EFFICIENCY FOR ACCESS

IKEA Foundation

UKaid from the British people

ICT

Solar Appliance Technology Brief

AUGUST 2021

EFFICIENCY FOR ACCESS COALITION

This technology brief is one in a series of insight briefs developed to synthesise the latest market intelligence and chart the pathway to commercialisation for some of the off- and weak-grid appropriate technologies most relevant to catalysing energy access and achieving the Sustainable Development Goals.

The first iteration of the LEIA Technology Summaries was published in 2017 to help the newly established Efficiency for Access Coalition navigate a nascent market. At the time there was limited data and reliable research available on market trends and performance of appliances suitable for resource-constrained settings. This brief updates and expands on these summaries, bringing together the latest insights on market and technology trends, consumer impacts, and pathways to scale for infortmation and communications technology (ICT). You can access briefs on all technologies that are a part of this series here.

This brief was developed by CLASP and Energy Saving Trust as part of the Low Energy Inclusive Appliances programme, a flagship programme of the Efficiency for Access Coalition. It is a catalyst for change, accelerating the growth of off-grid appliance markets to boost incomes, reduce carbon emissions, improve quality of life and support sustainable development.

This brief was authored by Garick Lee, Christopher Beland and Théo Schuhmacher of Energy Saving Trust. We thank Elisa Lai, Jenny Corry Smith and Yasemin Erboy Ruff (CLASP), Eleanor Wagner and Sarah Hambly (Energy Saving Trust), and others for their review and input.

This brief was funded by UK aid and the IKEA Foundation. The views expressed do not necessarily reflect the official policies of Government of the United Kingdom or the IKEA Foundation.

Cite as: Efficiency for Access, 2021. Solar Appliance Technology Brief: Information and communications technology (ICT).

Introduction

Information and communications technology (ICT) is a broad term that covers technologies that enable communications – such as radio, television, mobile phones, computer and network hardware, satellite systems and internet of things– and the services provided through these devices. ICT is used to provide information and communications for business, entertainment, education, social, health and other purposes.

This document discusses ICT specifically in resource-constrained settings (i.e., off-grid and weak-grid areas in developing countries). Unless specified otherwise, all the statements made in this brief refer to this context and not to urban areas or to developed countries. In this specific context, ICT can be broken down into two categories: near-to-market or market-ready technologies and horizon technologies.

Near to market or market ready technologies

Mobile phones are used for communication, internet access and access to mobile money for goods and services. Mobile phones are also a business tool, as farmers can improve their productivity by accessing weather reports, use mobile money to finance agricultural inputs. There are three main types of this technology:

- **Smartphones** combine phone and computing functionality running on a complex mobile operating system. Smartphones are typically touch-input with a relatively large screen and have internet and multimedia capabilities.
- **Feature phones** have basic multimedia and internet capabilities. Feature phones have button-based inputs and a relatively small display.
- **Basic phones** have few or no features beyond dialling and messaging.

Radios used for information and entertainment.

Televisions are used for information, educational content and entertainment. Note: televisions are covered in the TV technology brief and will not be discussed further here.

Horizon technologies

Computers, including desktop computers, laptops and tablets are used for information, education, business, entertainment and e-commerce.

Health ICT includes telemedicine and digitising health systems to enhance quality of care. Health ICT improves the efficiency of health centre management and supports public health programmes.

SDG INTERLINKAGES

ICT

SDG 1: No Poverty
SDG 4: Quality Education
SDG 5: Gender Equality
SDG 7: Affordaible & Clean Energy
SDG 8: Decent Work & Economic Growth
SDG 9: Industry, Innovation & Infrastructure
SDG 10: Reduced Inequalities
SDG 11: Sustainable Cities & Communities
SDG 12: Responsible Consumption & Production
SDG 13: Climate Action

ICT helps to boost access to credit for micro, small and medium enterprises, build a stronger payments ecosystem, and pave the way to a digital economy. Mobile money PAYGo has also unlocked a large segment of the off-grid solar market, enabling low-income consumers to access energy services while also indirectly supporting education, income-generating activities and entrepreneurship.

