women's technology use. Some female participants were stopped from using services like Facebook Messenger or WhatsApp by suspicious husbands. One participant from Nairobi, who had received her smartphone as a gift from her partner, got into an argument with him which resulted in her smartphone being taken away and sold.

### ON-DEVICE LEARNING CAN REPRESENT AN OPPORTUNITY TO BRIDGE THE GENDER GAP

Within the societal norms that can make traditional learning methods more difficult for women, there is an opportunity to bridge this gender gap with technology.

Out of the three styles of teaching we employed in DSO—workshops, a WhatsApp persona named Sterro, and a standalone app called Jisort—women were more comfortable than men with on-device experiences, and reported learning more through WhatsApp in particular. Our data shows that women were more talkative and engaged on WhatsApp than men. Workshops still seem to be invaluable resources, but they are perhaps more equally effective across genders when combined with other methods.

### WOMEN AND MEN SPEND DATA BUNDLES DIFFERENTLY

Overall, male DSO participants outspent women in data bundles. Measured over all 6 interviews, the average daily bundle purchased by women is 18MB, versus 25MB for men. There was no significant between the treatment and control group on this measure. ■

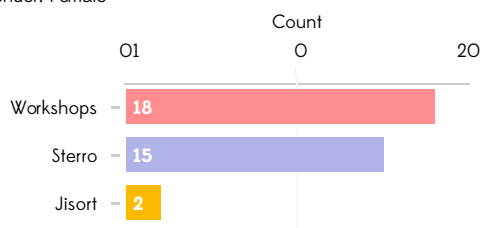
**“She uses Facebook Messenger rarely simply because her husband became suspicious and barred her from using it. Therefore she reduced her uses and also she only checks updates but doesn't do anything further than that.”**

— DSO RESEARCHER

<sup>1</sup> <http://www.pewglobal.org/2016/02/22/internet-access-growing-worldwide-but-remains-higher-in-advanced-economies/>

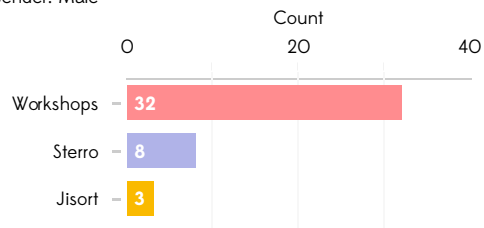
### Rate which taught you the most?

Gender: Female



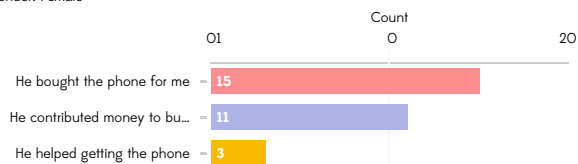
### Rate which taught you the most?

Gender: Male



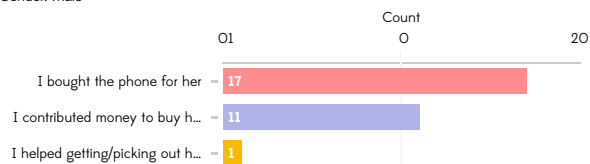
### How did you play a role in your partners purchase of a smartphone?

Gender: Female



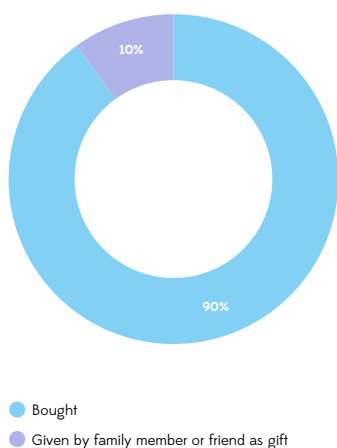
### How did you play a role in your partners purchase of a smartphone?

Gender: Male



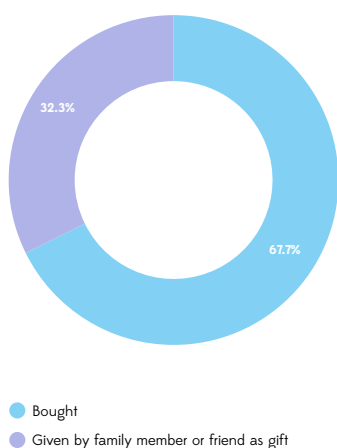
### How did you get your smartphone?

Gender: Male



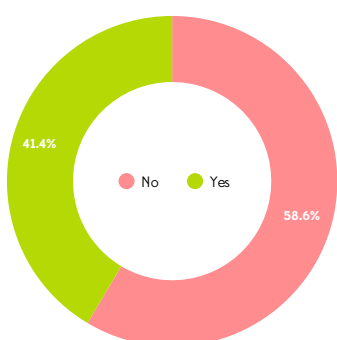
### How did you get your smartphone?

Gender: Female



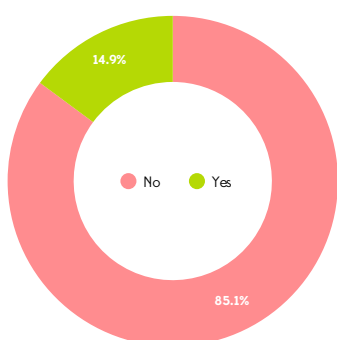
### Did your partner play a role in purchasing your smartphone?

Gender: Female



### Did your partner play a role in purchasing your smartphone?

Gender: Male



## KEY TAKEAWAYS

For women, technology access can be limited by men. They rely on men for hardware and consult them for knowledge.

While they still value in-person learning opportunities, women are more comfortable in more private situations, which can be offered through their smartphone.

- How might we build on-device experiences that provide the right space for women to be comfortable?
- How might we make information access easier to women who are interested in technology?
- How might we help women be more independent in their technology usage?

## Environment & ecosystem

### A NEW AND MISUNDERSTOOD CONSUMER ROLE

Entering the digital world challenges the understanding that new smartphone users have of their role in society. Who makes smartphones, apps, and the web? Who owns the Internet? Without experience with modern technology conventions, it is difficult to understand the expectations of a consumer (which the majority of new smartphone users are), and the relationships between the organizations that provide apps, services and access.

### OVERCONFIDENCE EFFECT

At the beginning of DSO, 93% of participants said that they knew how to use the Internet. After some investigation, it was clear that they were overconfident, and lacked an understanding of how much more there was to understand and how complex the Internet may be. (The overconfidence effect is well documented, and affects people in many fields of study and practice in a similar way.)

### CENTRALIZATION OF SERVICES LEADS TO LITTLE AWARENESS OF THE OPEN NATURE OF THE INTERNET

Their first moments in the digital world are paved by a handful of monopolistic players—Facebook, Google, Safaricom, etc. These organizations control the majority of people's online experiences. Since new smartphone users do not know who develops and maintains the applications and software they use, they are easily confused about the necessities of this ecosystem, like digital accounts. (The word "account" is strongly associated with banks for many DSO participants, and is regularly displayed to them in English.)

**The first experience people have with the Internet shapes their understanding of what it is and what they can do with it.** For previous generations of technology users, the Internet was shaped on computers, and was transformed through layers of technology advancements and economic competition. The Internet and the web are a vast and complex bundle of apps, services, and web pages that work across different types of devices. However, to first-time smartphone users, the web is encapsulated inside an app (for example, Opera Mini), and its connectivity to the rest of the digital world is less obvious. Apart from the web, the Internet is very closely tied to social media and mobile apps. In fact, because of how

they have been presented through apps, people hardly consider that well-known platforms like Facebook are web pages as well. Even the relationship between Android and Google is unclear to first-time smartphone users, especially without previous experience with Google as its own entity.

### DIGITAL ACCOUNTS ARE HARD TO UNDERSTAND AND MAINTAIN

Without an understanding of digital identities and the organizations that underpin them, it is not obvious why one would need a Google account (and an email address) to setup an Android phone or to download apps from the Play Store, or why a different service like Facebook requires another account. In one workshop, a DSO participant asked why he was not able to use his Yahoo email to log into a Gmail app. Another participant asked, **"Do I need to create a new email address especially for Twitter?"**

This confusion leads people have accounts created for them by someone else—a friend, a salesperson, or someone at a cyber café. Their accounts are not private or safe, and seldom are they able to remember and use the account information afterwards. If their phone is lost or broken (a frequent occurrence), so are their accounts. At the first workshop, password resets were among the most common requests for help.

**"You can access Facebook through Opera Mini? I did not know that was possible."**

– DSO PARTICIPANT

As their involvement in digital life increases with smartphone ownership, this lack of awareness and foresight puts people at a disadvantage. They lack the agency to make informed decisions about the services they use, the accounts they create, and the credentials they use to access them.

### PRE-INSTALLED APPLICATIONS ARE CONFUSING

Pre-installed content can have a negative effect on first-time smartphone users. DSO participants were often confused about what to do with pre-installed apps that did not have a clear purpose. They asked questions like Should I use it? Why is it here? What is it? With little or no awareness about the actors that provide and control the technology they use, they become confused by the presence of these apps that they do not need. Since many of these apps are manufacturer-specific, they differ from

**"T: Who makes the Internet?"**  
**"P: Safaricom."**

– TEACHERS AND PARTICIPANTS  
DURING A WORKSHOP

device to device, so useful knowledge about them is scarce.

However, even the common, generally accepted apps are confusing to some people. It is not obvious why Google apps appear on Android phones, and why they are the preferred applications. If Google already has an app for email, why is there a Yahoo version? Why can someone not use their email address on any one of these apps?

Not understanding the purpose of these apps or where they come from can make people feel less confident about their technology. During the first workshop, one participant showed us a few pre-installed apps on his phone. He was worried that he was missing something important if he was not using them. Some people had DRM validation apps on their phones, which they were very curious about, but had no need for, considering their heavy use of services like Tubidy. Even worse, some of these apps cannot be deleted through ordinary means, which makes them appear more important than they really are.

#### OWNERSHIP, RESPONSIBILITY AND ETIQUETTE ONLINE ARE UNFAMILIAR AND TROUBLESOME

The critical thinking skills people have honed in their offline life do not always transfer well into their online life. First-time smartphone users are confronted with a great deal of new information on unfamiliar platforms, and they need new skills to assess the validity and credibility of information, apps, and services they interact with. Since anyone can create and publish content on the Internet, first-time smartphone users need basic information and media literacy skills, and need some understanding of the relationships between people and organizations online.

Their inexperience with the online environment and its actors makes them particularly vulnerable to scams, pranks and social situations that could cause them trouble. Many DSO participants were unaware of the people,

**“[He] has a previous email which he can’t do away with. He has created a new one but still his statements appear in the older one.”**

– DSO RESEARCHER

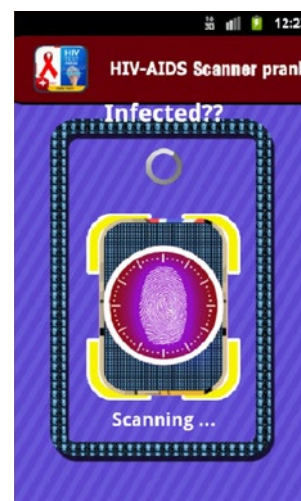
**“He has been trying to install Messenger on his new phone but he has difficulties setting up his Gmail account.”**

– DSO RESEARCHER

systems and organizations that are responsible for the content available on the Internet—apps, services, media, and websites. They have had little to no exposure to the open nature of the Internet, and lack critical thinking towards its content.

As a result, in places like the Google Play Store, people have downloaded and used apps that are demonstrably fake. Comments and rating systems are supposed to help consumers make good decisions, but the community-powered online vetting systems, on which services like the Play Store rely, are unfamiliar, complex and mostly in English.

Early in the study, a participant approached us with questions about an HIV diagnosis app she had downloaded. Unable to evaluate the validity of the app, she did not know it was fake and was confused about how it was able to give her a diagnosis. On the Play Store, there are HIV apps that truly attempt to help users identify the possibility of HIV infection by evaluating symptoms, but the app she downloaded attempted to do so via finger print analysis through her smartphone’s touch screen.



*Screenshot of the HIV-AIDS scanner prank app. It has since been removed from the Play Store.*

Participants have also been confronting fake news circulated on websites and social media. During our WhatsApp experiment, participants approached us to comment on the truth behind scandalous or strange photos they had found online. Their questioning led us to design a humorous learning endeavor in which participants were tasked to find and share instances of fake or incredible information, and comment on why it was not true.

A particularly ambitious DSO participant was inspired to take his writing skills to the Internet by starting a blog. With political motivations, he began to share gossip, inappropriate photographs, and exaggerated claims about politicians and celebrities. For such conduct, he could have easily garnered more than one fine.

In Nairobi, we conducted an interview with another participant named Evans, who was interested in hacking. We attempted to explain the depth of technical knowledge required to be a hacker, and illustrate privacy violations by relating to well-known offline infractions. Despite our efforts, Evans still wanted to hack our accounts, just “to see what is there.” Later, we discovered that he was representative of many other DSO participants who also wanted to learn to hack. To them, hacking was an admirable ability that could solve problems they faced daily, like locating someone who owed them money, not a violation of privacy that could even be a crime. How can we help new users understand the limits of what is allowed online?

#### **OFFLINE APP SHARING PREVENTS PEOPLE FROM EXPLORING AND CONNECTING**

Since a reliable connection is not always available, or is too expensive, many people share apps and content through SD Cards, Bluetooth, or an app called Flash Share, or Xender (there are many other clones).

This practice prevents the routine updates popular apps need to distribute to fix security vulnerabilities or new features. As a result, people are often faced with a screen that tells them their version of WhatsApp is out-of-date, which prevents them from staying in touch with their social networks online.

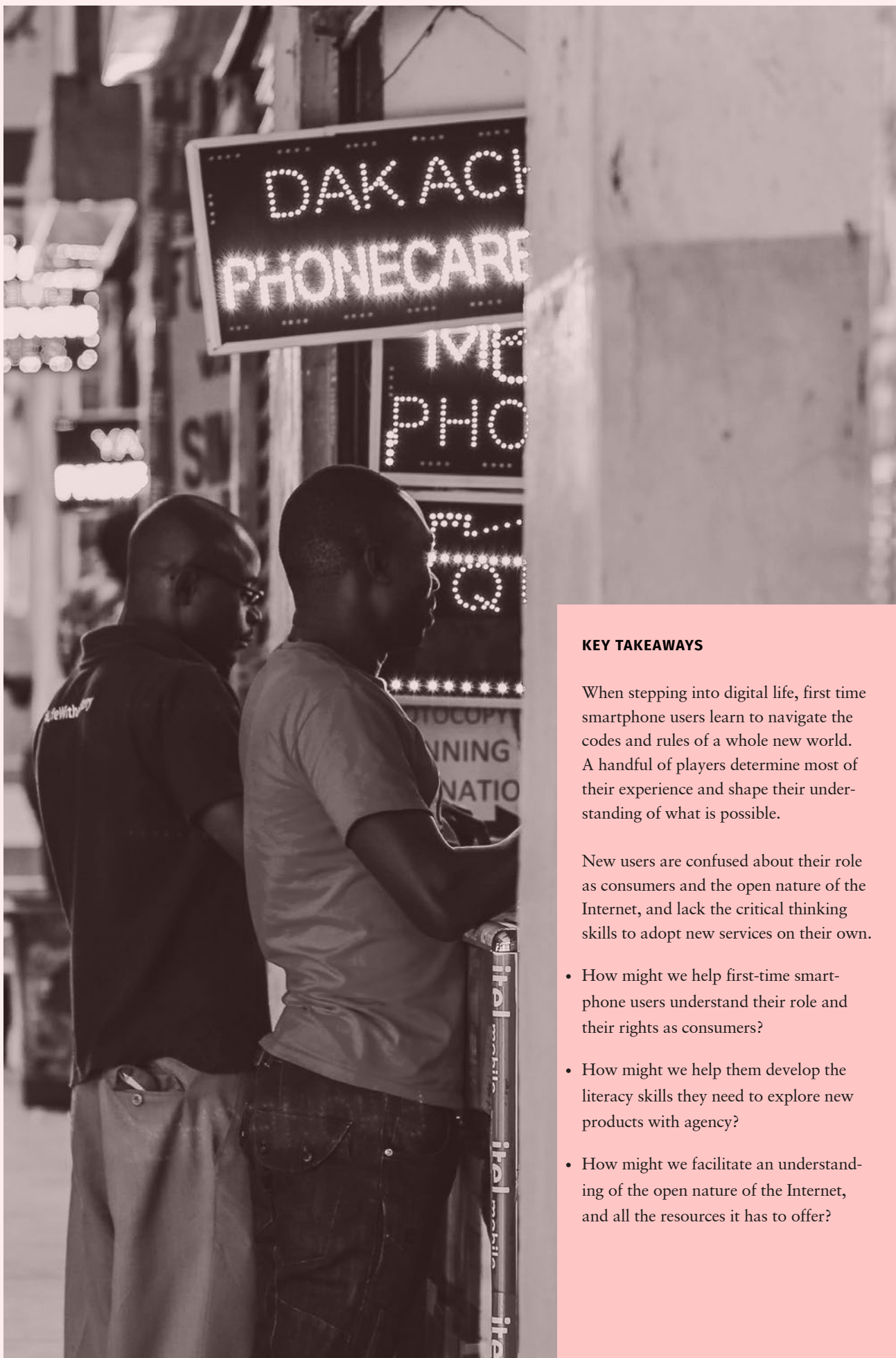
Without a service like the Play Store to facilitate app exploration, people are confined to their friends and relatives to learn about new apps and services. The best products pass through networks quickly, but first-time smartphone users that depend on this method never have the opportunity to search on their own. Their agency is limited because they must always rely on information to come to them through other people. ■



#### **PRE-INSTALLED EXPECTATIONS**

One participant’s phone was pre-installed with an app designed to find doctors in close proximity. However, since the app contained no data about doctors where she lived in rural Kenya, it did not operate as expected. This led her to believe she was doing something wrong, and led to a lot of confusion.

- For whom was this app intended?
- Why is it a pre-installed app?
- What kind of connectivity do companies expect their users to have?



#### KEY TAKEAWAYS

When stepping into digital life, first time smartphone users learn to navigate the codes and rules of a whole new world. A handful of players determine most of their experience and shape their understanding of what is possible.

New users are confused about their role as consumers and the open nature of the Internet, and lack the critical thinking skills to adopt new services on their own.

- How might we help first-time smartphone users understand their role and their rights as consumers?
- How might we help them develop the literacy skills they need to explore new products with agency?
- How might we facilitate an understanding of the open nature of the Internet, and all the resources it has to offer?

# Environment

## A look from the Internet Health framework

The Internet looks very different to people depending not only on their motivations and knowledge, but also on the geographic, political, economic and sociological environments in which they live, work and play.

DSO reveals the perspective of those who are discovering their hand-held technology—mobile OSs, the Internet, apps, and the web—for the first time. In that sense, it provides us with a snapshot of the Internet ecosystem in Kenya in 2016 for a specific, but sizable and important demographic.

**Using Mozilla's Internet Health framework, we can analyze this ecosystem.** Mozilla looks at the Internet through the lens of five key issues, providing a holistic understanding of the strengths, quirks, and weaknesses of the world's technology ecosystem as it relates to a free, open, safe, useful, and positive Internet. Their impact on the pace and quality of innovation and participation directly affects the experience of Internet users, and in-turn, affects a much broader socioeconomic ecosystem.

This concept is not intended to be a score-card, but simply to provide a framework for understanding the digital environment of our participants. **To learn more about Internet Health, visit [internethealthreport.org](http://internethealthreport.org).**



### PRIVACY & SECURITY

Internet users should be able to have greater choice over what information they share with what organizations and for what benefit. They should have the freedom to express themselves online without unwarranted surveillance. And, they should be able to safeguard their information against attacks.

Privacy and security are very important in Kenya, but DSO participants do not know or understand the actors and motivations that govern the Internet, and the technological and mental frameworks that underpin it. While society has strengthened its ability to detect fraud and scams, individuals lack awareness and experience of modern digital security and privacy practices (like strong passwords). This makes them vulnerable to malicious intent wherever connected technology is used.

A potent lack of understanding makes hacking mysterious and unbelievable, and possibly a reasonable and acceptable snooping tool to those who desire power or information.

### OPEN INNOVATION

People who want to change the world should be able to build products and understand different points of view through open source code and idea sharing. Copyright and patent laws should be reformed so that in this digital age, they foster collaboration and economic opportunity.

Theoretically, DSO participants can publish and invent online, but in reality, they have very little awareness of the creative potential of the Internet, and inadequate skills and confidence to explore.



## DECENTRALIZATION

There shouldn't be online monopolies. Instead, big and small businesses—and individuals from around the world—should all be able to contribute to and provide online services. Internet users should be able to reap the benefits of competition and exposure to different ways of thinking.

People purchasing their first smartphones today, especially in places where opportunities to learn are limited, are affected by the centralization of the Internet. Almost everything they experience online—from the selection of apps that are available to the communication and identity systems on which they depend—is directed by Google, Facebook, or the network operator that provides their Internet service. These initial interactions shape people's understanding of what the Internet is, how comfortable they are with it, and how they can leverage it.

## DIGITAL INCLUSION

People—no matter where they live in the world, their income, their language, the color of their skin, or their gender—should have unfettered access to the Internet. They should be able to both consume it and create it so that the Internet reflects the diversity of the people who use it.

