GLOBAL INFORMATION SOCIETY WATCH 2018

Community Networks

Global Information Society Watch

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This edition of GISWatch came into being alongside a brand new baby boy. Welcome to the world, Ronan Diga!

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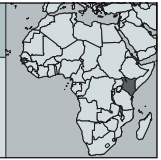
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Introduction

Kenya, one of Africa's fastest growing information and communications technology (ICT) markets, has a long-term development plan, Vision 2030, that aims to transform Kenya into a knowledge-based economy by utilising ICTs for national development and growth.[1] In the 2017/2018 second quarter statistics report released by the Communications Authority of Kenya, mobile subscriptions recorded a growth of 4.4%, rising from 41 million to 42.8 million. The mobile penetration level reached 94.3%, up from 90.4%.[2] Data internet subscriptions recorded an 8% growth – 33.3 million up from 30.8 million subscriptions.

Yet even with these milestones in mobile connectivity, rural and informal settlements lag behind. Challenges such as the high cost of internet access, a lack of infrastructure, a lack of locally relevant content and a lack of ICT skills are barriers to utilising ICTs effectively for socioeconomic development.

Nairobi is the country's largest and capital city, with an estimated population of 3.5 million,[3] and slums hosting almost three-quarters of this population.[4] Kibera is Nairobi's largest slum, located seven kilometres south of the city with an estimated population of 500,000 to 700,000.[5] Residents of Kibera suffer from poverty, inadequate food and water, rampant diseases and few educational opportunities. A majority of the residents live on under a dollar a day.

Community networks can be defined as a bottom-up approach to meeting community connectivity needs.[6] These needs vary from one community to another; as a result, these networks have different motivations for starting. Kenya, like many countries in Africa, is still new to community networks. This report focuses on the TunapandaNET community network, the only one in the country.

TunapandaNET community network

TunapandaNET is an urban community network operating in Kibera. It is a project of the Tunapanda Institute, a non-profit social enterprise that runs intensive three-month technology, multimedia design, and business training courses in extreme low-income environments in East Africa, such as Kibera and Turkana in deep rural Kenya.[7] These programmes enable young people to become digital professionals, and to gain skills and mindsets to empower other youth in their communities through peer-to-peer learning. The organisation has produced 400 graduates in the past four years.

The TunapandaNET community network was started to help the institute reach more youth in Kibera, since the institute can only accommodate 30 trainees per cohort. In 2015, the institute started developing a gamified e-learning platform called Swag.[8] Swag is an open source software system – for web and Android – that enables individuals and groups to access offline multimedia educational content without needing access to the internet or highly trained teachers. The initial goal was to connect the institute to three partners in Kibera through a wireless mesh network. The partners would serve as hotspots where youth would access the e-learning platform.

Through a video created by the institute, Ubiquiti equipment was donated to help build a pilot mesh network for the project. However, the project implementation team at the institute, consisting of two IT volunteers and three Tunapanda graduates from the previous cohorts, faced challenges such as insufficient knowledge and skills in operating the equipment and few resources online to provide guidance. As a

1   icta.go.ke/pdf/THE%20NATIONAL%20ICT%20MASTERPLAN%20 2017.pdf

2   www.ca.go.ke/images/downloads/STATISTICS/Sector%20 Statistics%20Report%20Q2%20%202017-18.pdf

3   Kenya's population is estimated to have reached 50,827,543 in 2018. worldpopulationreview.com/countries/kenya-population

4   Sana, O., & Okombo, O. (2012). Taking Stock of Socio-economic Challenges in the Nairobi Slums. *Friedrich-Ebert-Stiftung*. https:// www.fes-kenya.org/media/publications/2013/Taking%20 Stock%20of%20Slums%20Booklet.pdf

5   mirror.unhabitat.org/content. asp?cid=3220&catid=206&typeid=13

6   Rey-Moreno, C. (2017). *Supporting the Creation and Scalability of Affordable Access Solutions: Understanding Community Networks in Africa.* Internet Society. https://www.internetsociety.org/resources/ doc/2017/supporting-the-creation-and-scalability-of-affordable-access-solutions-understanding-community-networks-in-africa

7   https://www.tunapanda.org

8   swag.tunapanda.org

result, some of the donated equipment broke. The team was also not aware of any existing projects that they could contact for support for the technical challenges they faced. Finally, the team was able to pilot the network by connecting Tunapanda to one of three partner nodes. However, the e-learning platform did not receive as many users as they had anticipated.