Internet and networking technologies include satellite internet, wireless and mesh communication technologies providing internet and off-line communications.

Internet of things (IoT) enables devices to be connected to other devices or the internet, with the purpose of automating systems. In an energy access context, IoT can enable remote monitoring of appliances, solar home systems, the digitalisation and automation of mini-grids and capture important usage data (e.g., health of batteries).

State of Play

ICT in off- and weak-grid markets will play an important role as the component costs continue to drop.[1] In a recent survey, energy access practitioners ranked 'mobile/smart phones' third and computers seventh in perceived household appliance demand; computeres also ranked eighth in perceived business demand.[2]

Mobile phones are in the growth phase of the market development curve in developing countries. In Sub-Saharan Africa, mobile subscriber market penetration is expected to grow from 45% in 2019 to 50% in 2025.[3] Similarly, the penetration rate of mobile internet users is expected to grow from 26% to 39% on the same timeline. Smartphone use and 4G internet connections are also expected to greatly increase from 2019 to 2025 as technology improves and mobile networks expand.

The trends in Table 1 are expected to drive further uptake of mobile money. As of 2019, there were 481 million registered mobile money accounts in sub-Saharan Africa, of which 183 million are considered active.[5] 25% of the adult population owns an active mobile phone, accounting for 49% of the total global share of active mobile money accounts.

In India, the number of subscribers, mobile internet users, smartphones and 4G internet was higher than Sub-Saharan Africa in 2019. Strong growth is expected to continue to 2025.

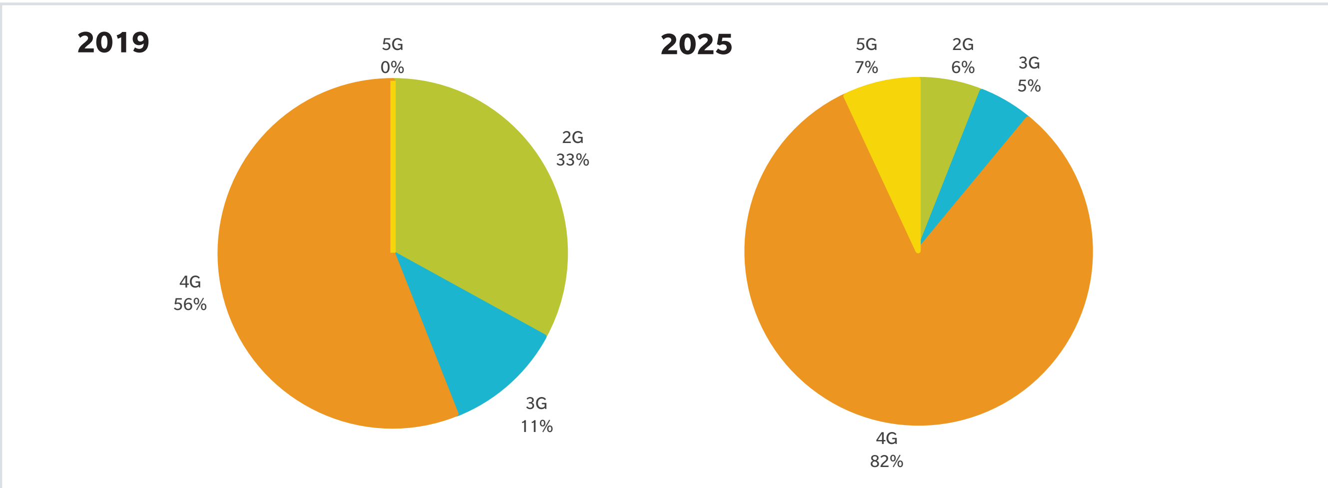
In off- and weak-grid areas, expanding mobile networks and the uptake of off-grid solar products, such as solar lights and solar home systems, are driving mobile phone update. Off-grid solar products provide many off- and weak-grid households with the ability to charge their mobile phones, as well as phone charging services for others. At the same time, mobile phones are now available through pay-as-you-go (PAYGo) financing, driven by existing PAYGo customers who have built a credit history through payments for off-grid solar products .[6]