Many DSO participants live in difficult conditions and have few educational opportunities that can help them get online and leverage the Internet. Language is a strong barrier that manifests not only online, but within the technology people use to connect. Even where learning opportunities are available, complex language and English prominence can still play an important role in hampering inclusion. Gender also affects inclusion in Kenya. Women have a very different approach to technology, learning, and communication than men, but their access to these resources is nevertheless impacted by the decisions of the men in their lives.

## WEB LITERACY

The Internet is a place where everyone can have their individual voice. Everyone should have the skills to read, write and participate online. Web literacy should be foundational in education, alongside other areas like problem solving and creativity. People everywhere should be able to shape the Internet to solve for our world's challenges.

Overall, the DSO participant group exhibits a very low level of web literacy. They do not know what the Internet is, how to use it, how to use safe online practices, etc. Their lack of knowledge intrinsically limits how they see their role as a consumer in the Internet ecosystem, and their ability to change it. ■

# Digital Financial Services

**Due to the history and function of Digital Financial Services in Kenya, they deserve special attention in this discussion of smartphone technology adoption.**

## What does DFS adoption and usage look like among DSO participants?

The use of Digital Financial Services was high among DSO participants from the start. Before the first interview, 96% of participants already used M-Pesa (the most popular DFS). Although adoption of new Digital Financial Services did not increase significantly throughout the study, during the first interview 80% of the participants said they use DFS ‘sometimes’, ‘often’, or ‘very often’, this combined number slowly increased to 92% during the last interview.

### **A GENERALLY STABLE USAGE, MOSTLY USSD BASED**

We see a modest improvement in the use of the most popular DFS, with an especially noticeable increase in popularity of Okoa Jahazi and M-Shwari.

Less than 10% to 15% of participants reported using Digital Financial Services which require a smartphone to operate, such as banking apps, PayPal, Kopo Kopo, mobile pension services and more.

### **SIMILAR MOTIVATIONS AND BARRIERS**

In many ways, DFS are similar to other types of products and services accessible through smartphones.

Societal trends motivate people. If a financial product is attractive or essential to some people, they will use it and others will not want to be left behind. As an obvious, but important example, the strong presence of mobile money (e.g. M-Pesa) in Kenyan society makes it a necessary component of economic and digital life.

Financial apps, websites and services also raise the same barriers to first-time smartphone users as other digital products. As with other services, the adoption of DFS is subject to its audience’s awareness of the service, its

ability to access and use the service, and its perception of the product’s value. For instance, a DFS app that relies on digital advertising or the Play Store for discoverability might remain obscure to first-time smartphone users because they cannot easily navigate the web or the Play Store to find and install it.

Instead, these users often receive news about apps, and the apps themselves, directly from local sources of knowledge, like friends, relatives, or cyber cafés. To be well known and widely used, a DFS app would have to spread through word-of-mouth, and, therefore, be particularly interesting or useful.

Even if a first-time smartphone user is interested in a DFS app, they must consider its cost vis-à-vis data bundles. Low-income earners are especially cautious of spending because of how much planning is required to meet the cost of living on a daily basis. Also, the quality of smartphones among these users usually leads to frequent storage problems and technology failures that impede installation and usage, and network interruptions or delays introduce problems with routine activities.

## Economical and financial specific barriers

Additionally, DFS have their own set of specific barriers that can further complicate adoption: they are more financial than digital in nature. We may be able to alleviate many of the common technology barriers already mentioned above—for example, improving people’s ability to download and use apps—but that may not be enough.

### **DIGITAL FINANCIAL SERVICES ARE FOR RICH PEOPLE**

Low income levels can also raise barriers that are, in many ways, specific to DFS. With little or no money

**“I want to hack an account, like yours, I want to hack your account. I want to see what is there.”**

– DSO PARTICIPANT, TALKING TO US

available, people may feel as though these products, which are perceived as more sophisticated than M-Pesa, are not for them. Unfortunately, some people are simply unaware that platforms and features exist which are specifically designed for low-income earners, like M-Shwari, which will let users lock away as much as Ksh 1 at a time.

**“M-Pesa is my bank.”**

– DSO PARTICIPANT

Instead, they prefer to keep their money as liquid as possible while still in the digital realm, and continue to use products like M-Pesa not just for transactions, but as primary financial storage. These people lack the financial literacy and product understanding to make effective use of the services available to them.

#### SECURITY BECOMES MORE COMPLEX ON A SMARTPHONE

Their close association with money makes these services particularly attractive to fraudsters and con men. For basic, mobile money services, most Kenyans are used to this criminal activity, since it is possible on feature phones as well. Already they are looking for ways to prevent it and are hoping to save their friends and relatives from it. However, as DFS develop to become more integrated with modern technology, there is a risk that first-time smartphone users will not be as well equipped because they lack familiarity with the digital world.

The strong interest in hacking we encountered shows how much understanding they lack already, and how real they believe the prospect must be to take advantage of technology in this way.

More broadly, financial aspects of DFS present many different infrastructural barriers to users. Sending too

much money to an unintended recipient is always an unpleasant surprise, as is purchasing too much airtime. Both of these problems negatively affect adoption since the process of remedying them is difficult or non-obvious. A few others are unable to use these services fully because they lack national identity documents and must ask someone else to act on their behalf.

#### THEY ARE ALSO TOO RISKY OR TOO EXPENSIVE

Furthermore, many of the providers require reasonable financial standing of their users, and regular transaction fees to generate revenue. While the overall magnitude of complaints is low in our data, service fees are mentioned consistently across interviews as a problem for DSO participants, who then choose to use cash instead.

Some people have been temporarily denied or blacklisted from access to DFS because of their inability (or refusal) to pay back loans.

Mark, a DSO participant, does not understand or accept that a loan must be repaid, no matter how small it is. Before his adoption of M-Shwari and other

**“Before my smartphone I was comfortable because I never knew [about M-Shwari and Branch]. Now I am stressed. Because now that I borrow money I receive messages. They message me about registering me in the CRB.**

**For Ksh 100 they disturbed me too much! so I just ignore the line. But I’m happy, because they give me money.”**

– DSO PARTICIPANT

credit products, he was relying on his informal network of peers and family, and his Chama, to access credit.

By accessing digital credit, he abandons the human aspects of his informal network for one that is institutional and faceless. He therefore refuses to repay loans and gets himself into trouble, without grasping the consequences.

Mark is not the only one who is confused about loans and digital credits. Many avoid using online credit all together because they are afraid they will not be able to repay their debts.

Saving or borrowing are serious life endeavors, which even when they are facilitated by a smartphone, are still related to money and security. As a result, when it comes to using these products, people make decisions that have more consequences than when they choose Instagram over WhatsApp.

Saving money in a locked account, for example, requires a lot of willpower, personal motivation and, of course, money. When compared to the immediate benefits of using an application like Facebook, the choice is clear.

## Technology specific barriers

### **USSD REMAINS EASIER TO USE AND SMARTPHONES CAN EXACERBATE THE PAIN POINTS OF DIGITAL FINANCE**

As illustrated in the graph below, most of the services that are used by DSO participants are based on SIM cards and could operate with a feature phone. Their simplicity and ubiquity are key to their success.

In contrast, like many of the barriers that we have described (faulty hardware, high turnover, Android mysteries, etc.), smartphones can exacerbate the difficulties of product adoption generally, as well as those problems specific to DFS.

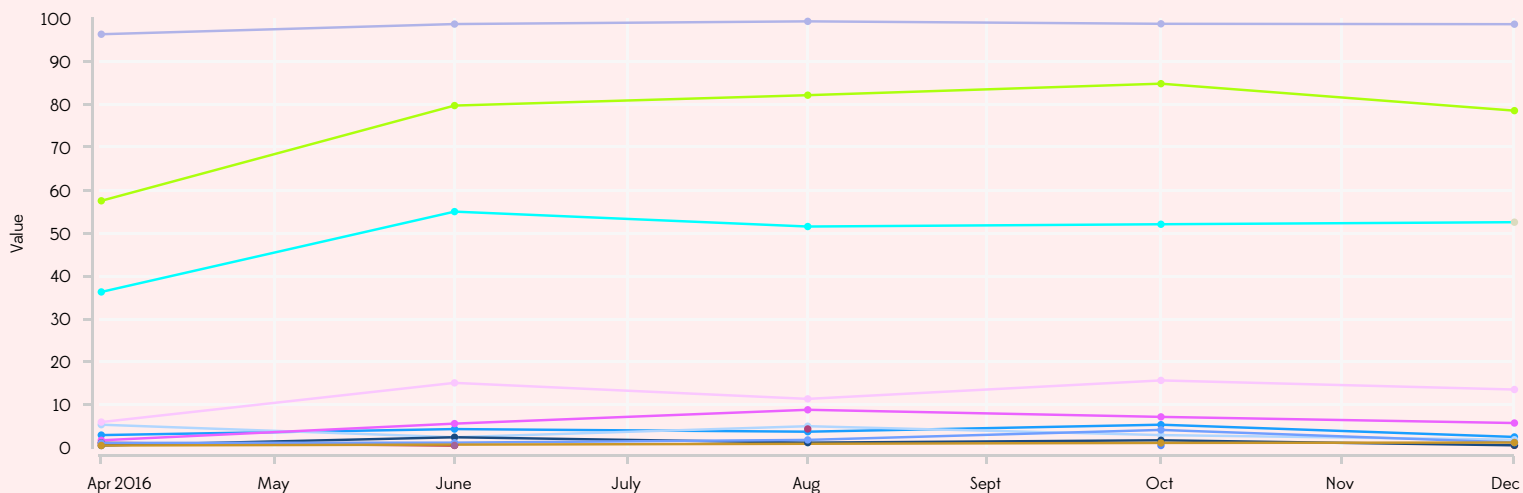
### **THE MARKET DOES NOT SEEM TO BE READY**

We observe a general tension between market forces, which seem trapped in a difficult cycle:

- Organizations are creating digital financial products in the form of mobile applications, which are too difficult to adopt for low income first-time smartphone users.
- These applications, in addition to being difficult to install, can be also perceived as lacking value in the eyes of new smartphone users. This might be reinforced by the unique maturity of the Kenyan market.
- When USSD remains easier to use compared to big native applications, there seems to be an **untapped potential** to create services between USSD and applications. How can DFS providers create products that leverage the smartphone form factor, without increasing the difficulties for their users?



If smartphones are actually enhancing the barrier because of their inherent technical complexity and operating skills they require of users, what does that tell us about the impact of digital skills training on adoption? We answer this question in the following sections of this report. ■



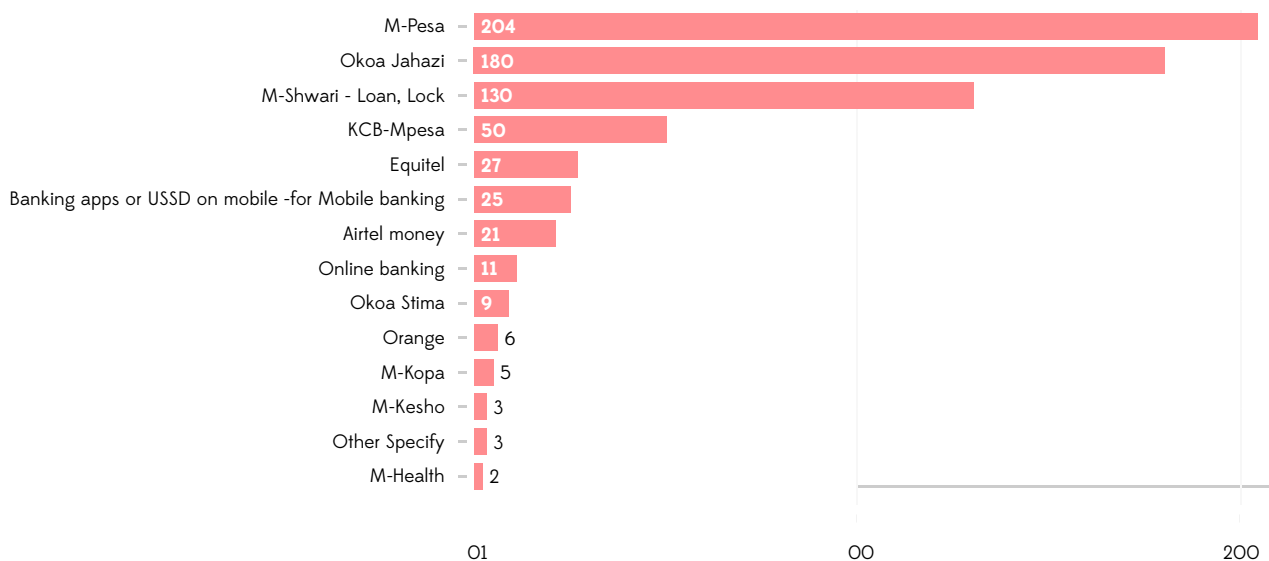
# Which Digital Financial Services have you been using since the last visit?

### M-PESA, OKOA JAHAZI AND M-SHWARI ARE THE TOP THREE SERVICES USED BY DSO PARTICIPANTS

The top three Digital Financial Services that participants were using at the beginning of the study were M-Pesa, Okoa Jahazi and M-Shwari. These are closely followed by

mobile banking services that work on USSD or mobile applications.

This usage illustrates the maturity of the Kenyan market: our small sample of first-time, low-income smartphone users already use their mobile phones to perform a lot of financial operations.



# A closer look at digital credits

With the introduction of M-Shwari in the market, as well as applications like as Branch or Tala that allow access to small loans in one click, we observed two interesting behaviors related to digital credit.

## PLAYING WITH M-SHWARI FOR INCREASED CREDIT LIMITS

M-Shwari is “a paperless banking service offered through M-Pesa.”<sup>1</sup> As the result of a partnership between the Commercial Bank of Africa and Safaricom, it allows anyone with a SIM card to have a “real” bank account. M-Shwari gives users access to locked savings and loans. Each user starts their M-Shwari journey with a credit score based on data available from their M-Pesa statements.<sup>2</sup> According to the Safaricom website, “the loan is payable within 30 days. However, you can repay the loan before the due date and borrow again. If you pay the loan in less than 30 days your loan limit qualification will increase.”

We have observed that low income earners and new smartphone users are using M-Shwari in a manner that will hopefully lead to an increase in their loan limit.

More interestingly, it appears to be a—maybe unintended—gamified element within the M-Shwari design that leads people to “play” with M-Shwari as opposed to simply “take a loan”. This observed behavior in DSO was also discovered by FSD Kenya<sup>3</sup>. As a matter of fact, M-Shwari has a strong reward component and an element of surprise which keeps the user very engaged. By

using it frequently, users receive rewards in the form of credit limit increases, which are also unpredictable.

## BORROWING FROM ONE SERVICE TO REPAY ANOTHER

The advent of these easily accessible loans can also lead to complicated scenarios in which people will “play” with multiple credits in order to increase their limits.

For example, one participant, Joseph, borrows from Tala and Branch in order to repay M-Shwari and KCB M-Pesa credits. Tala and Branch have more flexible installment periods, which are easier and more affordable for him to manage.

Joseph prefers using Tala, despite a higher credit interest, because they group users and assign loan limits in a way that encourages him to borrow and repay in order to move to the next status. **Joseph finds that his limits increase faster with Tala than with M-Shwari or KCB M-Pesa.**

Tala grading:

- Bronze: Ksh. 500 – Ksh. 4,999
- Silver – Ksh. 5,000 – Ksh. 9,999
- Gold – Ksh. 10,000 – Ksh. 50,000

By borrowing from four different institutions and cascading repayment of his loans, Joseph plays the system to increase his credit score. ■

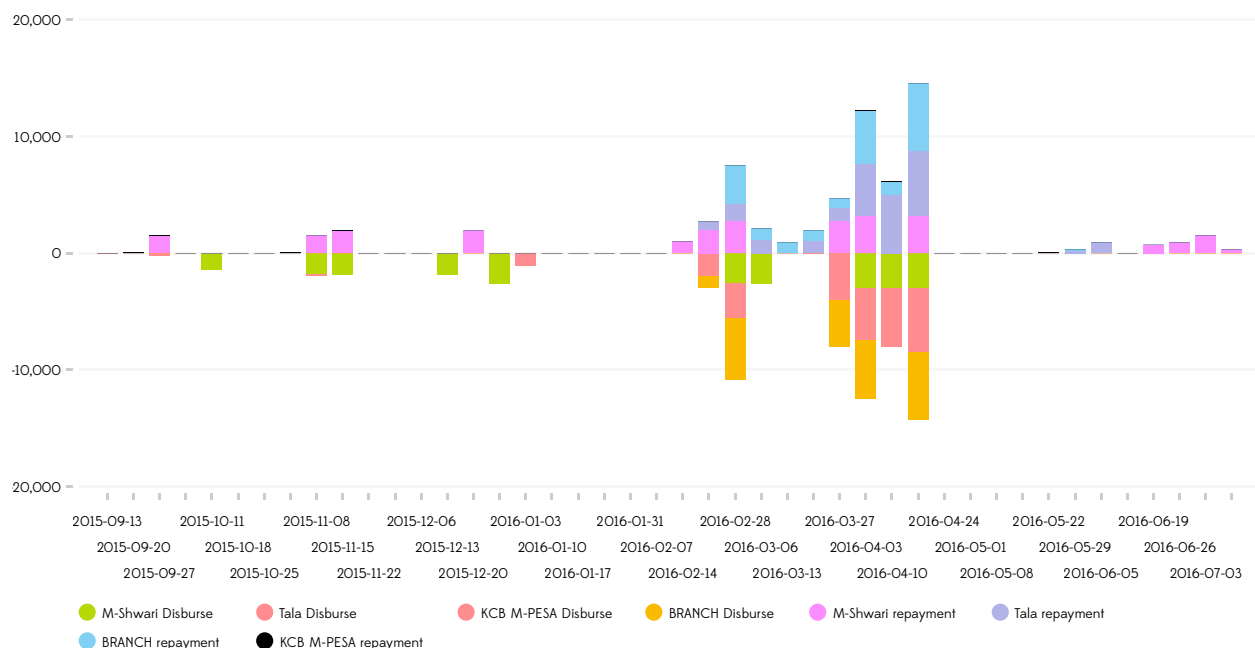
1 What is M-Shwari: <https://www.safaricom.co.ke/personal/m-pesa/do-more-with-m-pesa/m-shwari>

2 10 things to know about M-Shwari: <http://www.cgap.org/blog/top-10-things-know-about-m-shwari>

3 “Playing” M-Shwari: <http://fsdkenya.org/blog/is-there-any-thing-financial-service-providers-can-learn-from-mobile-gambling/>

## Joseph's credit behavior over a week

Disbursals and repayments of respondent DSOKM21 per service, grouped by week




## Joseph's credit behavior over a month

Disbursals and repayments of respondent DSOKM21 per service, grouped by month





Talking to communities helps us map knowledge transfer and the diffusion of information. After one participant learned about Wi-Fi, his friends and siblings started relying on his hotspot for connectivity.

A photograph showing a narrow, unpaved alleyway between traditional mud-brick houses. The walls are thick and textured, with some houses having branches or sticks embedded in the mud for reinforcement. The ground is dry and dusty. In the background, a person is visible standing in a doorway of a house further down the path. The sky is bright and overexposed.

Some participants live in mud houses, and have to go to a neighbor's house to charge their phone. One such woman saves as much money as she can to open her own hair salon one day. She thinks she will get there thanks to her chama, and has no interest at all in using any Digital Financial Services other than M-Pesa.



Mobile money agents are often trusted with important information to help people transact. However we learned that they are not a primary learning source for anything else related to smartphones. Cyber cafés take over when it comes to helping people with their digital lives.



Hair salons have become an important place for connectivity, where people swap songs, and talk about their smart-phones. Some salon owners are trying to differentiate by offering Wi-Fi or electricity for battery charging.



**JUKEBOX  
LAPTOPS**

PHOTOCOPY  
DI WA SIMU  
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PESA

**LAPTOPS  
ACCESSORIES  
SALE  
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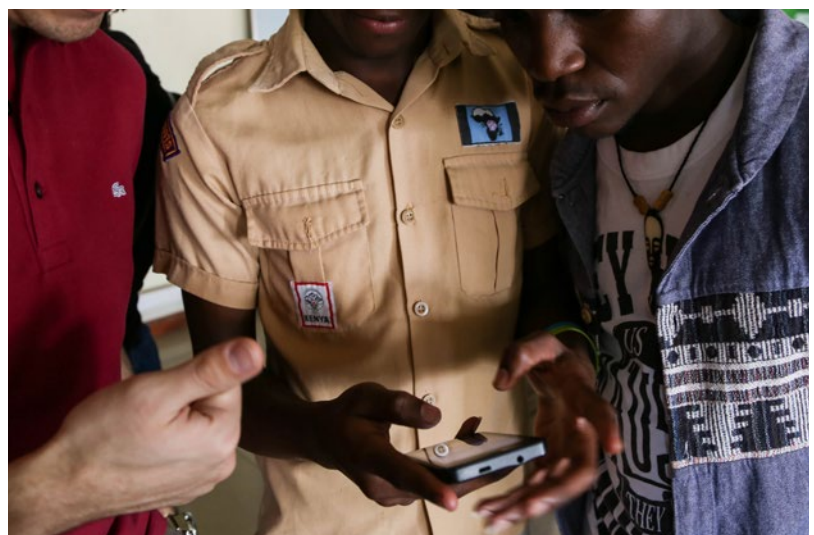
A patron poses for the camera as we run our very first pilot interview in this small business shop. Lengthy interviews take up to participants' valuable time during their work-day, so interviewers had to compromise with participants to let them conduct business while asking questions.