Breakthroughs

Two breakthroughs came in 2016. First, in March 2016, two of the team members were selected to attend a workshop on the internet of things (IoT) and networking for developing countries at the Abdus Salam International Centre for Theoretical Physics.[9] During the training sessions, they presented the mesh network idea to workshop organisers Marco Zennaro and Prof. Ermanno Pietrosemoli, who gave them some pointers on configuring Ubiquiti equipment and donated some routers to the project. The team also met Arjuna Sathiaseelan and Adisorn Lertsinsrubtavee, who also had experience in community networks and offered very valuable advice on how to move forward with the project. Before the workshop, the team was not aware of the term "community networks" and the significance of setting up a community structure that allowed the community to manage its own access needs. Their idea was simply a technological solution to solving the challenges of high bandwidth costs and access to digital educational content. They were introduced to successful community networks such as guifi.net[10] in Catalonia and TakNet[11] in rural Thailand, which they could draw lessons from.

The second breakthrough was meeting Carlos Rey-Moreno from Zenzeleni Networks in South Africa, who was carrying out research on existing community networks in Africa. Following the "Map of the Community Network Initiatives in Africa" report,[12] the first Summit on Community Networks in Africa was held in November 2016, supported by the Internet Society.[13] During the summit, the team met other operators in Africa and shared the challenges they were facing in establishing their network in Kibera. From these discussions, the network operators formed a support group championed by Carlos, Jane Coffin and Michuki Mwangi from the Internet Society to address the issues they were facing.

Going back to the drawing board

These experiences helped TunapandaNET rethink its model. One lesson drawn from successful community networks was that most go for community buy-in first. Using a user-centred design approach, the team started carrying out research on potential network users, a critical step they had failed to take before. This enabled them to understand the unique challenges faced by Kibera residents, and to co-design potential solutions with them. Some of the key challenges were access to computers, lack of ICT skills, and lack of knowledge on how access to connectivity could help them increase their earnings. Most of the youth only accessed the internet for entertainment purposes.

Three areas were identified as areas of great value to the community: education, health and business. Deployment was planned in three phases, with the education pillar being first. Kibera has over 300 educational institutions, most being low-cost, privately run, informal schools.[14] Most of these schools are run by religious institutions and non-governmental organisations serving vulnerable children and youth. They face challenges such as lack of trained teachers, poor infrastructure, and a lack of learning resources due to high costs.

Charles Ochieng, a local community leader and manager at St. Christine Community School, which has over 500 students, said that every year the school loses close to USD 10,000 in unpaid school fees since most parents are unable to pay. Because of this they have difficulties in paying their teachers and rely on the good will of these teachers during tough months. Despite the fact that the school lacks a fully equipped science lab and relies on borrowed equipment, its neighbouring schools rely on it to share its lab with them during the national secondary school examinations. Tumaini School, another informal school with a population of over 300 students, uses downloaded YouTube science experiment videos to teach practical science lessons with only four laptops serving the whole school. The school's principal James Wanyama has expressed his desire for the school to have more computers, but cited the high cost of computers as a barrier. However, despite these challenges, it is

9   https://www.ictp.it

10 https://guifi.net/en/node/38392

11 Lertsinsrubtavee, A., et al. (2015). Understanding Internet Usage and Network Locality in a Rural Community Wireless Mesh Network. *Proceedings of the Asian Internet Engineering Conference 2015.* docplayer.net/24614970-Understanding-internet-usage-and-network-locality-in-a-rural-community-wireless-mesh-network.html

12 Rey-Moreno, C., & Graaf, M. (2016). Map of the Community Network Initiatives in Africa. In L. Belli (Ed.), *Community connectivity: Building the Internet from scratch. Annual report of the UN IGF Dynamic Coalition on Community Connectivity.* https://www.researchgate.net/publication/309291449_Map_of_the_Community_Network_Initiatives_in_Africa

13 Rey-Moreno, C. (2017, 12 January). 1st Summit on Community Networks in Africa Report. *Internet Society.* https://www.internetsociety.org/resources/doc/2017/1st-summit-on-community-networks-in-africa-report

14 openschoolskenya.org

inspiring to see how these schools do their best to deliver learning to a population that seems forgotten by the relevant government institutions.

