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Data-driven Research to Bring Billions Online

MAWINGU

EMPOWERING KENYAN LIVES THROUGH AFFORDABLE
INTERNET ACCESS USING UNLICENSED SPECTRUM



A Mawingu Center in Kenya. Photo courtesy: Mawingu Networks

EXECUTIVE SUMMARY

The Mawingu project is a joint undertaking by Mawingu Networks, Microsoft, and Jamii Telecommunications that provides affordable access to wireless broadband Internet as well as device recharge facilities in the rural Kenyan counties of Laikipia, Nyeri, Embu, and Meru. Launched in 2013, more than 10,000 customers access its services through 300 Wi-Fi hotspots at less than US\$ 3 per month, with others in these districts – a total population of about 300,000 people – receiving free access through libraries, schools, and health centers. The project relies on a combination unlicensed spectrum and TV white space (TVWS) spectrum to provide last mile connectivity as well as backhaul.

Keywords: Kenya, rural, TV white space

CONTEXT

With an Internet penetration rate of nearly 70 percent, Kenya has among the highest rates of Internet use in Sub-Saharan Africa. Kenya's Internet usage rates rank among the highest in Africa with nearly 87.2 percent of the population having Internet access and 18.6 percent subscribed to broadband.

Kenya's rural areas still lag behind significantly, however, as broadband is not universally available. Moreover, those with access to signal continue to suffer from low incomes, which makes connectivity cost prohibitive. Most rural networks are 50-100 kilometers from a fiber-optic connection, a distance that is economically nonviable for traditional telecommunications companies to serve. Kenya has a relatively strong record of information and communications technology (ICT) deployment in rural areas; in 2008, 45.8 percent of all fixed-line telephone subscribers were rural based – among the highest in Africa. Furthermore, Kenyans are intimately familiar with Internet cafés, as the vast majority of the population primarily use computers or access the Internet at Internet cafés due to low household ownership of computers.

Kenya			
Population (UN, 2015)	46,748,617	Fixed broadband subscriptions (%) (ITU, 2016)	0.33
Population density (people per sq.km) (UN, 2015)	80.55	Mobile cellular subscriptions (%) (ITU, 2016)	81.28
Median household income (Gallup, 2006-2012)	US\$ 1870	Individuals using the Internet (%) (ITU, 2016)	26
Education (Mean years of schooling) (UNDP, 2013)	Male: 7.1 Female: 5.4	Individuals using the Internet by Gender (%) (ITU, 2016)	N/A

PROJECT DESCRIPTION

In August 2013, Microsoft sought permission from the Communications Authority of Kenya to test the viability of TV white space technology to bring last mile connectivity to Kenya's rural areas. The Mawingu project conducted these trials in the rural counties of Nyeri and Laikipia by Jamii Telecommunications Limited, Adaptrum, and Ubiquiti Networks, along with support from the United States Agency for International Development (USAID) and OPIC. The trials entailed setting up solar-powered Internet kiosks or solar cafés to provide Internet access to locations with limited or no access to electricity.

The Mawingu network uses photovoltaic solar power and TV white spaces as well as other license-exempt radio technologies to deliver commercial Internet access through Wi-Fi hotspots in villages as well as transport interchanges. Mawingu, meaning "cloud" in Swahili, connects rural communities where barriers to Internet use are significant, both because of the lack of infrastructure and the lack of affordability. Mawingu targets low-income earners by providing access at the cost of US\$ 1 per week and US\$ 3 per month.

The Mawingu network provides last mile connectivity through low-cost, high-capability, solar-powered, 5 gigahertz (GHz) point-to-point and point-to-multipoint, license-exempt radios manufactured by Ubiquiti Networks, as well as low-power, second-generation radios manufactured by Adaptrum that allow for extension of the network to off-grid locations. The solar panels that power these radios also produce power for device recharging services.

A noncommercial arm of the business provides Internet access to primary healthcare centers, schools, and other public services through partnerships with local organizations such as the Kenyan Red Cross and Nanyuki library. It is also connecting 20 schools near the Ol Pejeta conservancy.

Jamii Telecommunications Limited provides the backbone link that transmits Mawingu’s traffic to the Internet using a fiber-optic network that belongs to the Kenyan Power and Lighting Company. Additionally, 5 GHz wireless links connect to form rings and distribute connectivity from the backbone to end points. TVWS technologies provide links in areas that conventional 5 GHz links cannot serve due to terrain, and are used for both completing the ring structure and providing last mile connectivity. TVWS can penetrate rough terrain and reach up to 8 kilometers. They cover 16 times the area of traditional Wi-Fi, and nearly four times the distance.

Project specifics			
Technology	TVWS and unlicensed Wi-Fi	Training	N/A
Year of connectivity	2013	Cost to users	US\$ 1 per week
Geography	Rural	Total cost of program	Undisclosed
User profile	Low-income communities	Associated organizations	Adaptrum Jamii Telecommunications Limited OPIC Ubiquiti Networks USAID

PROGRESS AND RESULTS

At present, Mawingu has about 10,000 commercial users of its monthly and weekly flat-rate offerings in the four counties where it operates. The Mawingu network has to date provided free-of-charge connectivity to Male Primary and Secondary schools, the Nanyuki Red Cross Office, Tambuzi Farm, Tithigi Boys Secondary School, Thome Boys Secondary School, Gakawa Secondary School, and the National Library in Nanyuki. Microsoft provided ICT labs in Gakawa Secondary School, Male Primary School, and Male Secondary School, as well as relevant technology training for all the teachers and administrators, which has had a real impact on educational outcomes. Gakawa Principal Beatrice Ndorongo reports that in the two-and-a-half years since the connection was established, students at Gakawa Secondary School have improved their scores in *every single subject* on the Kenya National Exam.

Furthermore, Mawingu enables entrepreneurs to flourish by allowing them to set up “solar-cybers,” which are low-cost Internet cafés that provide device-recharging services. These “Mawingu agents,” as they are called, have flourished in parts of rural Kenya, and provide a range of services to clients.

The evaluation study conducted by the University of Southampton overwhelmingly emphasized the positive benefits that Internet users perceived because of access: 96 percent of respondents said the Internet could positively impact their communities, and 92 percent thought that the Internet could positively impact their own lives.

CHALLENGES

Lack of consistent basic electricity provisioning – Access to reliable electricity from the grid is difficult, as a number of these communities lie in rural and off-grid areas.

High levels of inequality – A baseline study of incomes conducted by University of Southampton in Laipika county showed a Gini coefficient of 58, which is well above Kenya’s country average of 48. Moreover, 60 percent of households were found to be spending more than 5 percent of all monthly expenditures on communications, with 41 percent are spending more than 10 percent of their total net income. The survey study, which used surveys, enumerated interviews, and focus group discussions as part of its methodology, found that 89 percent of Internet users said the cost of using the Internet is a barrier to expanding their use, and that 75 percent of Internet users expressed frustration over the speed of Internet access.

MAWINGU’S SUGGESTIONS FOR FUTURE PROJECTS

TVWS solutions can work to connect rural and remote communities – Low-cost, affordable access to the Internet facilitated by TVWS technology has the potential to connect rural, far-flung, and low-income areas to the Internet.

Connecting schools improves educational outcomes – Mawingu’s experience suggests that access to the Internet through schools has a real and significant impact on educational outcomes.

Energy solutions should complement connectivity solutions – Innovative ways of providing access would benefit from accounting for the lack of consistent electricity in rural areas in their design. Mawingu uses solar power to bridge this gap in areas that are off-grid within its target communities.

SOURCES

Project website: <http://mawingunetworks.com/>