Many people juggle multiple jobs to reach a certain level of income. Since these jobs are unstable, they diversify and try many different things to earn money.



During our first field visit in January, we tested our recruitment questionnaire. It turns out that finding first-time smartphone users is more difficult than we expected. Additionally, many people did not know which operating system was running on their phone.





In April 2016, we organized a hackathon to come up with ideas for our first on-device learning prototype. At the event, one team created a prototype that they imagined would help users learn about and manage their data spending.

During a workshop, participants show up with problems that need fixing. They were usually linked to lost accounts, passwords, emails, etc.







Fauzia is one of the DSO volunteers from Mombasa who brought dedication, passion and kindness to the project, all of which made a big difference for the interventions.



At the end of the last workshop, participants are very comfortable and confident.



This section provides an in-depth look at the competencies essential to first time smartphone users for the adoption and usage of new digital products, including DFS.

We dive into the findings from our six cascading interventions with the treatment group, and learn about the different outcomes of the three methods we tested.

The results from the mobile application and the chatbot-inspired experiment provide interesting findings about product design for first-time smartphone users.



# Digital skills, methods, and product design

# Skills and their impact

## Skills to leverage smartphones and adopt digital products

The following list contains each skill we identified between January 2016 and December 2016. These are likely not the only skills that people will need. Instead, consider this list as a snapshot of their learning curve as they start their digital journey. Once people are comfortable with their devices and these concepts, more advanced skills can be learned.

### WE TAKE LANGUAGE AND DESIGN CONVENTIONS FOR GRANTED

Most DSO participants were not part of the personal computer era in any significant way and were not connected to the Internet during its formative years. Today, they are discovering everything about the digital world through their smartphones, an environment full of language and design conventions that more experienced users take for granted.

### LACK OF FOUNDATIONAL AND BASIC DIGITAL SKILLS WAS A MAJOR BARRIER

Originally, we envisioned using social media and content creation applications to help participants learn new skills, increase their comfort, gain confidence, and unlock their creativity. However, early findings indicated that participants needed to pick up a different set of skills before these activities could be considered. Their problems needed troubleshooting and they needed more foundational digital skills.

We saw that people wanted to communicate with others, play games, or find information online, but faced problems like expensive data consumption, low storage space, or confusion about the Play Store.

### WE IDENTIFIED 53 DIGITAL SKILLS TO LEVERAGE SMARTPHONES AND ADOPT NEW PRODUCTS

We were able to identify the low-level skills our participants needed to begin to succeed online. These skills are required to instill the confidence and agency people need to use their smartphones and adopt new products, such as Digital Financial Services.

Throughout the project, we continually incorporated the skills we identified into learning experiences for participants.

### COMPARING DIGITAL SKILLS FRAMEWORKS

Existing digital skills frameworks, like Mozilla's Web Literacy framework, or the European Commission's Digital Competence Framework for Citizens, contain skills categories that fit the needs of DSO participants, but the specific skills we identified were often at the most basic level.

Researchers at the Oxford Internet Institute published a proposal for a comprehensive list of specific digital skills based on previous research<sup>1</sup>. Using statements like, "I know how to connect to a Wi-Fi network," or, "I feel confident in my evaluation of whether a website can be trusted," the skills they selected were closely connected to practical needs and actions of users. The investigative approach we used to discover needs of DSO participants closely matches their findings. While their studies were conducted within the UK and Netherlands, our results from Kenya support the Oxford researchers' notion that these skills are useful across geographical boundaries and in different social and economical contexts.

<sup>1</sup> [https://www.oii.ox.ac.uk/archive/downloads/publications/Measuring\\_Digital\\_Skills.pdf](https://www.oii.ox.ac.uk/archive/downloads/publications/Measuring_Digital_Skills.pdf)

## Android

1. Creating a Google account
2. Customizing phone settings
3. Taking a screenshot
4. Copying and pasting text
5. Managing storage space
6. Troubleshooting and recovering from crashes
7. Understanding memory limitations and problems
8. Recognizing icons

### **WHY THESE SKILLS MATTER**

There are basic features, quirks, symbols, and terminology common to most Android smartphones (and many other types) that let users feel more aware and confident that their device is behaving normally. People buy Android phones because they are popular and run the apps they want to use, but cannot use them if they crash or take up too much space, or if they are too hard to access or use.

## Apps

1. Understanding what apps are and how they differ from websites or USSD applications
2. Finding and installing apps from the Play Store
3. Updating apps from the Play Store
4. Evaluating the quality and credibility of apps on the Play Store
5. Sending and receiving apps without a network connection (e.g. over Flash Share)
6. Understanding pre-installed apps
7. Understanding business models behind apps and the Play Store

### **WHY THESE SKILLS MATTER**

Understanding what mobile applications are and how to get them gives users the ability to choose how they leverage their smartphones: entertainment, business, education or otherwise. When a user can download an app for themselves they become independent from their network since they do not have to wait for someone to tell them about or give them an app.

## Accounts

1. Understanding what digital accounts are and how to use them with different services
2. Opening an email account
3. Opening a social media account
4. Resetting an account password

### **WHY THESE SKILLS MATTER**

Understanding the role digital accounts play on the Internet and how to use them gives first-time smartphones users the ability to use different services online and to cultivate a digital identity.

## Privacy & Security

1. Understanding who can access your accounts and how they can do so
2. Making strong passwords
3. Keeping pins and passwords secret
4. Understanding and managing the visibility of your information online
5. Understanding how personal data is collected, shared, and used

### **WHY THESE SKILLS MATTER**

Mastering basic privacy and security skills will let first-time smartphone users use the Internet safely with minimal personal risk. Controlling access to their data and digital identity lets users explore the Internet with more agency.

“We saw that people wanted to communicate with others, play games, or find information online, but faced problems like expensive data consumption, low storage space, or confusion about the Play Store.”

– DSO PARTICIPANT

## Managing Data Usage & Costs

1. Understanding and connecting to Wi-Fi
2. Sharing hotspots
3. Understanding how phones connect to cell networks
4. Managing data usage

### **WHY THESE SKILLS MATTER**

Users have better agency of their Internet usage when they understand their various connection options and how their data bundles are used. Limiting unnecessary spending gives them better opportunities to use the Internet as they please.

## Ethics

1. Recognizing spam, scams and fraud
2. Publishing credible information online
3. Validating information online
4. Understanding web etiquette (harassment, all caps, forums, security, etc.)

### **WHY THESE SKILLS MATTER**

People need to learn to be citizens of the web the same way they learn to be citizens in a country or a city. These skills help people avoid risky and regrettable situations, while leveraging what the Internet has to offer.

## Problem Solving

1. Understanding smartphones as tools to learn, communicate and create
2. Mapping personal and professional problems to smartphone capabilities

### **WHY THESE SKILLS MATTER**

Once people improve their problem solving skills and understand the potential of their smartphone and the Internet, they are able to leverage this technology to their advantage and can think beyond traditional passive usage (e.g. social media and entertainment).

## Searching

1. Using in-app or web search
2. Building effective search phrases based on needs or desires
3. Being able to critically assess discovered content

### **WHY THESE SKILLS MATTER**

Users can make the most of apps, services and the web by making effective use of search functionality. They are better equipped to find the information they are looking for, and can move to more advanced app usage.

## Literacy

1. Navigating resources written in common English terminology
2. Understanding common language and conventions within Android

### **WHY THESE SKILLS MATTER**

Being able to recognize common technology phrases allows deeper phone usage and exploration, and increases confidence—especially when troubleshooting. People who have difficulty reading and writing can still use their smartphones, but are more limited in doing so.

## Scams & Fraud

1. Being skeptical of information on the Internet
2. Verifying the claims of apps and services

### **WHY THESE SKILLS MATTER**

By recognizing potential scams, fraud, falsehoods, and exaggerations, people can protect their information and assets, and be safer online. This skill is valuable for any technology user, but this demographic is particularly vulnerable without it.

## Ecosystem

1. Understanding the relationship between network operators, service providers, app developers, and content creators
2. Understanding the role of consumers
3. Making conscious decisions with awareness of the different actors of the ecosystem
4. Understanding the open nature of the Internet, where anyone can make content

### **WHY THESE SKILLS MATTER**

Learning about the technology ecosystem gives users a better understanding of the dynamics behind the apps and services they use and content they consume. These skills let them make conscious choices about what to spend money on or who to trust with their data.

## Social

1. Managing contact lists
2. Using social media and messaging
3. Blocking contacts
4. Joining, silencing and leaving groups on social platforms

### **WHY THESE SKILLS MATTER**

Mastering the mechanics of social platforms and contacts will help people enjoy these services fully, by avoiding harassment and difficult social situations.

## Creative/Functional

1. Opening documents
2. Creating memes

### **WHY THESE SKILLS MATTER**

When users start to master creative tools on their smartphones, they become aware that they can also be part of the web. Sharing their creations is the next logical step, making them active participants online.

## Browsing

1. Managing browser settings
2. Limiting browser data usage

### **WHY THESE SKILLS MATTER**

Customizing their browser is a skill that will give users the control they need to explore the Internet beyond apps. By changing language and other settings (e.g. caching, cookies, data usage, etc.), people can hone their web experience to their needs.

### **KEY TAKEAWAYS**

We take for granted the most basic design conventions and language, but first-time smartphone users do not have the same mental models. The most basic skills are needed to adopt smartphones and new products.

When designing mobile experiences and programs, consider the user journey to take these skills into account, in order to avoid barriers.

- How might we help product designers work with these skills in mind?
- How might we embed the learning of these skills in the product journey? For example, can we design the First Time Use (FTU) experience of a DFS application to include these skills?



# Three methods to engage first-time smartphone users

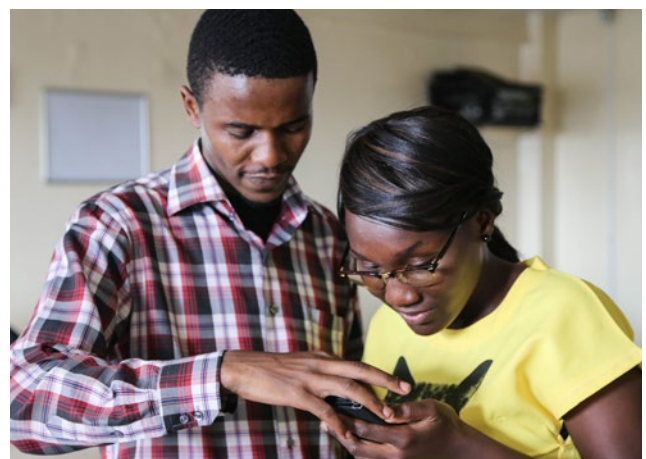
## Comparative view of the three methods

While we were able to identify many digital skills that would be useful to users, we also wanted to understand how to best engage this audience and help them learn. To do so, we tried various approaches to curriculum and workshop design and experimented with technology to deliver learning content according to what we observed. Each engagement method and each curriculum variance gave us more insights for product and content design for this audience.

We created and implemented six cascading learning interventions, each with product design grounded in community:

- Four in-person workshops
- Two on-device experiences: a mobile application and a chatbot inspired experience.

This table highlights the different variables we tested for each method: duration, content, interaction, constraints, technology. Each has an impact on adoption.



|                                 | <u>In-Person Workshops</u>   | <u>Jisort! Mobile Application</u>  | <u>Sterro Mjanja WhatsApp Experiment</u>  |
|---------------------------------|--|--|---|
| <b>SETTING</b>                  | In-Person  | On-device<br>Offline   | On-device<br>Online   |
| <b>FACILITATION</b>             | Regional group of young volunteers   | Self-driven, but introduced by the team  | One persona, driven by three actors   |
| <b>CONTENT</b>                  | Group learning activities (theory)<br>Workshopping (practice)<br>1-1 help                            | Self guided tutorials with instructional and fun gifs<br>An icon memory game   | Teacher guided games, activities, and discussions   |
| <b>TECHNOLOGY</b>               | Smartphones for certain activities<br>Wi-Fi available  | Mobile application working offline   | Social media chat (WhatsApp)  |
| <b>INTERACTION</b>              | Once over several hours, every couple months   | Whenever participant wants to  | When participant talks to Sterro or vice-versa  |
| <b>DURATION &amp; FREQUENCY</b> | 4 workshops periodically spaced over 11 months<br>Each workshop lasting about 5 hours                | July-December (with qualifications)<br>6 months or ~4320 hours   | Each day for 42 days from 8am to 10pm<br>588hours / person  |
| <b>CONSTRAINTS</b>              | Time = Money<br>Participants must be available for at least half a day and commute to each workshop. | Device & Storage<br>Participants must have access to a smartphone with at least 20MB of storage space running Android 4 and above. | Device & Data<br>Participants must be active WhatsApp users and have data bundles available to engage with Sterro on a regular basis. |
| <b>INTENSITY</b>                | High   | Very low   | Medium  |

## In-person workshops



Field Researcher Mary (left) bonding with a participant (right) after a workshop in Kilifi. These in-person trainings are important social events for the DSO participants.

# Design

### Hypothesis

#### **A METHOD GROUNDED IN SUCCESSFUL PEER-TO-PEER AND COMMUNITY BEHAVIORS IN KENYA**

The in-person workshops allowed us to test the impact of communities and peers engaging in activities together.

We operated with an underlying theory that people learn well with their peers, with participatory methods, and in informal learning spaces. These fundamental principles guide many informal learning programs, such as the Intel Computer Clubhouse, various Library Clubs, or the Mozilla Clubs. Similar community driven behaviors were also very present in Kenya for digital activities (entertainment, social media groups, gambling, music, etc.).

### Design

#### **TEACHERS**

Mozilla volunteers were trained to deliver participatory, practical and engaging workshops. They were chosen because of their passion, their ability to speak the local language, their geographical proximity with the learners, and their association with Mozilla and technology. They worked closely with the research team, to make sure content design and delivery was appropriate for the audience in each region.

#### **CONTENT**

The first curriculum covered a broad range of topics in order to assess the skill level of participants, and subsequent iterations were based on interview results and previous interventions.

Workshop topics included the smartphone ecosystem, accounts, privacy and security, the Play Store, apps and the web, and creative problem solving.

# Findings

## Findings

### **IN-PERSON ACTIVITIES CAN LEAD TO FEAR AND DISCOURAGEMENT**

Workshops were designed with a mix of individual and group activities to provide a friendly, constructive, and diverse atmosphere. Our intent was to encourage participants to think about and discuss topics, and then practice what they learned. However, as with any large social situation, only certain people were prepared to learn, contribute and speak. **Pride and nervousness were significant limiting factors**, exacerbated by abstract or complex topics that were difficult to relate to. Workshops occurred relatively infrequently and lasted for a short period of time, which limited participant exposure to educational social situations of this sort.

### **LITERACY AND LACK OF FORMAL EDUCATION ARE BARRIERS FOR ATTENDING THESE EVENTS**

At the beginning of the study, many participants were skeptical about attending workshops because of their lack of literacy or formal education. Some wanted to send another person on their behalf to avoid losing their confidence in front of others.

### **IN-PERSON TRAININGS ALSO PROVIDE AN OPPORTUNITY FOR STRENGTHENING RELATIONSHIPS**

As difficult as these workshops were for some people who were especially shy or had low literacy levels, they allowed people to build strong relationships based on trust with teachers and other participants. Given the amount of scams, fraud and other problems in Kenya, we found that trust is one of the most difficult aspects of any relationship and program. Trust is a highly important cultural element to take into account when working with this group. The lack of trust users may feel toward bank transfers can be projected on to other programs and products that seem “too good to be true” or are fairly new.

**“Many people thought that we were politicians and that we were going to use their information to make fake votes. Now, [this woman] regrets because she sees what we are doing [with her friend].”**

– FIELD RESEARCHER

As a matter of fact, when

we started DSO, many people were incredulous and refused to be a part of it because they suspected a scam.

After the workshops began, participants from the same community bonded and stayed in touch. As a consequence, they looked forward to future workshops as positive social moments.

We leveraged the air of trust in these workshops to introduce both on-device experiments (Jisort and Sterro), which may have had a positive impact on their uptake.

#### WORKSHOPS ARE AN EFFECTIVE METHOD FOR PROVIDING EXPOSURE TO NEW IDEAS

In a workshop setting, people can express themselves in the same space and debate topics. People are able to appreciate the extent of knowledge they can learn from teachers and from each other. As a result, these social learning moments are a very effective way to introduce new ideas.

Participant interviews showed us that people had very limited awareness about what they could learn about their smartphones, the web, or apps. These workshops played a very important role in opening people's minds, which would have been difficult to achieve in a less social setting.

However, we discovered that people did not necessarily grasp or retain the topics we taught. Later in the project, people continued to ask questions about topics we had previously covered.

#### WORKSHOPS DIRECTLY ADDRESS PEOPLE'S PROBLEMS

At the end of each training, participants had a chance to converse with the teachers and ask for help with specific problems. This period was often the most useful, as it directly addressed participants' needs. Not only were participants able to see first-hand how their problems were fixed, our team of teachers was able to gain experience with how participants use their phones. These sessions strengthened our empathy and understanding of

the mental models participants used.

#### PEOPLE ARE PROUD TO BE PART OF A PROGRAM

It is exciting for this low income population to be part of a learning program with no entrance fees or examinations. **Learning for the sake of learning is not an opportunity that is often offered to them.** So, when they joined this program, people were proud to be part of it and attend the workshops.

**"Now I can connect to the Wi-Fi in the Matatu, and I even show people how to do it. Before the program, I did not know anything."**

– DSO PARTICIPANT

Additionally, participants got better at using their smartphones and talking about technology. They became more knowledgeable in their community and were proud to be part of DSO.

#### WITHOUT INCENTIVES, PEOPLE WOULD NOT ATTEND

**For such a cost-sensitive group, a half-day of work is too important to be missed, even to learn valuable new skills.** The opportunity cost is too high. Hence there is a need to compensate them for their time and transportation. This requirement is tremendously important, and must be taken into account when trying to **scale** similar programs.

**"Through group discussion I was able to learn and share new digital skills with community members and other participants."**

– DSO PARTICIPANT

The role of the incentives has little to do with the fact that there is a foreign organization involved, which we questioned. Instead, they are linked to the need for a daily income.

#### MOTHERS HAVE TO ATTEND WITH THEIR CHILDREN, WHICH CAN BE DISTRACTING

There were no strong indications that women learned very differently from men in the workshops we hosted. We witnessed a balanced participation in the different activities, which might be the result of participatory and interactive design.

However, some mothers needed to bring their young children (babies) to workshops, since it is difficult to leave them at home. As a result, mothers are forced to take care of their children during training. This responsibility is not shared by men in Kenyan society and it could prohibit women from fully benefiting from or even attending workshops like ours.

#### **LOCAL DIALECTS ARE EVEN MORE IMPORTANT THAN NATIONAL LANGUAGES**

English is commonly used in Kenya. It is often mixed with Swahili when spoken, but is widely taught in schools. Yet, for DSO participants, English is still very difficult and unfamiliar, and uncomfortable in a workshop setting. People used local dialects to speak with others from their region, but used Swahili to speak with those from outside. To ensure maximum comfort and understanding, it is important to deliver training in these local dialects, using Swahili when that is not possible.

Since Swahili lacks many of the technical terminology one needs to discuss the Internet and smartphones, people often use Sheng—a mixture of Swahili and English—which is much more flexible. Since Sheng is effectively a commonly accepted form of slang, it is very organic and differs from region to region in Kenya. So, to lead workshops, it is ideal to have able, local teachers who can navigate situations where language is a problem. ■

**“Like workshop, many people sometimes made me uncomfy to open up because I had not attended the first 2 workshops previously and so I felt not in place. I also had multi-task acts of checking my child and listening too.”**

– DSO PARTICIPANT



After the workshop in Malindi, participants, researchers and volunteers pause for a group photo.

#### **KEY TAKEAWAYS**

We know that there is no lack of motivation, pride, or desire to learn about smartphones and the Internet. So, we must make workshops as welcoming and comfortable as possible to allow people with very low income or literacy levels to attend and participate without feeling excluded or inferior.

Based on DSO, we have a few recommendations:

- Design and deliver the training in the local dialect, with as little written content or written activity as possible.
- Provide food, a free Wi-Fi connection, and electricity.
- If possible, have a space designated for babies, or even a baby sitter, to make sure mothers are able to focus on their learning.
- Make time to help people troubleshoot problems they face on their devices. A workshop might turn into a “helpdesk” before you realize it!



(From left to right) Winnie, Alex, Festus, Stephen, and Dennis are members of DSO teams from Mombasa and Nairobi regions. The expertise they lent to the project was invaluable. Having community members responsible for in-person trainings and the WhatsApp chat experiment ensured that participants could speak local dialects and feel as comfortable as possible.

# Jisort: a mobile app for digital skills



Jisort's icon represents a teacher who is always available to help.