This phase focused on promoting the use of ICTs for education. This entails providing schools with access to digital educational content through the e-learning platform and digital tools for records management. Teachers would also receive ICT training and be taught how to use the e-learning platform to digitise their lesson plans and deliver learning to students.

In 2017, through a partnership with the Internet Society, the International Centre of Theoretical Physics and Rhinotivity (Denmark),[15] TunapandaNET deployed four nodes serving two schools with over 1,500 students and a youth centre serving 300 local youths. The network provides access to offline educational resources and capacity building for the different network user groups. In 2018/2019, the network will be expanding to 10 additional centres – seven schools, two youth centres and one women's centre. This will be done in partnership with the Internet Society Kenya Chapter[16] through the Internet Society's Beyond the Net Funding Programme.[17] The seven schools have a total of 2,900 students while the community centres will be adding 550 users to the network. It is estimated that the network will have 5,000 users by 2019.

TunapandaNET provides the following services[18] to partner institutions:

- Access to the internet.
- The Swag e-learning platform, which enables users to access learning resources as well as create content. Through the platform, teachers can create digitised lesson plans and curricula. The goal is to provide locally relevant digitised educational resources. The platform also has content that teaches the youth skills in technology, design and business. These micro courses are derived from Tunapanda's three-month curricula.
- Digital skills training for teachers, youth and women, equipping them with relevant skills in education, work and entrepreneurship.
- Technical support for schools and community centres.

The centres will receive a free six-month trial period for all the services, during which the TunapandaNET team will conduct research with partner institutions that will help determine ownership and business models for sustainability.

The network – which uses the 2.4 GHz and 5.8GHz unlicensed spectrum – now has three main layers: core, distribution and access. The core layer is the Wi-Fi network backbone, as well as a data centre, responsible for hosting the Swag e-learning platform, open educational resources and a school management system.

The distribution layer is responsible for connecting the access and core layers. To overcome interference from obstacles such as buildings and trees, there are two base stations set up on high points in Kibera. The hardware used for the base stations are the Ubiquiti LiteBeam AC grid and Ubiquiti LiteBeam AC. The Litebeam AC grid is used for the backhaul connection to Tunapanda Institute. The access layer, which provides the connection to the end-users, has either Ubiquiti LiteBeam AC or Ubiquiti NanoStation M5 and 2.4 GHz D-Link wireless access points. This layer is responsible for distributing internet access and other network services to the end-users.

Beyond access: Building innovative learning and earning communities

> "Building community networks is 20% technical engineering and 80% social engineering." –Michuki Mwangi (Internet Society)

With the low literacy levels in the community, most find it difficult to understand the value that the internet would bring to their lives. There is always the "So what?" question. Unless the community members see tangible solutions to their local needs, the network is not sustainable. Going "beyond access" means individuals and communities being able to access better education, health and government services. They should be able to innovate and create local solutions to their unique challenges, such as new markets for their products and services, the preservation of indigenous cultures, and amplifying the voices of the unheard. There is also the challenge of how to incentivise the community to be part of the network as volunteers, or even to take part in the capacity-building programmes. Kibera has many NGOs that give monetary benefits to the community, and this creates an expectation from the community.

There is also some competition among schools and NGOs which can hinder collaboration. The

15 https://twitter.com/rhinotivity?lang=en
16 https://www.isoc.or.ke
17 https://www.internetsociety.org/beyond-the-net
18 We are offering the services for free for a period of six months, after which institutions will start paying. We are still working out a business/payment model.

challenge and opportunity ahead lie in building learning and earning communities within the network, and bringing together the different stakeholders to work collaboratively.

The network can be a catalyst in enabling the community to create solutions and boost the local economy. As local schools continue to adopt ICTs, they need maintenance services. The network is working towards equipping local youth with computer hardware, software and network skills to meet the network maintenance needs, and thereby increase their earning potential. Youth in Kibera are very passionate about art and music and the network can be a platform connecting them to local and international markets. The network is also working towards training women in e-entrepreneurship so they can better the business potential of their handmade crafts such as handbags and jewellery.

The gender gap

The gender gap can be addressed from two perspectives: the team and network users. Only two of the seven members of the TunapandaNET team are female. This is a symptom of few women embarking on technology-related careers in Kenya. The main challenge faced by female team members is access to some of the network's partner institutions, due to insecurity and fear of harassment from unemployed male youth. Thus, we female team members have to be accompanied by male team members for all partner visits.