## Design

### Hypothesis and Design

Jisort is an offline tool for learning about smartphones and the Internet. It is meant to travel with its user on their smartphone, so they can access information wherever and whenever it is needed, as opposed to traveling to a workshop or depending on the Internet to learn.

The app is a combination of two prototypes that were created during a two-day hackathon we held using design challenges extracted from early findings:<sup>1</sup>

- How might we leverage chat and social media?
- How might we learn from and model the success of USSD software?
- How might we encourage people to explore their device and discover new applications?
- How might we help people understand the role that digital accounts play in their new connected life?
- How might we improve first-time user experience for problems related to Android?
- How might we help people understand and manage mobile data usage and associated costs?

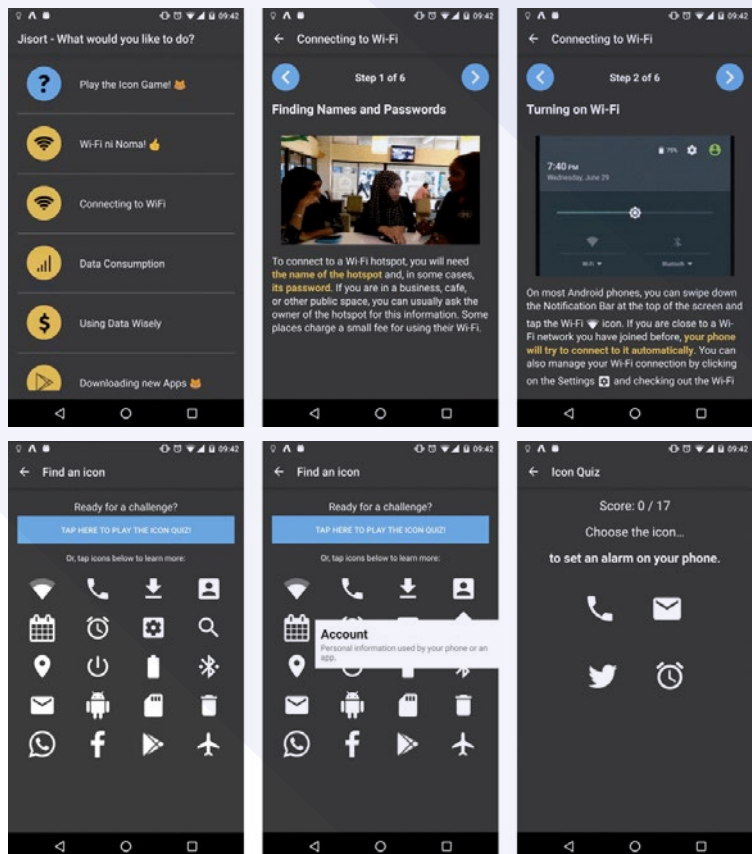
One contributing prototype was a virtual assistant who helped new users become familiar with their device, answered common questions, and detected moments when the user might experience trouble.<sup>2</sup> The other was an icon guessing game, which included a Sheng glossary for learning and practicing.

The resulting app was further guided by several design constraints, which were developed based on findings gathered between January and April:

- **It must be light, to avoid occupying too much memory on participants' phones.**
- **It must work offline, to match people's ability to connect.**
- **Its content must be practical and answer people's daily needs with regards to using their smartphone efficiently.**
- **It should use Sheng, emojis and casual language.**

<sup>1</sup> Blog post with original concepts for the hackathon: <https://mozilla-foundation-research.herokuapp.com/tamasha-hack/>

<sup>2</sup> Blog post about the results from the hackathon: <https://mozilla-foundation-research.herokuapp.com/results-from-tamasha-hack/>



### TUTORIALS ADDRESSING PEOPLE'S PROBLEMS

The majority of Jisort is composed of tutorials aimed at performing basic tasks or answering questions about functionality:

- **Wi-Fi ni Noma (Wi-Fi is Awesome):** All about Wi-Fi and its data– (and therefore money–) saving benefits.
- **Connecting to Wi-Fi:** Instructions and troubleshooting for connecting to Wi-Fi.
- **Data Consumption:** Understanding how to track data usage.
- **Using Data Wisely:** Tips for managing data consumption.
- **Downloading New Apps:** All about the Play Store, what it provides, and how to use it.
- **Freeing up Storage:** How to think about and preserve storage space.
- **Using Airplane Mode:** Why there is an airplane icon, and how it can help you manage wireless services.
- **Accounts and Passwords:** The importance of account awareness in the era of apps, and how to create strong, memorable passwords for them.

These tutorials were based on questions people asked us, or problems we witnessed—even when these were unspoken. We avoided using unnecessarily abstract concepts. We wanted to make something that people felt they needed without overloading them with information. And, we wanted to assess the impact of focusing solely on real, obvious problems participants faced.

### THE FIRST-TIME USER EXPERIENCE THAT DOES NOT EXIST ON ANDROID

When people start using their Android phone, downloading their first apps and creating their first accounts, they receive almost no guidance from their device. Instead, they reach out to people in their community, who might charge them a fee to solve the problem rather than teach them how to solve it themselves. We created Jisort so that people felt like they had a friend on their phone to offer help when needed and to encourage them to solve their own problems.

### PEOPLE NEED MEMORABLE VISUALS AND ACCESSIBLE LANGUAGE

Each tutorial contains emojis and symbols to provide visual reminders and necessary context to grasp tricky concepts or unfamiliar icons. To avoid or assist with

large pieces of text, each tutorial contains images or animated GIFs which demonstrate concepts or illustrate navigation through Android. Our intention was to make instructions easier to understand, or at least more visually stimulating.

With advice from participants and the community, most of Jisort's content is written in English, since Swahili either lacks the vocabulary, or requires too many words to describe common smartphone concepts.

### A FUN WAY TO IMPROVE RECOGNITION AND UNDERSTANDING

Jisort also featured an icon quiz, which let users study common Android and app iconography, and then test their knowledge.

The icon quiz was born from three major motivations:

1. Many first-time smartphone users do not recognize the different icons on their phones, and do not understand the language used in Android.
2. By quizzing people about common Android icons, we hoped that they would discover new features on their phones. For example, "Which icon opens an online map?" might familiarize people with the map icon, but also inspire curiosity about online maps.
3. We wanted to see if people would be drawn to a fun learning experience, using interactive, game-like features.

### LIMITS OF A PROTOTYPE

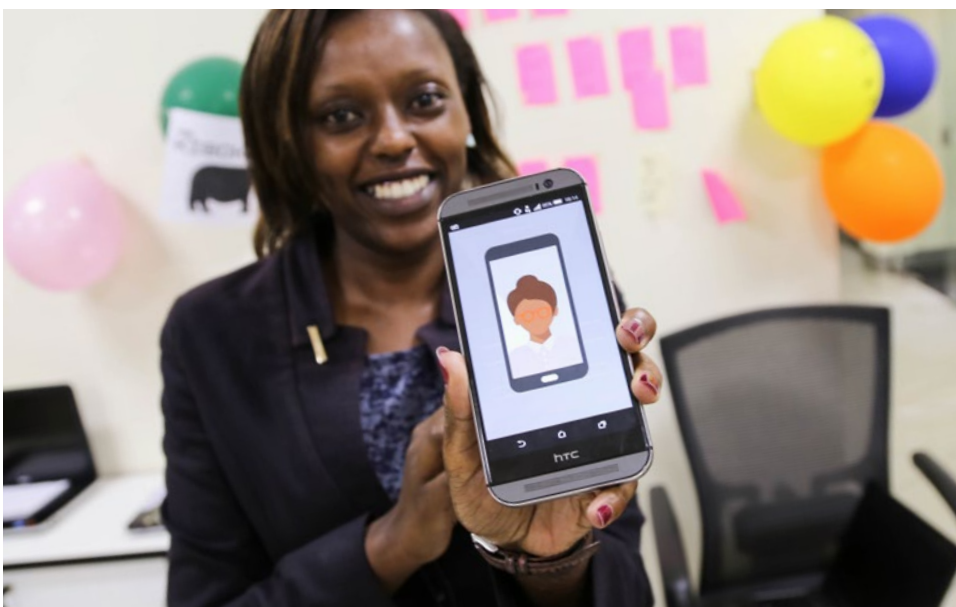
Despite our ambitions, we were forced to limit the scope of Jisort and cut several planned features:

- Notifications which appear when certain Android events occur that might be problematic for the user. These notifications would be connected to relevant tutorials.
- Customization where the user can give their virtual assistant information about themselves to personalize the experience.
- Assistance via screenshot whereby users can send a screenshot to a live team for help.
- Text-to-speech for users that have trouble reading the instructions Jisort provides.

To measure the impact and the reactions of users, we built offline analytics tools. While we were able to gather data about which tutorials were most popular and view scores from the icon quiz, data collection was difficult and results were trivial.

**"I did not take much time on it. There was no one who could explain it to me. If I don't understand anything there is no one to explain it to me."**

**- A PARTICIPANT REFLECTS ON JISORT**



# Findings

## Findings

### TRUST AND INTEREST YIELD HIGH RETENTION, BUT STATIC CONTENT LEADS TO LITTLE USE

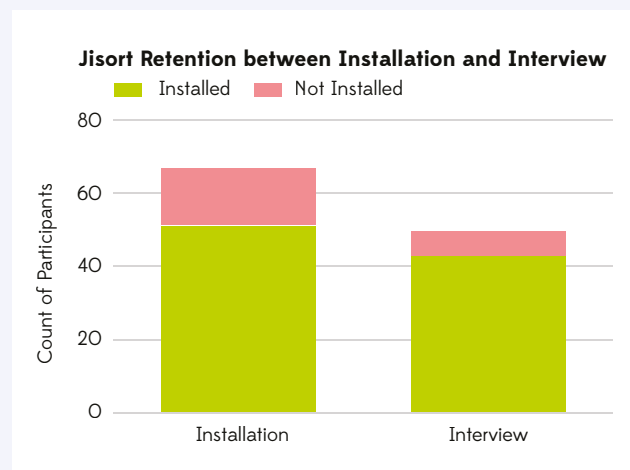
Overall, Jisort was well received by DSO participants. Of the 67 people asked, 51 were able to install Jisort when it was released. In a later interview, we saw that 43 of those people still had Jisort installed.

Their perception of the app may have been favorably biased, since it was created and installed by the DSO team. Participants knew it was a trustworthy application, designed for them as a part of the DSO program. However, although participants appreciated having Jisort on their phone (a desire to be included), they did not necessarily use it as intended, or at all.

In reality, people had little incentive to use Jisort, and only a few people did so. However, those who did use it learned something from it. Jisort is like a digital manual; by design, it is a static experience that lacks social or dynamic aspects, which means people only use it for a limited amount of time, to fix their problems. For DSO

**“I just read and played games but had nothing much than that.”**

– PARTICIPANT EXPLAINING WHY JISORT WAS THEIR LEAST FAVORITE METHOD FOR LEARNING



participants, the information within Jisort became stale and did not grow with them.

As we learned in follow-up interviews, people had a lot of varied ideas about what was missing from Jisort, including instructions to use Twitter, social features, in-depth tutorials about phone settings, tips for theft and privacy, and more games.

### WRITTEN ENGLISH DID NOT APPEAR TO BE A MAJOR BARRIER

While we did incorporate Sheng and imagery to convey concepts, Jisort’s tutorials included a lot of English text. In interviews before and after Jisort was deployed, many participants told us they had no problems with English apps. In fact, 63% of Jisort users said its language should not be changed. However, several people said Jisort’s content was too complex, or that there was nobody around to explain the app to them. From the data we have, it is difficult to judge why these people thought the material was inaccessible, but further investigation should be conducted concerning acceptable degrees of English language.

### HARD TO INSTALL ON PEOPLE’S PHONES

Jisort was built to be light, to work offline, and to

operate on as many Android versions as possible. However, installation was still problematic for some participants.

Of the people that could not install Jisort, some were prevented by errors and crashes, and some were no longer in possession of an Android smartphone when our team visited them. Surprisingly, several phones did not have enough storage space to install Jisort. As an APK, Jisort was about 10MB, and unpacked to become about 14MB when installed. (It has since been improved further.) Compared to other apps, it was relatively small. Facebook is ~70MB to download<sup>3</sup> and ~175MB when installed, and WhatsApp is 31MB<sup>4</sup> to download and ~45MB when installed.

See the Barriers section on page 52 for more on storage limitations.

### THE ICON QUIZ WAS THE MOST ATTRACTIVE PART

Many participants expressed their interest for Jisort's icon guessing game. It was simultaneously fun and instructional, so participants enjoyed playing it and learning from it. Some even shared it with people outside of the study to compete and compare results. One participant told us he

**“Cause it failed on my phone and I have no better idea of how it was. I only got the chance to test it when the researcher showed me and never encountered because my phone did not respond to it.”**

– DSO PARTICIPANT

**“The icon game was interesting and easily remembered, how to know about the running apps in the background.”**

– DSO PARTICIPANT

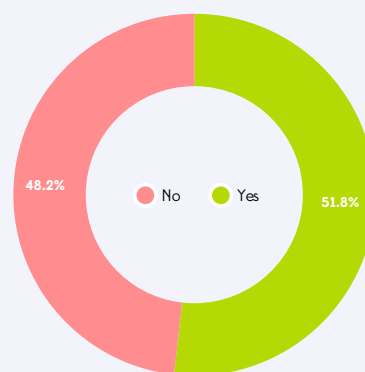
<sup>3</sup> Facebook APK file size from <http://www.apkmirror.com/apk/facebook-2/facebook/>

<sup>4</sup> WhatsApp APK file size from <http://www.androidapksfree.com/apk/whatsapp-apk-latest-version-download/>

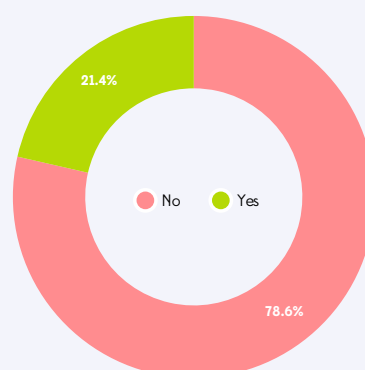
**“For the puzzle games it was repetitive and so the questions became monotonous to me and somehow I was bored.”**

– DSO PARTICIPANT

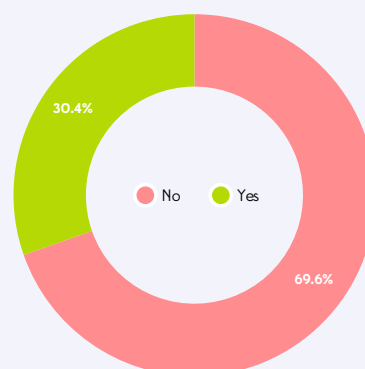
Have you shown Jisort to anyone else?



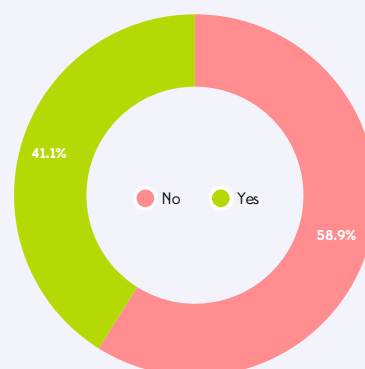
Have you shared the Jisort app with anyone else?



Have you shared lessons from Jisort with anyone else?



Has Jisort helped you answer someone else's questions?



played the game enough times to have memorized all of the icons, and got a perfect score.

**“It had more things to learn and less expensive to maintain like Sterro in terms of data bundles.”**

– DSO PARTICIPANT

## JISORT IS PRACTICAL, FREE, AND ALWAYS AROUND

People appreciated the fact that Jisort worked offline, and would not consume any data bundles. Also, comparing Jisort to Sterro (the other on-device experiment) or the workshops, participants highlighted the benefit of having the app always available on their phone, in case they faced a problem. It reassured them and made them feel equipped to manage their smartphones.

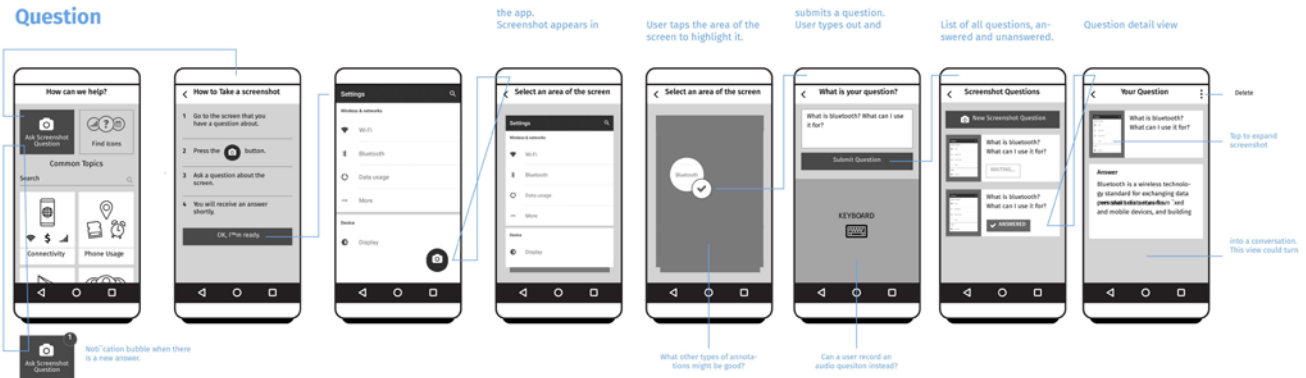
## JISORT IS A SHAREABLE TOOL

Many Jisort users showed the app to other people, and even used it to teach them or solve their problems, such as connecting to Wi-Fi, managing storage, creating strong passwords, downloading apps, and recognizing icons. Several participants gave Jisort to a friend to let them play the icon game.

**“It’s something he can always revise, otherwise he has forgotten most things he learnt about with Sterro or the workshops.”**

– DSO RESEARCHER RELAYING A PARTICIPANT’S COMMENTS

### Screenshot Question



### Suggested Topic UX

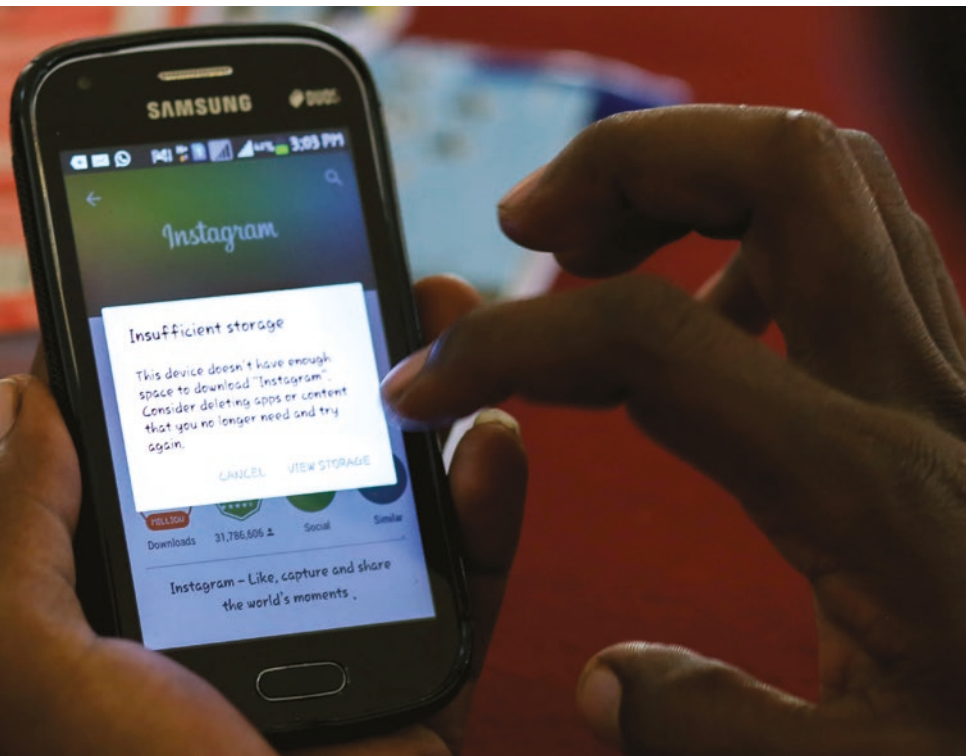
If we can detect a scenario that we have information about in the app, we can suggest it to the user.



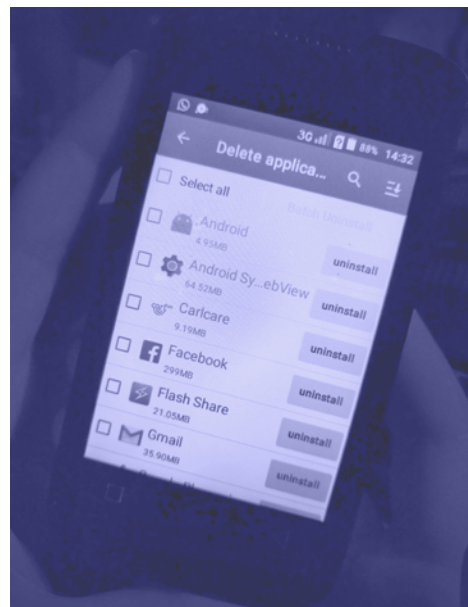
### Floating action button



Features from Jisort’s cutting room floor, including a screenshot help tool, and a notification system.



Storage space is one of the most important blockers for the adoption of mobile applications.





During our hackathon in April 2016, different teams brainstormed ideas to create a digital skills on-device experience. The personal Android assistant was a common theme and led to the creation of Jisort.

## Sterro Mjanja: a chat experiment



### INTRODUCING: STERRO MJANJA

Sterro (a well-known Kenyan cultural reference to brave heroes in film) Mjanja (“the bright, clever one”) is a high school teacher that has devoted himself to teaching people how to use their smartphones and the Internet wisely. Throughout his life, he has been interested in technology and has become an Android and Internet expert.

Born and raised in Nairobi, his parents were fans of movies featuring stereotypical heroes and villains, in which “The Sterro” always prevails. At an early age, his parents introduced him to these movies, where he adopted the Sterro persona to fit his name. Later, his aptitude for technology and his heroic persona gave him the passion to teach others to learn about their own technology and to use it well.

### Hypothesis and Design

#### CONVERSATIONAL LEARNING OVER WHATSAPP

For our second on-device experiment, we wanted to give participants more personal, customized, relevant and entertaining content to facilitate learning through a familiar platform that they were already compelled to use. Social messaging platforms, like WhatsApp and Facebook Messenger, are in high-demand, easy to access, and frequently used by all kinds of smartphone users. Their perceived value is reinforced by the fact that people continue to use them despite frequent problems with them, and that people have a strong desire to learn how to use them properly. Since many DSO participants reported using these platforms to learn about technology, and reported asking a friend, family member, or neighbor for technology help, we wanted to see if a social messaging platform would be useful for peer-to-peer or mentored technology-related problem solving.

WhatsApp is one of the top—if not the number one—social messaging platform used by DSO participants. Not only is it popular, people are also confident using it. They already understand what it does, how it works, the problems it has, and some of the risks associated with it. For many participants, WhatsApp was the primary motivator for the purchase of their first smartphone. Its attractiveness and its simplicity led us to use it to run our experiment, as opposed to Facebook Messenger or Telegram.

Some existing products that are tailored to the adoption of Digital Financial Services use conversation as an engagement method to increase product adoption. For example Juntos uses SMS as a “vehicle for engagement” and has seen a 33% increase in engagement with clients in an experiment with one of the largest banks in South America.



Since sharing is an essential function of the learning process, we created these colorful information cards to send to participants as images. Our goal was to see if they circulated on WhatsApp the same way that people send each other memes and entertainment.

## A DESIGN MOTIVATED BY CHATBOTS

Inspired by recent academic and industry interest in chatbots and virtual assistants (e.g. Siri), we wondered if and how chatbots could be an effective digital skills learning platform for first-time smartphone users, in pursuit of a built-in FTU for smartphones, apps, or Digital Financial Services. However, the complexity of creating a chatbot in a short time frame, and the proprietary nature of the WhatsApp API forced us to focus more closely on the social messaging medium rather than the technological trend of chatbots. We settled on a human-centered, human-driven experiment aimed at understanding how social messaging can be used to teach digital skills.

## PROACTIVE AND REACTIVE LEARNING METHODS

Noting the success of designed workshop content, and participants' appreciation for one-on-one troubleshooting time, we chose two design principles for teaching:

**Reactive support and practical help:** with a “customer support” mindset, be consistently available to participants so they can explain their problems when they occur, and so we work on solutions with them.

**Proactive exploration and sharing:** provide pathways to learn about topics that would not otherwise be

considered by participants. Cultivate exploration and sharing behaviors that encourage people to learn outside their existing frame of reference.

Originally, we wanted to use WhatsApp groups to encourage peer-to-peer learning as well. However, to avoid abuse, and to make participants feel as comfortable as possible, we decided against them. Commonly, WhatsApp groups become noisy, and inundated with spam, catering only to the most vocal members. In the worst cases, predators comb through group members to find people to harass. We wanted participants to feel comfortable talking with us directly, especially where pride, shyness, or technological uncertainty could be limiting factors.

## CREATING A PERSONA: STERRO MJANJA

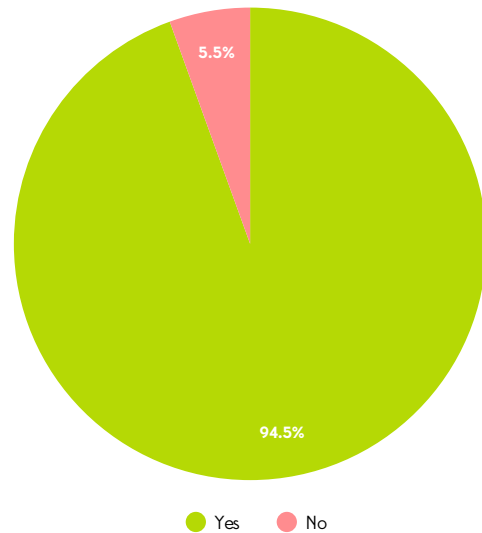
To offer a comfortable, dependable, and flexible user experience, we hired three human actors to run the experiment. Together, we created a persona to maintain their anonymity and to keep the focus on learning objectives rather than on the teacher. The resulting persona was a passionate, experienced teacher and technology expert named Sterro Mjanja.

Participants were introduced to “Sterro” during a workshop, and were immediately curious about his name and his tribe.

“I feel more comfortable learning through WhatsApp with Sterro because there are some questions if you ask in workshops where all participants are present then it seems that you are not technologically advanced. But through Sterro there was one-one interaction with one allowed to ask any questions.”

—DSO PARTICIPANT

Can you use WhatsApp on your phone?



## SIX WEEKS OF ITERATIVE CURRICULUM AND CONTENT

Following our learning method design principles, Sterro asked questions every day to spawn conversation, like, “Hi, how are you today? Anything I can help you with?” He also ran activities following weekly themes, the first of which were designed in advance and guided by topics and questions from interviews and workshops. As the experiment progressed, activities were written to reflect participants’ needs as they were uncovered through conversation.

| WEEKLY TOPIC                                   | DESCRIPTION   |
|--|---|
| Introduction                                   | Begin relationship with participants  |
| Trust on your phone                            | Scams and fraud over SMS and online   |
| Making better, more creative use of your phone | Creative and constructive uses of smartphones (inspired by learning from the latest workshop) |
| Miscellaneous activities                       | Interest-based topics and incentivized activities   |
| Miscellaneous activities                       | Interest-based topics and light activities  |
| Teaching learned skills & saying goodbye       | Incentivized activities and salutations.  |

To learn about what people preferred and what they reacted to best, we used six different types of engagement. Since participants enjoyed our workshops, and with a library of activities from which to draw, our design motivation was: **How might we create a dynamic and participatory environment within WhatsApp conversations that is similar to a workshop?**

- **Polls:** statements that encouraged participants to respond using true/false or letters representing choices from a multiple-choice menu
- **Tips:** pieces of information that participants may not have encountered or asked about
- **Questions:** questions about participants’ online and smartphone experience
- **Exploration:** activities that encouraged participants to use their smartphones to find and evaluate knowledge online
- **Creation:** activities that encouraged participants to create shareable artwork with apps or services
- **Information cards:** images with tips, examples, and descriptions, intended to be shareable assets participants could send to other contacts.

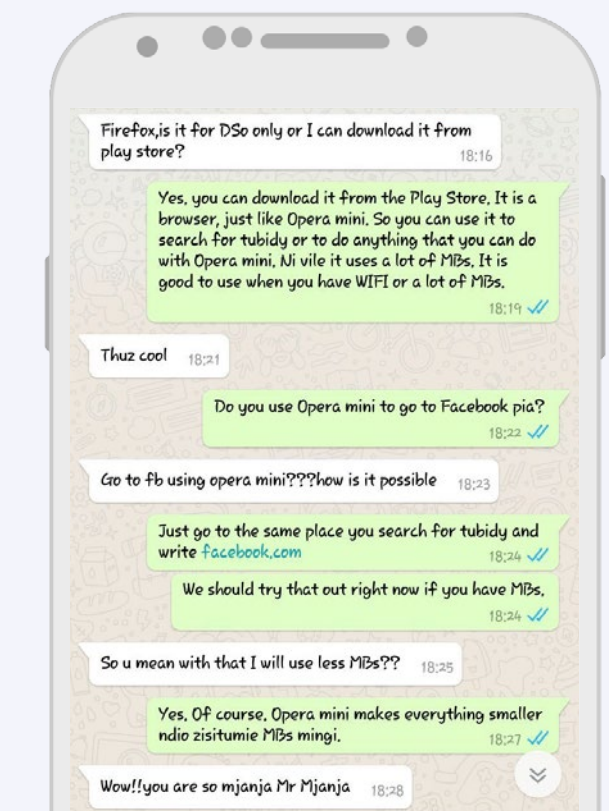
While WhatsApp—like many social messaging platforms—also supports richer communication methods, like video and audio, the potential data costs incurred by participants and the more significant production effort they require prevented us from designing activities with them.

**“It really mattered that we cared about personal problems. Sometimes they could give Sterro some sense of them, not being very good. There is someone who cried.”**

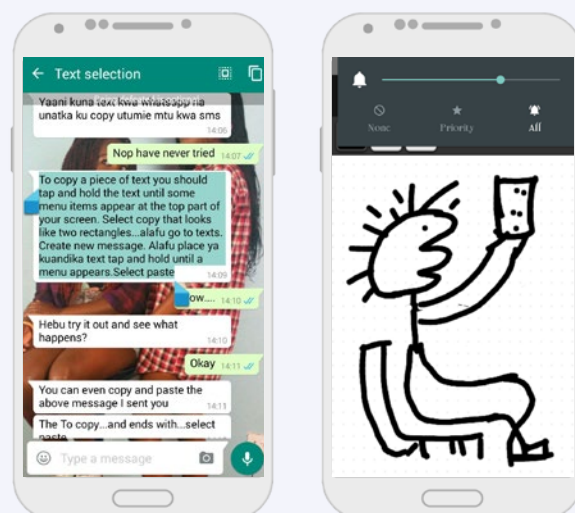
—ONE OF STERRO'S ACTORS

## MEASURING ENGAGEMENT

To measure engagement we tracked the recency of Sterro's communication with each participant, and recorded how many people partook in conversation each day. As a crude measure of activity, we also compared the number of messages Sterro sent to each person against the number of responses he received from them, to form a response ratio. This number gave us a sense of how often participants responded to Sterro, since he was normally the conversation initiator. To give us a rough measure of continuity for each participant, we counted blocks of discourse in which messages were no more than 30 minutes apart and contained more than three messages, and labeled each as a “conversation”.



A participant learns about using Facebook via the web by talking to Sterro about web browsers and saving on data consumption.



Participants learned to copy and paste text, and to take screenshots. These basic Android functions delighted the learners, increased their confidence, and let Sterro help them further.

**Analyzing Sterro's WhatsApp conversation logs gave us a quantifiable view into people's behavior during the experiment.** Throughout October, participants were introduced to Sterro. On average, Sterro reached out to 53 people per day, and an average of

25 responded. Actors were careful not to overwhelm participants, and spoke to them less often if they did not respond. Response from active participants closely followed Sterro's engagement.

### Daily Participant Engagement



## Findings

### EMPATHY IS AN IMPORTANT DOORWAY TO LEARNING

Conversation is not just a vehicle for relaying planned lessons and information, it is essential for listening, empathizing, and responding. Informal conversation, in particular, is not accompanied by an expectation to do or learn anything specific, but it can be used to understand a participant's needs on a personal level.

**Unstructured chat was instrumental in building deep connections with participants**, extending well beyond the comfort-setting and reactive learning purposes we intended. It allowed more impactful learning moments which gave us better insights.

In *Your Next New Best Friend Might Be a Robot*, Yongdong Wang speaks of similar results from an experiment with an artificial intelligence chatbot named Xiaoice, remarking, "Her constant availability prompts a remarkable flow of messages from users: mood, minor events, pointless questions."<sup>1</sup> **Similarly, Sterro was a friend who would always be there to answer your questions, teach you things and talk.**

### THE BEST ENGAGEMENT INCLUDES BOTH CONVERSATION AND ACTIVITIES

While unstructured, unprompted chat provided a powerful foundation for learning, by itself it was not enough to teach the topics we covered. No one engagement technique worked better than others in isolation. Sterro's success can be attributed to a mixture of techniques, scaffolded by structured activities and strung together by unstructured conversation.

Different people benefited from different combinations of the techniques we used, based on their level of knowledge, comfort and their environmental conditions (e.g. being available consistently for the duration of an exploration activity). Sterro chose which avenues to pursue based on participants' propensity to disappear due to lack of interest, time or data.

Of the techniques we used to engage with participants,

**Sterro: Hi, How are you feeling today?**  
**Participant: Fyn**  
**Sterro: Great. Ever heard about blogs?**  
**Participant: Blogger**  
**Sterro: What have you heard about a blogger?**

[END OF CONVERSATION]

some did work better than others. Tips, questions, and exploration activities were the most effective in starting sustained conversations that showed real interest and growth in participants. Through these techniques, Sterro actors were able to understand the information each participant needed to understand the topics we were teaching, and opened up unstructured chat which let Sterro dive deeper, one layer of complexity at a time.

For instance, to help participants, Sterro needed them to send details about their phones back to him, such as Android version numbers. To do so, Sterro helped them navigate to the appropriate screen and suggested using Android's built-in screenshot feature. While some participants had used this feature before, others needed an explanation and instructions. Similarly, participants learned how to copy and paste text between apps by following one of Sterro's tips, and then were able to use the feature to better communicate with him. These features became regular fixtures for whimsical conversation and problem-solving.

**Exploration activities were insightful, and allowed participants to try things they have never felt comfortable trying, or had never thought to try.** Participants who took part learned that apps exist for various tasks, like drawing and meme creation. In particular, participants were excited to create memes since they had seen them before, and they were enthusiastic to make their own.

**In the process she learned her maps app was outdated and she needed to run an update which she did and the offline option is now present. She finally managed to save a map of her area.**

STERRO'S DAILY JOURNAL

**"I think it was by far the best way for them to learn new stuff and get some confidence. They went to places they have never been. I think this one was the best."**

—ONE OF STERRO'S ACTORS TALKING ABOUT EXPLORATION ACTIVITIES

**STERRO: Do you want to play a game? It's called, "Is it legit?"**

**PARTICIPANT: What's the meaning of legit?**

**STERRO: Legitimate.**

**STERRO: Kama ni ukweli.**

**PARTICIPANT: Yah**

<sup>1</sup> <http://nautil.us/issue/33/attraction/your-next-new-best-friend-might-be-a-robot>

## POLLS, INFORMATION CARDS, AND TEACHING ACTIVITIES WERE LESS EFFECTIVE

**Polls were fairly ineffective**, offering few openings for deeper conversation. We modeled polls after structured debates or spectrograms from workshops, but without the public group dimension they are far less interesting and are ineffective.

Reception of information cards was lukewarm. They were perceived as complex, text-heavy and formal, despite our attempt to incorporate entertaining imagery, colors and icons. Also, people deleted the cards we sent them to save space for other things, and then asked to have them again later.

People were more engaged if the information from the cards was sent to them textually by Sterro. This way, participants were expected to react, and could comment, answer and ask questions. Image cards removed the aspect of reciprocity, and made people less likely to ask questions about text they did not understand.

If we were to run this experiment again, these cards would be much shorter, with more images than text. They might resemble memes to spawn conversation, rather than incorporate all the relevant information.

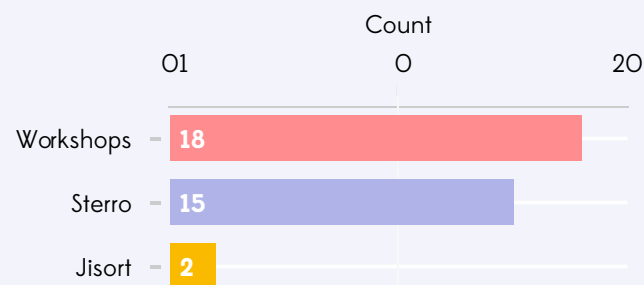
Teaching activities were mildly successful. These activities required participants to teach something they had learned from Sterro to someone they knew, and to record their experience to share back. They were part of the learning process, and part of the way that we wanted to conclude DSO: making people feel like they had enough knowledge and talent that they could teach their peers.

## INCENTIVES WERE WELL-RECEIVED, BUT THE PROJECT DID NOT DEPEND ON THEM

Contrary to the workshops, Sterro ran for four weeks without distributing any monetary incentives, despite the cost of using WhatsApp for the participants. The experiment was designed to introduce incentives only at Week 5 and 6, so that we could observe if there was a difference in people's engagement with or without them. For two different types of activities, we offered mobile data as compensation for participants who put forth the effort. Engagement was fairly regular, and did not increase when we introduced incentives. While interested participants showed more enthusiasm, passion, and speed in accomplishing the activity, in general, the intrinsic motivators to converse with Sterro were stronger.

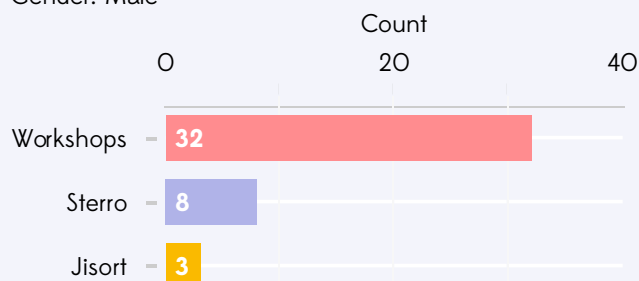
### Rate which taught you the most?

Gender: Female



### Rate which taught you the most?

Gender: Male



## DATA COSTS AND IRREGULAR USAGE PATTERNS IMPOSE LIMITS ON CONVERSATION AND SHAPE CURRICULUM DESIGN

The cost of data interferes with the ability of low-income smartphone users to use social platforms regularly. During this experiment, several DSO participants complained about the expense of talking to Sterro every day. Some were forced to stop temporarily until they could buy more data. While this problem mainly affected DSO participants with the most difficult living circumstances, it should still be taken into account more generally when designing curriculum delivered over the Internet to these users.

Despite a person's willingness to pay to connect and socialize on the Internet, they want to save their

**“He was ok with the skills and personality he possessed, patient and willing to help in the best way possible. Like there are some explanation he used to do in English and he would request him to do it in Swahili and he was ready to change language.”**

– DSO PARTICIPANT

bundles as much as possible, making conversations terse and fragmented. Sterro’s actors often needed to pick up and continue conversations that had been started hours or days earlier, making it difficult to administer one lesson across the entire cohort of participants. Some participants’ responses were short and full of abbreviations. On average, Sterro’s messages to participants were more than 56 characters in length, but participants’ responses were roughly 26. Developing and deploying curriculum in this environment is a considerable design challenge.

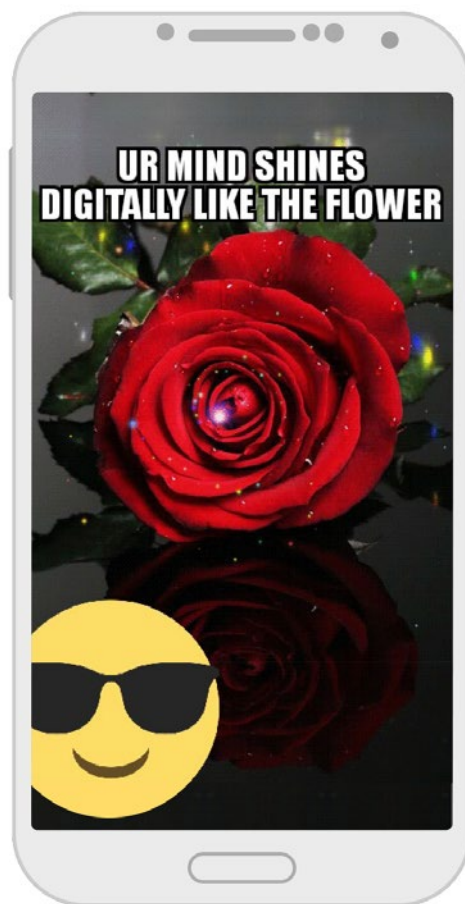
#### **LOCAL TALENT IS AN ESSENTIAL SOURCE OF KNOWLEDGE AND CREATIVITY**

The practical and strategic benefits of hiring dedicated local actors cannot be understated. They were instrumental in maintaining the relevancy of curriculum topics and the methods we used to teach them, and in delivering the curriculum to participants. By continually adapting to participants, they were able to help them make the most of the training individually, and by listening to their needs, they were able to guide the curriculum we developed as a team. Without their ability to relate to participants, speak

**“Some folks you really had to twist language around to get them to understand what you wanted to say.”**

–ONE OF STERRO’S ACTORS

As part of a creative activity, participants learned to download an app to make their own memes. Participants enjoyed the opportunity to create their own images.



the language participants preferred, and understand the environments they were in, the experiment could not have been as successful as it was.

While the local, human nature of our actors gave us positive results, scaling this approach to larger populations is a challenge. At around 80 active participants, our actors reported being at or near capacity due to continual context switching and detailed record-keeping. To interact with more people, more actors and better tools would be required. Chatbots with artificial Intelligence, with increasing empathy and ability that replace a human or simply aid them in delivering the best teaching, may be a solution to this problem.