For the network users, very few women and girls are interested in digital skills training programmes or technology-related careers. During the team's interview with form four students at St. Christine high school, only one girl out of 23 girls was interested in a career in science, technology, engineering, and mathematics (STEM). None of the girls knew about technology-related careers or had heard about computer science or coding. Although the school has a computer lab, the school manager said that only the male students used it frequently. When the girls were asked why, they answered that they did not see how learning computers would help their desired careers. I took that opportunity to share with the girls my journey to becoming a network engineer and quite a number took an interest in learning more on technology.

From this experience at St. Christine school and other partner institutions, it was found out that a majority of girls and women in Kibera have very limited knowledge of technology and technology-related careers, and see it as a male domain. Other challenges are high costs of ICT devices such as computers and smartphones. To access the internet, women would have to use local cybercafés, which are mostly used and run by males. Many women have expressed fear of sexual harassment in the cybercafés. Relevance is another issue: women often cannot see how the internet can be used to tackle the challenges they face.

In 2016, Tunapanda started an initiative called Tech Dada (Tech Sisters) to address these challenges through a mentorship programme for girls aged 14 to 20, and offering digital literacy training for women. These programmes are done in partnership with centres connected to the TunapandaNET community network. The initiative has in the past partnered with Plan International Kenya through the Adolescent Girls Initiative Kenya,[19] which provided online safety training for the programme's peer mentors. It has also trained local women champions in Kibera through the Women Voices programme,[20] which used ICTs to amplify women's voices in governance issues in Kibera.

Currently, none of the women from the community is involved in the technical aspects of the network. However, the network is working towards increasing the number of women in the community with technical expertise by encouraging more women to start with the digital literacy training, after which they can proceed to the advanced courses in technology. These courses are to be offered in a local women's centre that the network will be connecting.

Action steps

Community networks are like entrepreneurial start-ups: it takes resilience, learning from failures, and efficient management of available resources to build one. It is an iterative process, as technology and community needs keep evolving. They also need institutional support to survive.

The following steps would strengthen community networks in Kenya:

- Lower the operating fees: The Communications Authority of Kenya develops the national radio frequency plan and a publicly available National Table of Frequency Allocation.[21] Community networks such as TunapandaNET fall under network facility providers of infrastructure and content providers. The initial licence fees under

19 www.popcouncil.org/research/
    adolescent-girls-initiative-action-research-program
20 https://womenvoicesictchoices.org
21 www.ca.go.ke/index.php/frequency-spectrum

these categories are between USD 1,000 and USD 2,000 within a county boundary.[22] These fees are difficult for communities such as Kibera to meet. For community networks to have an impact in poor communities in Kenya, these fees need to be lowered considerably.

• Create policy incentives for community networks: In the country's Wireless Broadband Spectrum Policy, drafted in 2017, some of the proposed principles include offering incentives to encourage deployment in rural areas and tax exemptions for initiatives with public interest objectives, such as research and development.[23] Community networks should be given such policy incentives, given their efforts in connecting underserved areas.

• Raise awareness: Finally, given that TunapandaNET is the only community network in Kenya at the moment, it is important to promote more awareness on community networks in the country. This would help TunapandaNET in gaining buy-in from the community and build local partnerships and collaborations to support the network.

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22 www.ca.go.ke/images/downloads/TELECOMMUNICATION/ LicensingProcedures/New%20Market%20Structure%20 Under%20The%20Unified%20Licensing%20Framework%20 -February%202017.pdf

23 www.ict.go.ke/wp-content/uploads/2016/03/DRAFT-WIRELESS- BROADBAND-SPECTRUM-POLICY-Final.pdf

Community Networks

THE 43 COUNTRY REPORTS included in this year's Global Information Society Watch (GISWatch) capture the different experiences and approaches in setting up community networks across the globe. They show that key ideas, such as participatory governance systems, community ownership and skills transfer, as well as the "do-it-yourself" spirit that drives community networks in many different contexts, are characteristics that lend them a shared purpose and approach.

The country reports are framed by eight thematic reports that deal with critical issues such as the regulatory framework necessary to support community networks, sustainability, local content, feminist infrastructure and community networks, and the importance of being aware of "community stories" and the power structures embedded in those stories.

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