### WOMEN WERE MORE RECEPTIVE TO STERRO THAN MEN

Though there were more male participants than female participants that took part in this experiment (43 vs. 34), those who were most engaged were more often female. Females accounted for more than 70% of the top ten participants when measuring number of active days, number of conversations, average number of responses per day, and ratio of responses to messages from Sterro. On average, they responded more often and more consistently.

Also, the team of Sterro actors unanimously agreed that women were more responsive and loquacious than men, and had a different style of communication. Women were more open, trusting and talkative. Their tendency toward more casual, unstructured chat than men led to more unexpected learning opportunities. Men, on the other hand, were more likely to show up, ask questions and disappear. Sterro was helpful, knowledgeable, friendly, trustworthy and always available to chat, and women responded more positively to this setting.

Anecdotes from participants suggest that women may have more time to spend on their devices during the day. Women may be at home taking care of children, or have an occupation that allows more opportunities to chat. For example, owning a hair salon can be less consistently demanding than driving.

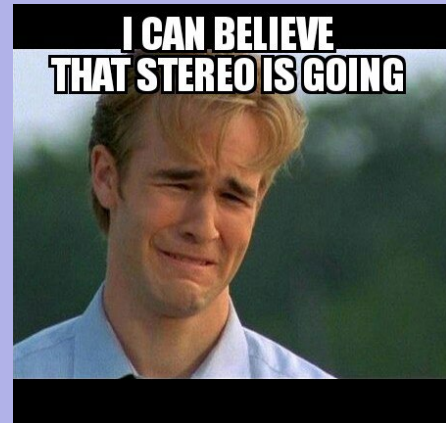
In the interest of making this learning method non-specific to a gender, it could be improved in several ways that we were not able to incorporate:

- Use a more gender neutral name without any historical reference, removing the possibility that it skews toward one gender.
- Develop a female persona as well to understand more about gender sensitivities, hesitations, and biases.
- Hire a more diverse team of actors since Sterro's all-male team may have inadvertently made their gender obvious.

### NOT ALL WOMEN COULD CHAT WITH STERRO

Unfortunately, Sterro's gender may have also been a barrier for some women. One participant was relatively talkative until her husband became suspicious and concerned that she was talking to Sterro. After that moment, she stopped responding to Sterro's messages and could no longer benefit from Sterro's availability or expertise. ■

The most active participants lamented the ending of the Sterro experiment, and chose to display their grief through memes.



**“Because he (Sterro) was ready to help in the best way possible and because she didn’t know who he was, she was free to ask him any question. They were also having a one on one encounter so it was easy to open up than in a case where there is a many people dialogue.”**

—A PARTICIPANT ANSWERING, “WHICH METHOD MADE YOU FEEL MORE COMFORTABLE?”

**“On some days maybe the someone they texted on WhatsApp wasn’t replying to messages, but Sterro was there :).”**

—STERRO ACTOR

**“It was expensive in terms of data bundles unlike Jisort and workshops.”**

—DSO PARTICIPANT

**“Women participants would say ‘Let’s talk. What can you teach me today?’”**

—STERRO ACTOR



In this section, we look at the impact of our interventions on the treatment group, and reflect on the implications of the project's findings.



# Impact and implications

# Impact and comparison of teaching methods

**In person workshops create awareness, and on-device experiences provide deeper and more consistent learning.**

After testing three channels to reach, engage, and teach first-time smartphone users, we are able to analyze their impact. We recommend looking at these findings from a product or program design perspective. **These results have implications beyond teaching: they give us unique behavioral insights about first-time smartphone users.**

## **PARTICIPATING IN DIGITAL PROGRAMS MAKES PEOPLE FEEL PROUD AND ENGAGED**

The vast majority of the treatment group was grateful to have been a part of the six interventions, and attended and participated whenever they could. Involvement in DSO made them feel proud and special: They were selected to receive free training on a subject they cared about, in a fun and casual atmosphere, involving many other people from their community. There were barriers which prevented some people from taking part, but we worked hard to ensure that people had the means and comfort to participate as they pleased (e.g. incentives and transportation).

## **IN-PERSON WORKSHOPS ARE THE MOST PREFERRED AND IMPACTFUL**

More than 60% of participants said workshops were their favorite method, followed by Sterro (the WhatsApp experiment) and then Jisort (the mobile app). 63% of participants also said that workshops led to greater learning than other methods.

Participants enjoyed group discussions, friendly staff, face-to-face interaction, a variety of learning activities, and open Q&A troubleshooting sessions. These elements were included in our workshops by design, to follow a participatory learning approach. Knowing that **“Participation is the active engagement of people in decision-making**

**processes,”**<sup>1</sup> we observed that participatory workshops led to a sense of agency in people’s learning journey. They felt more ownership and enjoyment, and were more positively impacted by the experience.

Additionally, our workshops made use of an important peer-to-peer dynamic. Group activities allowed participants to learn from each other, and from teachers. There was little formal authority, which enabled spontaneous and relaxed exchanges and conversations. These activities exposed people to new ideas that were relevant to their daily lives, since they emerged directly from their discussions. For example, participants themselves led conversations about managing data bundles and DFS problems, so learning came about organically. This kind of exchange is undoubtedly more impactful than a formal teaching setting, where the curriculum is heavily structured and driven by an authority figure.

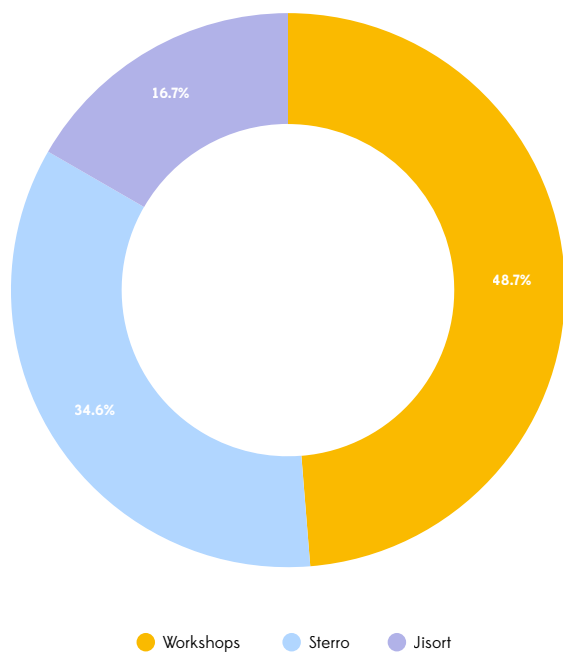
Workshops also enabled real-time demonstrations and troubleshooting. Instead of learning how to change the settings of an application abstractly, participants were taught using their own, specific examples, and practiced with friendly guidance. This human dimension was more present here than on-device learning, and was greatly appreciated.

Conversations that happen within workshops are a catalyst for exposure: compared to a static curriculum, conversations and activities expose people to as much as discussion and interest will allow. They bring dynamism and reactivity to learning which is often lacking from on-device experiences.

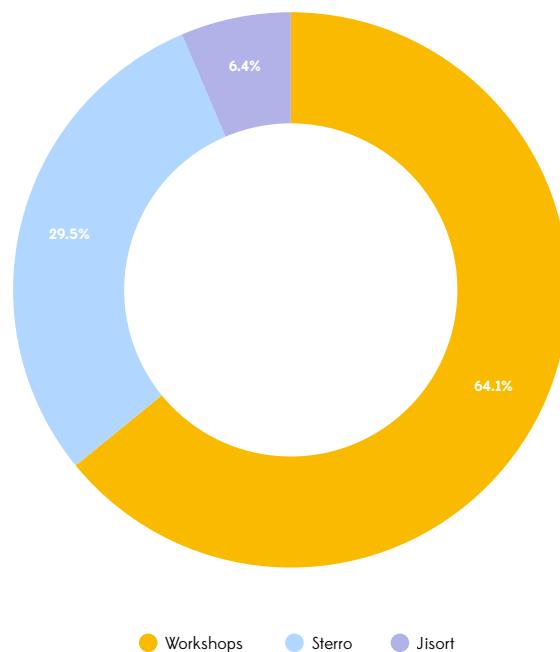
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1 Nicole Kenton’s *Participatory Learning and Action*: <https://www.iied.org/participatory-learning-action>

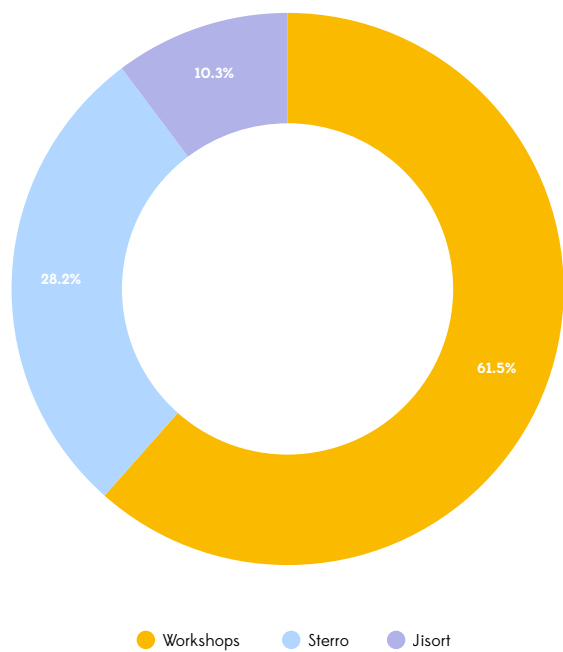
Please rate which made you feel most comfortable? [Sterro, Jisort, or Workshops]



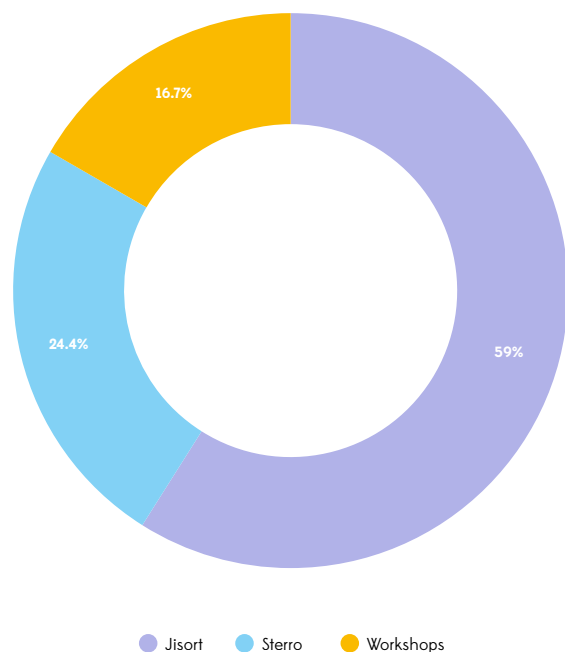
Please rate which taught you the most? [Sterro, Jisort, or Workshops]



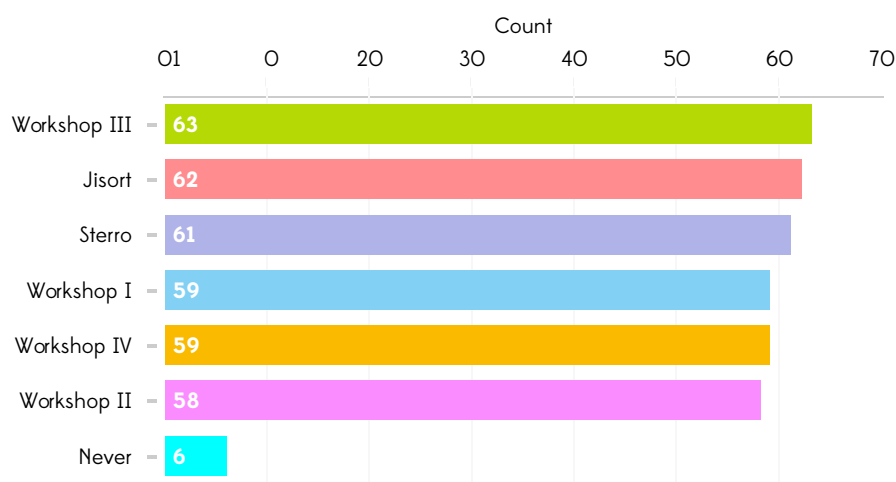
Please rate which was your favourite: [Sterro, Jisort, or Workshops]



Please rate which was your least favourite? [Sterro, Jisort, or Workshops]



Which of these were you able to take part in?



#### STERRO WAS MORE USEFUL FOR A SMALLER AUDIENCE, AND COULD BE A VIABLE ALTERNATIVE TO WORKSHOPS

For some participants, Sterro had advantages over workshops. 30% of participants told us they learned the most from Sterro, and 35% said Sterro made them most comfortable. The public atmosphere of workshops intimidated some participants, and since they occurred infrequently, workshops could not help people when problems actually occurred.

While workshops offered participants a period specifically for troubleshooting, Sterro was almost always available, and built 1-1 relationships with his students. He was able to take the time participants needed to learn concepts, and follow up with them on their progress. **Due to the conversational nature of this learning method, some participants learned things they never would have in workshops, because unstructured conversation leads to unexpected learning moments.**

#### IMPACT HAS A PRICE: WORKSHOPS ARE EXPENSIVE, AND DIFFICULT TO COORDINATE

Building and running a workshop requires a large commitment from many people. While this learning method is arguably most effective, it is difficult to deploy workshops to the many people in need of digital skills training across Kenya—let alone the world.

Using learnings and curriculum from DSO, streamlined volunteer programs could be created to run more training on a larger scale. A network could be cultivated to take advantage of the peer-to-peer learning model we know to be effective, and to continually research and integrate better ways to help the population of first-time smartphone users.

Make workshops physically and conceptually closer to the people that attend them. People could be trained and supported to run workshops within villages, slums, and neighborhoods in which they live

**“I did not take much time on it, there was no one who could explain it to me, if I don’t understand anything there is no one to explain it to me.”**

—DSO PARTICIPANT

**“I just read and played games but had nothing much than that.”**

—DSO PARTICIPANT



and work. This way, they could be constantly listening to the needs and aspirations of new smartphone users, and implementing better ways to teach them. Considering that some people already attend to people's technical questions as casual work, we know there is demand. A "representative" program may make people more legitimized within their communities, and be the basis for a network of individuals with common interests to learn from one another.

Such an approach may also provide an opportunity for small business. Money and knowledge would be re-invested in a community, paving the way for better overall technology awareness and usage there.

**"Because [Sterro] was ready to help in the best way possible and because she didn't know who he was, she was free to ask him any question. They were also having a one on one encounter so it was easy to open up than in a case where there is a many people dialogue."**

—DSO PARTICIPANT

**"He was available most of the time, not like workshops which came once a time."**

—DSO PARTICIPANT

**"Chatted most with him. Sometimes could be at work and still managed reply him when I get his message, so it was a flexible activity and I could adjust to any time where and when I could."**

—DSO PARTICIPANT

## IN-PERSON EXPERIENCES AND ON-DEVICE EXPERIENCES WORK WELL TOGETHER

Our findings show the importance of a combined approach to learning. Each person's situation is slightly different and depends on their access to quality technology, their socioeconomic status, and their style of learning. A variety of in-person, on-device, connected, and disconnected methods complement each other, and compensate for the nuances of a population.

Workshops are useful for building trust and relationships in a community, and for growing awareness and exposure to fundamental concepts and products. However, the limited duration and frequency of workshops can not continually address the challenges users will inevitably face as they explore. Also, their public nature inhibits some people, making workshops less useful for them.

On-device experiences can fill in the gaps between workshops by giving people reminders and guidance while they practice what they have learned on a more regular basis. They also give people opportunities to discuss topics in private. ■

**“He was always there to ask any questions unlike in workshop and jisorot where he could not ask any questions.”**

—DSO PARTICIPANT



**“At the first intervention, the participants were not able to operate on the basic skills of their smartphone well. Some had no idea what the different apps in their phones meant, and also were not able to use them.**

**As time goes by, the participants are now able to operate on their phones well. They understand how to download apps, connect to Wi-Fi, send apps to one another.**

**Also, the atmosphere changed, is very cool. The participants are helping each other out. Also, they come up with new problems and ideas which they need solutions for.”**

—MOZILLA INTERVENTION LEAD



# Lowering the barriers to adoption with Digital Skills

## Digital Skills Lead to Confidence, Awareness & Ability

Digital Skills training gave people the confidence they needed to explore.

Over the course of DSO, participants who attended our workshops and took part in our on-device learning experiments (i.e. the treatment group) became more confident with their smartphones and on the Internet. Each training gave them new ideas and new language, which they could use to ask better questions about their problems or aspirations, and to better understand their technology environment.

During our first workshop, participants were shy and reserved, and scared to show that they did not know the material. Many were confused about the Internet on a conceptual level, but also had several basic problems with their devices. Eventually, as workshops became a dependable space for participants to solve their problems, ask questions, and learn new concepts, their confidence and comfort improved, and their questions evolved. At the beginning of the study, participants might have asked “What is Wi-Fi?” or “How do I download this app?” As we progressed, they would say “I want to learn how to create an app” or “Show me how to hack.” The progress was striking.

In general, participants’ improving confidence was marked by their evolving participation and their own self-perception. They shared more, interacted more, and taught more to one another.

In July 2016—mid-study—the treatment group participants were more outspoken and confident than the control group about using their phones’ full potential. 75% of the treatment group agreed with the statement, versus just over 50% for the control group.

An almost identical difference exists between the male and female participants. Male participants agreed in higher numbers 72% than female participants, with 42 participants, or 57%.

DSO gave people the opportunity to learn regularly with their peers, about topics they cared about. This fact alone gave people more confidence, even without regular occasions to practice the skills they learned. Access to learning is more rare and difficult to reach for this population. Just being part of such a program made people more confident that they are going to get better and improve their usage.

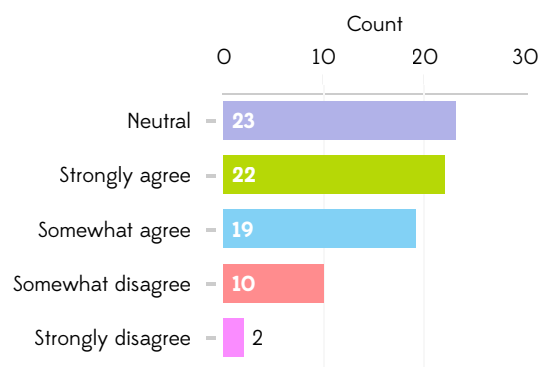
**“In the case of Kisumu, during the first intervention, most participants were not open to sharing their experiences and skills. That changed gradually through to the fourth intervention, where some participants could explain some concepts with fellow participants, e.g. searching apps in Google Play store.”**

— MOZILLA INTERVENTION LEAD



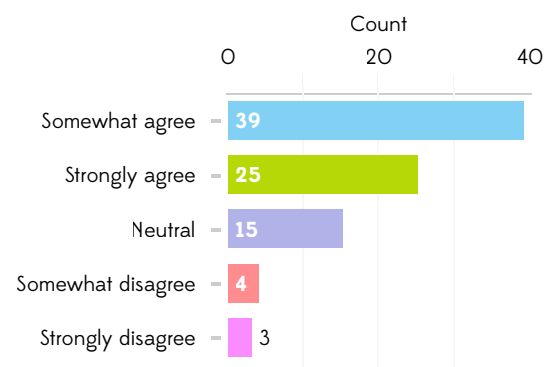
### I am confident that I can use my smartphone to its full potential

Group: Control



### I am confident that I can use my smartphone to its full potential

Group: Treatment



## Digital Skills improved people's empowerment and their ability to perform fundamental and needed tasks on their devices.

Not only were people more confident, they also made clear progress in their ability to use their smartphones. Our training enabled them to find and install apps, use email, recover passwords, use maps, manage their data use, and more—all of which were difficult tasks at the beginning of the study.

Some participants began applying their knowledge to their businesses, to their communities, and to solving their own problems. After learning about Wi-Fi, one participant decided that she wanted offer Wi-Fi to her customers, and was inspired to learn more.

More generally, participants were better equipped to leverage their smartphones to accomplish everyday tasks, find information, have fun, and satisfy curiosity.

Before DSO, people found others to fix their problems for them, not with them. If they needed help installing an app, they would refer to people in cyber cafés or in the community who would be able to install the application, perhaps at a price. In these situations, knowledge equates to money.

Participants also made progress about online security. Kenyans are very conscious of scams and fraud, but first-time

smartphone users have difficulty recognizing the digital forms of these crimes. Knowing how they manifest online let our participants use available tools to continue their Internet usage confidently and safely.

Our final interview contained problem statements for participants in both the treatment and control groups to evaluate their knowledge of the topics covered in trainings throughout DSO. Researchers assessed participants' ability to perform the tasks at hand, using the necessary skills.

**In general, the treatment group fared much better than the control group, which shows that our training was successful.**

The tasks in this evaluation were based on real problems participants faced that we learned about during the study. All were recognized as barriers to adoption, so, by teaching the appropriate skills, we hoped to reduce these barriers

**“One lady in Kisumu asked me during intervention 4 how she can be able to supply Wi-Fi to her customers in the salon she owns and how much it would cost her. This was an indication for me that the use of Wi-Fi as a hotspot/tethering is a skill she has become comfortable in using.”**

—MOZILLA INTERVENTION LEAD

**“By the fourth intervention, most participants could navigate through their smartphones with confidence, from searching apps in the Play store to installing apps and using their browsers to browse the Internet.**

**The kind of questions asked by the participants were a bit technical and they could use the right technical terms to ask the questions. i.e. ‘what happens if one doesn’t clear his or her cache?’”**

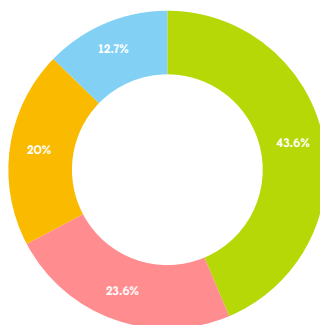
— MOZILLA INTERVENTION LEAD

## Connecting to Wi-Fi: dramatic group difference

Almost 85% of the treatment group were able to connect to Wi-Fi with little or no difficulty, compared to 56% of the control group. This skill could save a participant money by conserving data bundles, or let them share their Internet connection with a friend or relative.

My phone's hotspot is turned on, and is called [your hotspot name here]. Show me how you can connect to it.

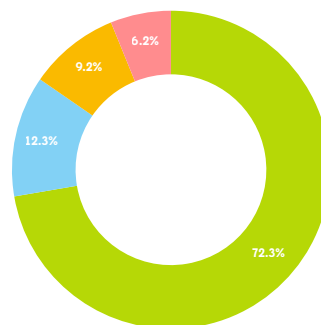
Group: Control



- No problems completing the task
- Unable to complete the task
- Major Difficulties
- Minor Difficulties

My phone's hotspot is turned on, and is called [your hotspot name here]. Show me how you can connect to it.

Group: Treatment



- No problems completing the task
- Minor Difficulties
- Major Difficulties
- Unable to complete the task

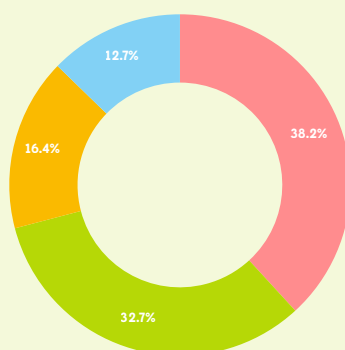
## Solving problems with your phones or using an online map: large group difference

70% of the treatment group was able to use Google Maps to find landmarks around them. During a workshop, some participants told us they used this skill to help bus drivers navigate rural streets to find their destination.

Using Google Maps in this manner illustrates their ability to find the right tool to perform a task. When users realize that their phone can do more than WhatsApp, they are empowered to discover and explore.

(Google Maps) I've been wondering where the nearest library is around here. Use your phone to direct me to the nearest one.

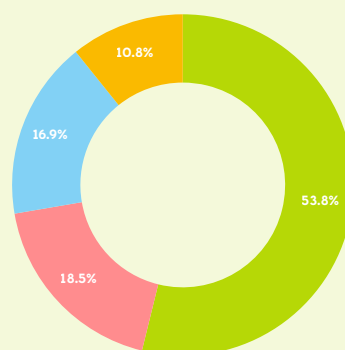
Group: Control



- Unable to complete the task
- No problems completing the task
- Major Difficulties
- Minor Difficulties

(Google Maps) I've been wondering where the nearest library is around here. Use your phone to direct me to the nearest one.

Group: Treatment



- No problems completing the task
- Unable to complete the task
- Minor Difficulties
- Major Difficulties

## Finding and downloading a trustworthy app: Large group difference

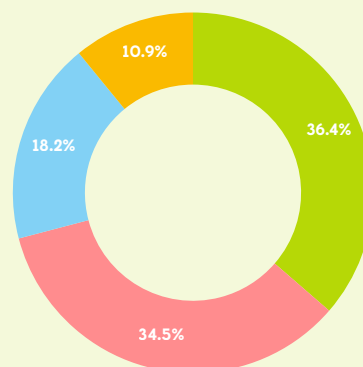
The ability to find and download an app represents a level of understanding and makes exploration and problem solving more effective and safe with a smartphone. More than 50% of the treatment group was able to download an appropriate app without any difficulty.

**“I fear even changing language settings in my phone and so I can’t try anything even online because I think my phone may be compromised.”**

—PARTICIPANT EXPLAINING WHY SHE IS UNABLE TO DOWNLOAD AN APP

(Finding and Installing a trustworthy apps) I’ve been researching a trip to China, and would like to learn some Mandarin Chinese before I go. Use your phone to find and install an app that I can trust to help me practice.

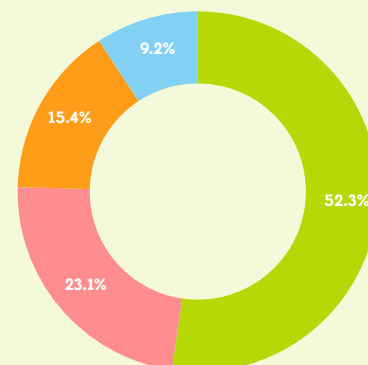
Group: Control



- No problems completing the task
- Unable to complete the task
- Minor Difficulties
- Major Difficulties

(Finding and Installing a trustworthy apps) I’ve been researching a trip to China, and would like to learn some Mandarin Chinese before I go. Use your phone to find and install an app that I can trust to help me practice.

Group: Treatment



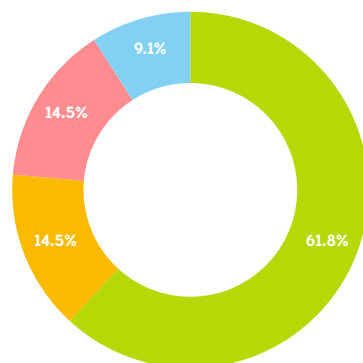
- No problems completing the task
- Unable to complete the task
- Major Difficulties
- Minor Difficulties

## Ability to search the web for information: slight group difference

Using the web to search for information represents a more abstract ability to find what is not already available on a smartphone through an app or the OS. The modern technology ecosystem requires effective use of search tools (e.g. identifying a search box, and using strong keywords). Most participants were able to use the web to search for information without difficulty. The treatment group was only slightly more successful than the control group, at roughly 70% and 62% respectively.

(Searching the web) Yesterday, my friend and I had an argument about which cities were the most populated in the world. Use your phone to find the top 3.

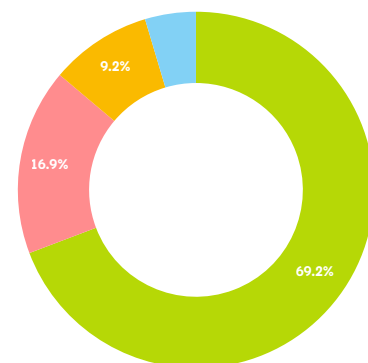
Group: Control



- No problems completing the task
- Major Difficulties
- Unable to complete the task
- Minor Difficulties

(Searching the web) Yesterday, my friend and I had an argument about which cities were the most populated in the world. Use your phone to find the top 3.

Group: Treatment



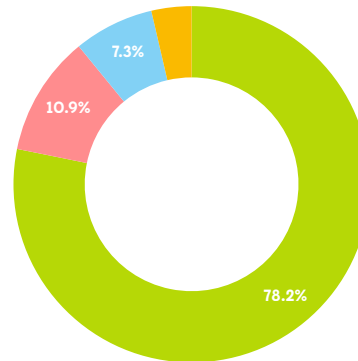
- No problems completing the task
- Major Difficulties
- Unable to complete the task
- Minor Difficulties

## Measuring available storage space: small group difference

Many people complained throughout the study about storage space limitations. We taught people how to check on their free space to understand their phone's capabilities, and to give them a sense of control. Between groups, there was a small difference: treatment participants had no difficulty with this task, 8% more often than control. 95% of treatment participants were able to complete the task with only minor or no difficulties, as opposed to 86% of the control group. There was also a small difference between genders, with 87% of males able to complete the task without problems, compared to 78% of females.

(Storage) My phone is always running out of space. Using your phone, show me how I would check if my own phone is almost full.

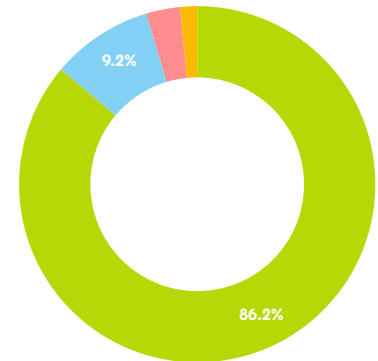
Group: Control



- No problems completing the task
- Unable to complete the task
- Minor Difficulties
- Major Difficulties

(Storage) My phone is always running out of space. Using your phone, show me how I would check if my own phone is almost full.

Group: Treatment



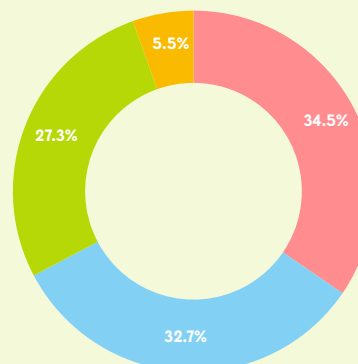
- No problems completing the task
- Minor Difficulties
- Unable to complete the task
- Major Difficulties

## Comparing app size to storage space: large group difference

To see if an app would fit on their phone, participants used various techniques, like checking an app's description on the Play Store, or starting an app download to check its size and then canceling the download. Regardless of the method, 55% of treatment participants were able to compare an app's size to their storage space without difficulty—twice as many as the control group. 74% were able to complete the task with minor or no difficulties, compared to 60% of the control group.

(Storage) Now, if I want to download an app, show me how I can tell if it will be too big to fit on my phone.

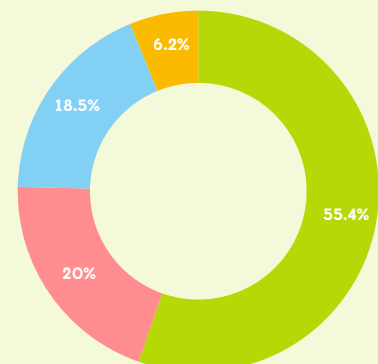
Group: Control



- Unable to complete the task
- Minor Difficulties
- No problems completing the task
- Major Difficulties

(Storage) Now, if I want to download an app, show me how I can tell if it will be too big to fit on my phone.

Group: Treatment



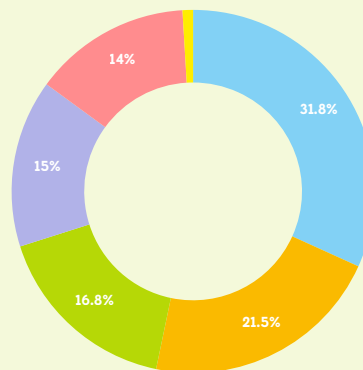
- No problems completing the task
- Minor Difficulties
- Unable to complete the task
- Major Difficulties

## Changing or creating a password: no difference

Passwords are a common barrier for first-time smartphone users. They lack simple techniques for making memorable passwords that are hard to guess. To keep their accounts secure, people should be aware of how to create a strong password and how to navigate services to change existing passwords.

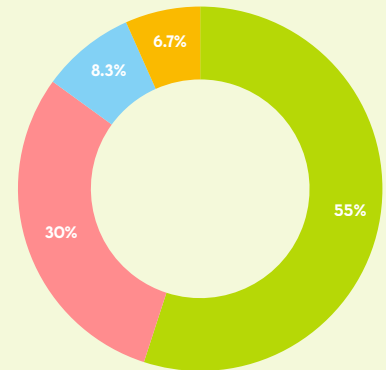
Alas, after training, the treatment group showed almost no advantage over the control group in being able to change their password on Facebook or email, or in creating a new one. In each case, more than half of the entire cohort was able to complete the task at hand. Of the people that attempted to create new passwords, more than half were evaluated to be risky or easy to guess.

(Passwords) Password strength score



- Easy to guess
- Risky password
- Very strong (currently almost impossible to crack)
- Pretty good (basic online protection)
- Strong (basic offline cracking protection)
- N/A

(Passwords) Without actually changing it, show me, or tell me the steps to change your password on facebook or email.



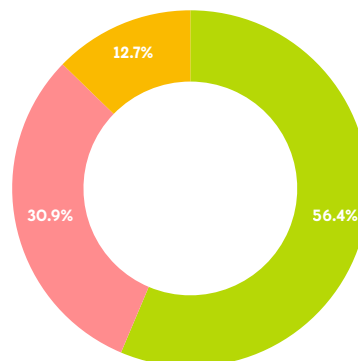
- No problems completing the task
- Unable to complete the task
- Minor Difficulties
- Major Difficulties

## Recovering a forgotten password: small group difference, and large gender difference

Many people forget their passwords and are either forced to create a new account or find someone who can help them through the password reset process. Using common services like Facebook and email, we taught people how to reset their passwords when they were lost. While there was only a small group difference in completing this task (62% vs 56%), there was a larger gender difference, with 66% of males able to complete the task without trouble compared to 53% of females.

(Passwords) Imagine you have lost your password for instagram/facebook/email. Can you tell us the steps to recover it?

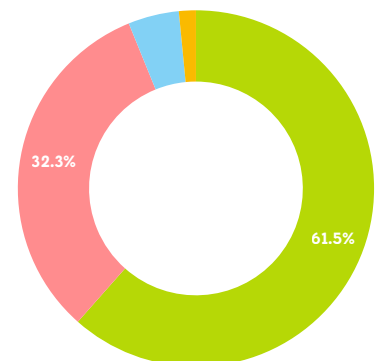
Group: Control



- No problems completing the task
- Unable to complete the task
- Major Difficulties

(Passwords) Imagine you have lost your password for instagram/facebook/email. Can you tell us the steps to recover it?

Group: Treatment



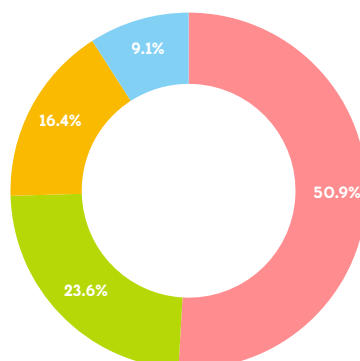
- No problems completing the task
- Unable to complete the task
- Minor Difficulties
- Major Difficulties

## Adjusting browser settings to manage costs: difficult for everyone

Browsing the web can be costly, with large images and unnecessary content that consumes data. If people are aware of their browser options, and the settings each browser has to limit data usage, people can browse and search the web more confidently. While the treatment group showed gains over the control group in completing this task (32% vs 24%), it was by far the most difficult task for the entire cohort. 51% of people were unable to complete this task at all.

(Browser settings) Show us one way to reduce data costs when you are using a browser (e.g. Opera Mini).

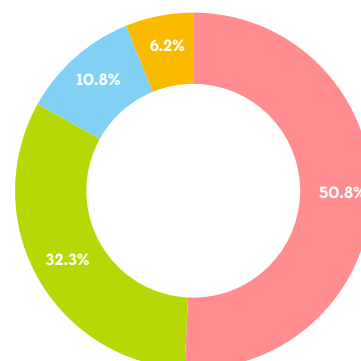
Group: Control



● Unable to complete the task  
● No problems completing the task  
● Major Difficulties  
● Minor Difficulties

(Browser settings) Show us one way to reduce data costs when you are using a browser (e.g. Opera Mini).

Group: Treatment



● Unable to complete the task  
● No problems completing the task  
● Minor Difficulties  
● Major Difficulties

## People teach their peers more and more as they learn

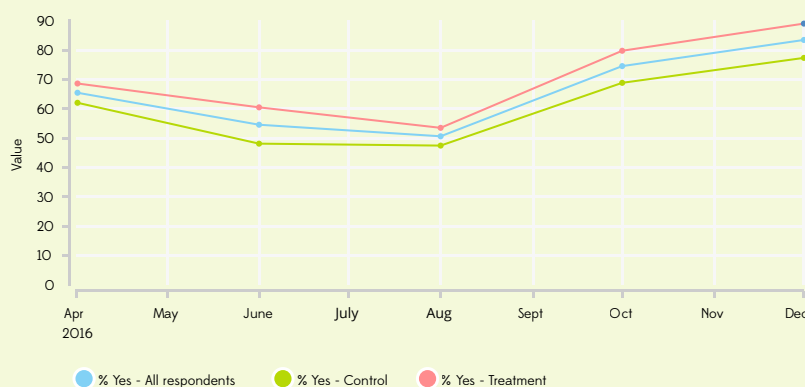
From the second interview onward, participants were asked if they had helped anyone else use technology. Results show that in addition to picking up these skills, there is an increase in knowledge sharing, which is also a positive indicator.

Positive responses to this question increased substantially over time, with a peak of 83% of all participants indicating they had helped someone during the final interview in December 2016.

Although participants from the treatment group and the control group followed an identical progression over time—showing the same dip and peak—treatment group participants

Have you helped anyone use their phone/internet/technology?

Question: Have you helped anyone use their phone/internet/technology? Filter: All respondents, Control or Treatment



were consistently more likely to help others with technology than control group participants.

This organic helpful attitude could be beneficial to adoption in an indirect way. By teaching people digital skills, they become competent and the “tech support agents”, if you will, that their community can rely on for information and help. With respect to Digital Financial Services, with the right kind of training, these people can help others with their DFS-related problems, too.

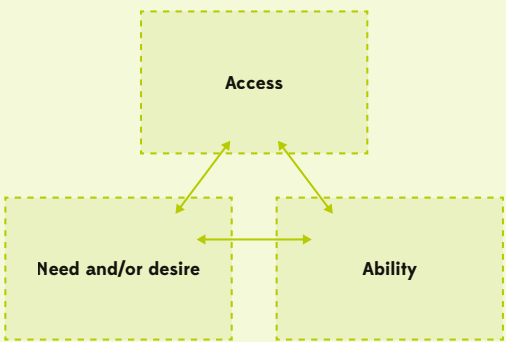
# Impact of digital skills on Digital Financial Services

Digital skills have positive impact on the adoption and usage of DFS, but they are not enough.

## DIGITAL SKILLS HAVE A POSITIVE IMPACT ON ADOPTION OF DIGITAL FINANCIAL SERVICES AND MOBILE TECHNOLOGY

As previously mentioned, smartphones present difficulties to overcome and competencies to learn. From setting up accounts, to tweaking settings, to downloading mobile apps, DSO helped us understand how impactful digital skills are in completing everyday tasks. Without them, people’s usage is constrained.

The 53 competencies identified in Section 4 have a direct positive impact on the adoption of Digital Financial Services. They allow people to use their smartphone to its full extent, and shape their independence, confidence, awareness, curiosity, and, therefore, their exploration. All of these behaviors are directly beneficial to Digital Financial Services—that is, if the right conditions are in place.



### Access

Does the population have access to the product?

### Ability

Does the population have the skills to use it? Do they have the time and the money to use it? Is there anything blocking them from fully adopting it?

### Need and/or desire

Does the product provide any perceived value to the user? Is there a real need being fulfilled? Is there real value, or even fun?

## SKILLS ARE ONLY ONE OF THREE NECESSARY CONDITIONS

Previous research about smartphone adoption in Asia and East Africa conducted by Mozilla<sup>[1]</sup> uses a framework to look at smartphone and web adoption:

By referring to this model, we are able to see what works well and where we fall short. We have seen organizations focus on providing only one of these elements, often resulting in limited outcome.

DSO's design impacted only one of the three conditions needed to increase adoption, which yielded promising, but not conclusive results:

- **Access to Digital Financial Services can be improved with smartphone adoption**, but is still limited by poor device quality and aging software. However, access is already very high, given the amount of USSD-based products on the market that do not require smartphone technology. Having a new smartphone lets participants download financial applications such as TALA or Branch, but hardware and operating system limitations and knowledge barriers can slow their uptake.
- **People need cheap, stable Internet access**, which was provided for free over Wi-Fi during interviews and interventions. Participants postponed all their downloads and updates until the day of an upcoming intervention.
- **Ability can be improved through intervention**. Our treatment fared better than our control group on fundamental operational tasks.
- **Need and desire are only mildly impacted**. The perceived value of Digital Financial Services is highly correlated with their financial lives—their source of income and borrowing and saving activity.

Since participants were *already* using a small number of Digital Financial Services, and because we did not introduce new (and better) hardware or new digital financial products explicitly, we did not observe an increase in the usage of Digital Financial Services. However, we observed that increasing people's ability to use a product (such as smartphones, applications, and the Digital Financial Services), increases their

chance adopting the product, **if they have access to it and it has perceived value**. Skills are an essential part of the equation, but they are *only one* of three important variables. Increasing usage directly is an altogether different challenge.

## DIGITAL FINANCIAL SERVICES DO NOT ALWAYS HAVE PERCEIVED VALUE

Some participants, in both the treatment or control groups, are very tech savvy and competent with their smartphones, but they chose not to use Digital Finance, because it does not seem relevant to their lives.

On one hand, a participant referred to his phone as:

“A portable bank with financial power to solve his long and short term financial constrain at his finger tips by swiping his touch screen and performing transactions.”

This participant, from Kisumu, uses TALA, Branch, and other financial applications. He is also an avid user of services like M-Pesa, M-Shwari, KCB M-Pesa, and Equitel.

To achieve this particularly savvy usage of multiple services, the participant must know how to find apps, download them, update them, protect them, and more. Since he aspired to get loans, the skills taught by our project had an impact on his needs and desires to use Digital Financial Services.

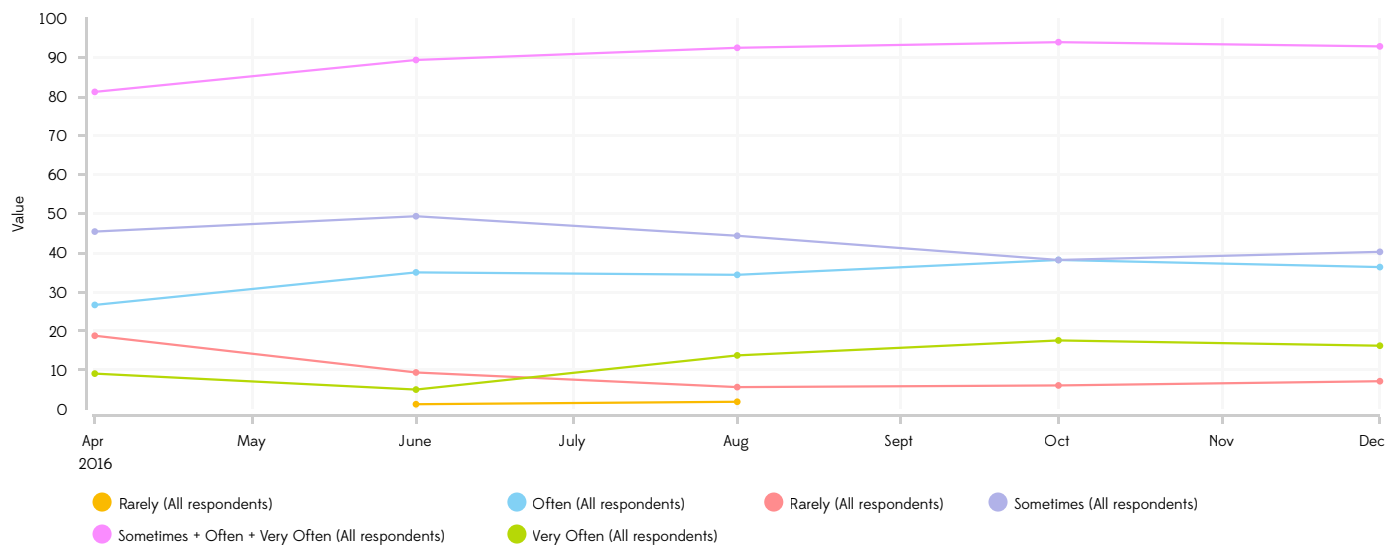
In contrast, a DDD researcher described a participant named Frank from Nairobi like so: “He knows so much about his phone, he has good digital skills, but doesn't use DFS and even started using M-Pesa recently.”

Frank himself comments:

“I am just a student and I don't have money to pay the loans. I have heard about TALA and Branch but I am scared of debts and being harassed to pay. I use my M-Pesa just to receive money.”

These two examples are representative of the varied perception of value participants have for Digital Financial Services in their financial lives.

How often have you been using digital financial services since the last visit?



### A SMALL INCREASE IN THE FREQUENCY OF USE OF DIGITAL FINANCIAL SERVICES

We asked participants to report the frequency at which they used Digital Financial Services throughout the project. The number of participants who responded “Often” and “Very Often” increased for each successive interview. Combining “Sometimes”, “Often” and “Very Often”, there is a rise from 82% at the beginning of the project (already quite high), to 94% at the end, with a slightly higher percentage among the treatment group than the control.

### VERY HIGH, STABLE USAGE OF EXISTING SERVICES

By asking participants which Digital Financial Services they use, we looked for evidence of those which leverage **smart-phone technology**. However, we found that the most popular apps and services were USSD based, and people did not change their usage substantially throughout the study.

The consistently high rate of use over the course of the project suggests that people do find value in using Digital Financial Services, but **the form factor of existing services suits their needs**.

### FOR THE ADOPTION OF DIGITAL FINANCIAL SERVICES, FINANCIAL SKILLS ARE ALSO IMPORTANT

Neither financial nor digital skills are enough in isolation to improve the adoption of Digital Financial Services. While understanding the relevant technology is essential, people also need to be aware of the things they could or should do with their money, and the array of products and services available to them. ■

**“Knowing how to manage finances is more important than digital skills.”**

**Services are easier to use when you don’t have to balance your money.”**

—DSO PARTICIPANT

**“You need to know that you need an account. You need to know about transaction fees. You need to understand the phone, where to go in the app, etc.”**

—DSO PARTICIPANT

**“They need digital and financial skills. First, digital skills will help you withdraw and understand how to use it. Financial skills will be able to help you know how they charge.”**

—DSO PARTICIPANT

# Impact happens through community



Digital skills cannot be taught in isolation, away from the context of everyday life. The way people use and learn about technology is closely connected to the values they have, much of which is centered around community. To have a lasting positive impact on the way people interact with technology, we have to consider the community as a whole, and ensure that the skills and values exist within it for it to sustain itself and grow on its own.

To that end, a group of volunteers and field researchers was assembled from various regions of Kenya to form the DSO team. Instead of hiring a group of professionals, we modeled the peer-to-peer learning networks that many people in Kenya—and the world—live in every day. With this approach, we were able to address the challenges and aspirations of first-time smartphone users that only a multidisciplinary community can.

The results from this project show that our approach was beneficial to everyone. DSO participants were able to bond with one another around common interests and challenges, and build peer-to-peer learning relationships that a community needs to thrive. They were also able to relate to our team, and form important bonds of trust that facilitated learning.

Many of the people on the DSO team are young professionals and volunteers, just starting their careers. With their diverse skills, local expertise, positive attitude, and courage, they built curriculum, ran workshops, developed software, facilitated discussion, and provided analysis, all in multiple languages and across multiple sub-cultures. Their dedication and talent were invaluable to the project, and should be a model for applying the teaching methods found in this report in future projects.

The bonds team members have formed with each other and the study's participants through this work have strengthened their professional identities, and given them valuable, reusable experience. They represent a network that has valuable research and development capacity, and the ability to positively impact underrepresented technology users in Kenya's future. Already, they are reflecting their experience on an open-source, human-centered research project on their personal and professional ambitions.

An important learning network and support community were started with DSO. We hope that the lessons learned within it, and the impressions it left on people, paves the way for better, healthier technology adoption in Kenya's technological future. ■

# Implications and opportunities



Smartphones represent tremendous potential for the low-income population to step into the digital world and take advantage of the social, economic, and financial opportunities it offers. After a year of observation, testing, and evaluation, we have a better understanding of how low-income, first-time smartphone users utilize their technology, what motivates them to do so, and how we can best help them learn throughout their journey.

We now know that they adopt technology based on social trends, and that they are motivated to spend time and money on social media. Some are similarly motivated to gamble, and have used their smartphone to become better at it. Both activities have habit-forming properties we can learn from and incorporate into other kinds of products.

We also learned that hardware, social setting, skill, and financial ability impose limits on a person's use of smartphones, apps, the Internet, and, therefore, Digital Financial Services.

Participants' lack of understanding of the technological environment they are stepping into stunts their ability to explore, and gives them the wrong impression of what is possible, and what motivates corporations to serve them. For example, people do not understand how platforms like WhatsApp or Branch make money. Without that information and awareness—and the skills to explore—they cannot make informed decisions about what to do with their technology.

However, none of these barriers curb people's appetite for smartphones and apps. They buy, replace, and repair their smartphones as soon as they are able. They hear about apps from friends, neighbors, and cyber cafés owners, and are able to get them through unconventional means. They learn to use the apps they want even when it is difficult to do so, and, when comprehension is too far out of reach, they will pay someone to fix it for them.

By honing their digital skills through workshops and on-device prototypes, we were able to open the door for people to discover the digital world. Their competencies improved, they became more comfortable and confident with their technology, and could use it in unexpected ways. However, while we saw their ability improve, their activities did not vastly change. In particular, the narrow set of Digital Financial Services they used when the study began was just as narrow as when it ended.

While digital skills by themselves are not enough to drive the adoption of Digital Financial Services, they give people the proper footing to be successful in a complex equation of fast-paced digital change, and constant financial and social pressure. Without digital skills, their motivation to use technology and the barriers they face forces them to find their own methods, and, potentially, maintain or exacerbate their vulnerability.

Considering the importance and risk associated with financial activity, we want to give people the strength and agency they need to take part. Digital skills give people a platform to engage in the world of digital finance when they are ready and can find value in doing so. **They want to take part in society. They do not want to be left behind.**

**What else can we do to give people the knowledge and exposure they need to fully partake in the digital world, via apps, the Internet, and Digital Financial Services?**

**Knowing what we know, are we able to leverage this insatiable appetite for technology to make it easier and more compelling for people to use it for their financial benefit?**

**How can smartphones be leveraged to increase the adoption of DFS?**

# 13 ways to leverage smartphones for low-income first-time users

## 1. Don't build an app. Yet.

### 1. DON'T BUILD AN APP. YET.

Building Digital Financial Service products does not necessarily mean building new mobile applications. For a population without robust hardware, modern software, and adequate skills, applications are difficult to build and maintain. Installation and bugs are hard to track and fix, and due to competition for storage space, data costs, and mindshare, an app for digital finance may have less staying power than a social messaging app or a game.

Of the learning experiences we designed in DSO, Jisort (the mobile app) was the least effective. Although participants enjoyed its affordability, its constant presence, and their ability to review information they had previously learned, they wished the app was more interactive, updatable, and easier to grasp.

The amount of time, effort, and money it takes to

**“I did not take much time on it, there was no one who could explain it to me, if I don't understand anything there is no one to explain it to me.”**

—DSO PARTICIPANT

## 2. Leverage existing products.

build an app of Jisort's caliber suggests that there are better ways to reach this audience, either for learning, Digital Finance, or otherwise. Of course, a more concerted effort could be made to build and maintain a better experience, but the benefits of other options seem to outweigh the costs of doing so. People change phones too often, and face too many specific, unexpected, and evolving problems for a narrow-purpose app to be viable on its own.

When there is clear, strong value for apps by themselves, or as a companion to another activity, they can still be a useful tool.

An example: in teaching digital skills, Jisort 2.0 could be updatable with content when participants attend a workshop, so they can review what they have learned later in a controlled environment. This approach would take advantage of in-person meetings as a way to distribute trusted content cheaply, thereby maintaining the relevancy of an app.

**“I just read and played games but had nothing much than that.”**

—DSO PARTICIPANT

### 2. LEVERAGE EXISTING PRODUCTS

Instead, we can leverage existing apps and services with which people are familiar. Many existing

## 4. Experiment with social platforms and artificial intelligence.

### 3. Use a “middle of the road” approach.

platforms have the strength and flexibility for us to design, experiment, and deploy new kinds of Digital Financial Services, which can take advantage of the trendiness, social connectivity, and habit-forming designs these platforms already employ.

#### 3. USE A “MIDDLE OF THE ROAD” APPROACH

People are buying smartphones at an unprecedented rate, but the phones they are buying cannot handle the technological demands of modern apps. Alternatively, USSD offers the ubiquity, affordability, simplicity, and familiarity people need and already use on a wide variety of devices. To help low-income smartphone users take part in society and adopt Digital Financial Services when they are needed, we should develop apps that take advantage of both paradigms as transitional tools where possible. Unfortunately, USSD’s UI and UX are dated and it is difficult and expensive for organizations to set up.

We can already see systems like these becoming more available as chatbots on Telegram, Facebook, Kik, and WeChat. They circumvent the expense associated with building a USSD service, but give their users cheap, simple ways to communicate with services they need on platforms they already use. For example, the Kenya Power Bot lets customers manage their account through simple text & UI over Telegram.<sup>1</sup>

#### 4. EXPERIMENT WITH SOCIAL PLATFORMS AND ARTIFICIAL INTELLIGENCE

For low-income first-time smartphone users, cheap, dedicated assistance (especially for digital skills) is rare, appreciated, and important. At scale, it is difficult to give people the in-person, individual, and regular attention they need. Sterro showed that it is possible to teach people with a sense of personal connection through social messaging platforms, but we only scratched the surface of this approach. With

<sup>1</sup> <http://blog.ongair.im/how-to-use-the-kenya-power-telegram-bot/>

### 5. Truly understand and leverage gambling.

its popularity, demand, feature-set, and motivating factors, social platforms present many opportunities to explore this concept further. Combined with artificial intelligence, it may be a cheap, scalable learning method that first-time smartphone users will find useful and dynamic enough to suit their needs. It can and should be applied to onboard new smartphone users by familiarizing them with their device and their OS, and helping them adopt relevant apps, services, and Digital Financial Services.

There are important caveats:

- **Men and women respond differently.** People seem to have different levels of comfort, and different availability depending on their gender. This could benefit from further research in an environment less constrained by technology quality and data costs.
- **It may be expensive to use frequently.** Participants are careful with their spending on data, and buy small bundles to use on a weekly or daily basis. Regularly activity on social platforms may require more data than people are willing to pay for. AI may help, if it is available offline.

Currently, WhatsApp and Facebook are the most popular messaging apps, but Facebook’s Messenger platform has a more welcoming bot development ecosystem. Further experimentation with Messenger is advantageous, and people are already beginning to build useful solutions with it. For example, **farm.ink** is building chatbots on Facebook Messenger for farmers to improve their business and practice.<sup>2</sup>

#### 5. TRULY UNDERSTAND AND LEVERAGE GAMBLING

While gambling in itself may not be beneficial, it has a lot of potential to push people in the right direction. For example, until they were shut down by the supreme court as a violation of the Lottery Act,

<sup>2</sup> <https://medium.com/farmink/why-we-think-chatbots-for-farmers-in-kenya-isnt-as-stupid-as-it-sounds-f3a5d30087bc#.Scpj1mrhu>

## 7. Explore other distribution and adoption channels.

### 6. If not gambling, why not games?

lottery-based savings accounts compelled more South Africans to save more of their money.<sup>3</sup>

Gambling is social and addictive, and can inspire people to adopt technology and learn to use it. Many people are already using their smartphones to gamble, so we need to step in the middle of that world to guide people toward smart financial practices using accessible digital platforms. Whether we model new platforms on the habit-forming principles of gambling, or integrate off ramps from gambling into Digital Financial Services, there are possibilities we must explore.

#### 6. IF NOT GAMBLING, WHY NOT GAMES? ○

Games are in relatively high demand, and have many of the habit-forming characteristics of gambling and social platforms.

Unfortunately, while we incorporated games or interactive activities into all of DSO's learning experiences, we did not focus on them specifically. People liked Jisort's quiz game, and some people specifically referred to it favorably later. In workshops, the games we played created a sense of comfort and ease, and the activities let people be creative while learning the material.

Since games and interactive experiences are engaging and reusable in-person, online, and offline, they are a viable on-device learning method, especially for this population, and could be used to inspire adoption.

#### 7. EXPLORE OTHER DISTRIBUTION AND ADOPTION CHANNELS ○

With limited connectivity and few sources of knowledge, low-income first-time users utilize offline personal networks to collect knowledge, apps, and content for their smartphones. SD cards and Flash

<sup>3</sup> <https://insight.kellogg.northwestern.edu/article/using-the-lure-of-a-lottery-to-spur-savings>

### 8. Improve hardware and the operating system.

Share are common tools to trade apps and content at cyber cafés and between friends. To make the experience of using an app or service easier for developers and their consumers, we need good ways of making sure people can receive updates and knowledge, even in this offline-first environment.

While DSO has shown that workshops would be an effective tool in this space, they are difficult to scale. However, with a proper structure and community support, it is possible to reduce the cost of running workshops and to reduce their logistical constraints by running them closer to the places where people live and where they already use and fix their technology (e.g. cyber cafés).

Existing entertainment channels may also be useful for learning and adoption. Road shows are popular in Kenya, and are used by MNOs to market products and government agencies to administer health information. They could be used to make people aware of new technology, help fix devices, and offer connectivity.

Also, people in Kenya are avid radio listeners and movie watchers, and consider some shows to be full of learning opportunities. As has been shown through educational entertainment previously, it is possible to use these popular media channels to educate the public. An idea we did not have time to pursue involved a Kenyan radio presenter who would record podcasts and radio shows that included digital skills awareness and training. Shows would have been casual, colloquial, and full of tips, and people would be able to call in to solve their problems. Since community centers like hair salons, matatus, and restaurants (hotels) often have a radio to listen to, they could become learning centers as well.

#### ○ 8. IMPROVE HARDWARE AND THE OPERATING SYSTEM

There are many hardware and software problems that plague low-income, first-time smartphone users, preventing them from fully taking advantage of their devices' potential. To fix these problems and better educate people, it is important to understand that they need to use

## 9. Use existing features to address language barriers.

the same devices and the systems as the rest of the market (or as close as possible). It may seem attractive to develop a smartphone or an OS that is designed specifically for this population, but there is a risk of isolating them even more than they already are. They want to truly take part in the rest of technological society, and we need to give them the same tools as everyone else for them to succeed. The tools we build need to give people the opportunity to progressively enhance their experience with knowledge and confidence. We need to build educational, facilitatory tools that grow with users instead of limiting them.

For instance, manufacturers pre-install applications on their devices, many of which are useless or confusing to users. By working with these manufacturers, we could pre-install tools that are more useful to them.

Also, the pace of Android seems to be outrunning the pace of hardware among this audience. They still struggle with the confines of Android artifacts that have long been supplanted with better systems and features. Since this population will routinely lag behind the rest of the market, we need to develop ways to improve the experience they have now. For instance, is it feasible to develop and deploy patches to old versions of Android that fix common storage problems like the app partition?

At the same time, manufacturers, mobile operators, NGOs, and other organizations can work together to improve the quality and availability of devices. With more accommodating purchasing plans, people can get better devices for lower prices, and be able to use the apps and services that are being developed for the rest of the market.

If people had the right technology in their hands, would they still not be using advanced apps and services, including Digital Financial Services? We need to conduct a new study with better smartphones to identify exactly when hardware is a problem, and when it ceases to be one.

## 10. Pay more attention to gender.

### 9. USE EXISTING FEATURES TO ADDRESS LANGUAGE BARRIERS

Technical language and specialized vocabulary make smartphones, apps, and services difficult and unfamiliar to people. How might we help people understand the language on their phone while they use it?

Modern smartphones are well-equipped with voice technology that can explain terms and provide simple explanations in English, Swahili, or local dialects of Sheng, depending on the comfort and inclination of the user.

### 10. PAY MORE ATTENTION TO GENDER

There are clear differences in the roles men and women have in society. In some cases, women rely on men to make decisions, and have their online lives shaped by men. Through DSO, we know that they appreciate different things online and use their technology differently. For example, women found a digital mentor more engaging than men, were more comfortable, and learned more through those means.

For the most part, finances are separated between husband and wife. Women are expected to make different kinds of purchases than men, and are expected to spend their time differently. Not only do they make different purchases, but they also maintain a knowledge barrier between each other as a system of security and trust.

We need to take this divide into consideration and investigate further the specific motivations and barriers of men and women with respect to digital finance.

Men and women are likely to learn about and use any technology differently, including Digital Financial Services, and previous expectations about banking need to be reevaluated in the online context. Women may

## 12. Use a multidisciplinary approach.

### 11. Help people manage the cost of being online.

simply have different opportunities here than they ever have because financial activity online is shaped differently than offline.

#### 11. HELP PEOPLE MANAGE THE COST OF BEING ONLINE

Mobile data is expensive, and the constant weight of this expense prevents people from using technology freely.

People are also unaware of how their smartphone consumes data, and how to manage it. We can train people to use and understand their phones better, and give them the chance to use their money in other ways. Since it is an investment of time, perhaps training can be incentivized by credit for data instead of money. We can also build software that helps people understand how their money is spent by more precisely demonstrating how data is consumed by Android, and making suggestions. Connectivity can be made cheaper by lowering costs without restricting the availability of content, and by making Wi-Fi more available for occasional heavy use. If Wi-Fi locations are managed by members of the community, it provides an incentive for the community to invest in its own growth.

#### 12. USE A MULTIDISCIPLINARY APPROACH

We suggest an approach where interdependent problems are solved together for better impact. For example, if a product designer is convinced about the future success of an application, but we know that hardware is going to be a barrier and people are likely to be confused by the app, we would recommend deploying new hardware and specific training at the same time. For improving the adoption of specific products (for example, an app for a new Digital Financial Service), programs should be designed that introduce the product in combination with the digital skills needed to use it and the financial skills to take advantage of it.

### 13. Dream up and experiment with completely different digital financial systems.

To deliver this exposure and training, it is best to use a mix of in-person experiences (e.g. workshops) delivered by members of a community, paired with cheap, live, and potentially entertaining on-device assistance (e.g. a social media experience similar to Sterro.) This combination of techniques will allow community growth, scale, and freedom for individuals to experiment.

#### 13. DREAM UP AND EXPERIMENT WITH COMPLETELY DIFFERENT DIGITAL FINANCIAL SYSTEMS

We can not think about today's financial landscape the same way it was thought about 15, 10, or even five years ago. People use traditional banking for specific tasks, and are willing to make use of more flexible alternatives that technology allows. However, the two worlds cannot be conflated.

In developing new Digital Financial Services, our thinking needs to look beyond the systems of the traditional financial world. Today's smartphone users are ready for the change, as long as they see value in it. They just need the access and knowledge to succeed. ■



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