Phone battery sizes are increasing over time as lithium battery technology develops and battery prices fall. As a result, a battery in a smartphone requires a growing amount of energy to complete a full charge. A typical smartphone with a 3500 milliampere per hour (mAh) battery requires about 18Wh to charge, accounting for charging losses. A typical off-grid solar product with a 12W solar photovoltaic (PV) module has about 27Wh of electricity available per day to run appliances and charge devices .[7] If the smartphone was fully charged daily, this would leave only 9Wh available for lights and appliances. Manufacturers need to develop low-consumption mobile phones to avoid phone charging competing with energy needs of other appliances.

Table 1. Mobile usage statistics in Sub-Saharan Africa.[4]

	2019	2025
Unique Mobile Subcribers (million)	477	614
Mobile Internet Users (million)	272	475
Smartphones (% of total)	44%	65%
Connections by technology (% using 4G)	9%	27%

Figure 1. Technology mix statistics in India.[8 9]



1. Microsoft Dynamics 365, Manufacturing Trends Report (2019), https://info.microsoft.com/rs/157-GQE-382/images/EN-US-CNTNT-Report-2019-Manufacturing-Trends.pdf
2. Efficiency for Access, Off-Grid Appliance Market Survey (2020), https://efficiencyforaccess.org/publications/off-grid-appliance-market-survey-2020
3. Penetration is defined as the number of unique subscribers/users per population.
4. GSMA, The Mobile Economy Sub-Saharan Africa (2020), https://www.gsma.com/mobileeconomy/sub-saharan-africa/
5. GSMA, State of the Mobile Money Industry in Africa (2019),https://www.gsma.com/sotir/wp-content/uploads/2020/03/GSMA-State-of-the-Industry-Report-on-Mobile-Money-2019-Full-Report.pdf
6. Oluwadamilare Akinpelu, M-Kopa Partners Safaricom, Samsung to Roll Out a Pay-as-you-go Mobile Phone Plan in Kenya, Technext (2020), https://technext.ng/2020/01/29/m-kopa-partners-safaricom-samsung-to-roll-out-a-pay-as-you-go-mobile-phone-plan-in-kenya/
7. VeraSol Product Database, https://data.verasol.org/
8. GSMA, The Mobile Economy Asia Pacific, (2020), https://www.gsma.com/mobileeconomy/wp-content/uploads/2020/06/GSMA_MobileEconomy_2020_AsiaPacific.pdf
9.Connections refer to "unique SIM cards (or phone numbers, where SIM cards are not used), excluding licensed cellular IoT, that a mobile network has registered during the period of analysis. The number of subscribers differs from the number of connections because a unique user can have multiple connections."

Radios are mature technologies that are declining in use in some developing countries. In Sub-Saharan Africa, radios are the most widely used medium for disseminating information to rural audiences. 800 million radios were estimated to be in use as of 2017.[10] In India, however, their reach is less significant compared to other media, like televisions. Radios are estimated to reach only 110 million people as of 2016.[11] The lower reach in India is likely to reflect other South Asian countries.

Many of the off-grid products offered with solar home systems are radios. More than 225,000 radios were sold in the first half of 2020, often bundled with an off-grid solar product.[12] The efficiency and price of radios is not expected to change substantially in the near future due to their level of maturity as a technology.

Computers (e.g., desktop computers, laptops and tablets) are in the growth phase of the market development curve in developing countries. In 2019, it was estimated that only approximately 7.7% of households had a computer in Africa.[13,14] In South Asia, the percentage of households with personal computers ranged from 6.9% in Bangladesh to 22% in Bhutan,[15] as of 2016. In India, 13% of households owned personal computers in the same year. As such, most people in off- and weak-grid areas are accessing internet through mobile phones.

Compared to mobile phones and radios, computers are expensive and consume significantly more energy (Figure 2), resulting in very low penetration rates in off- and weak-grid areas.

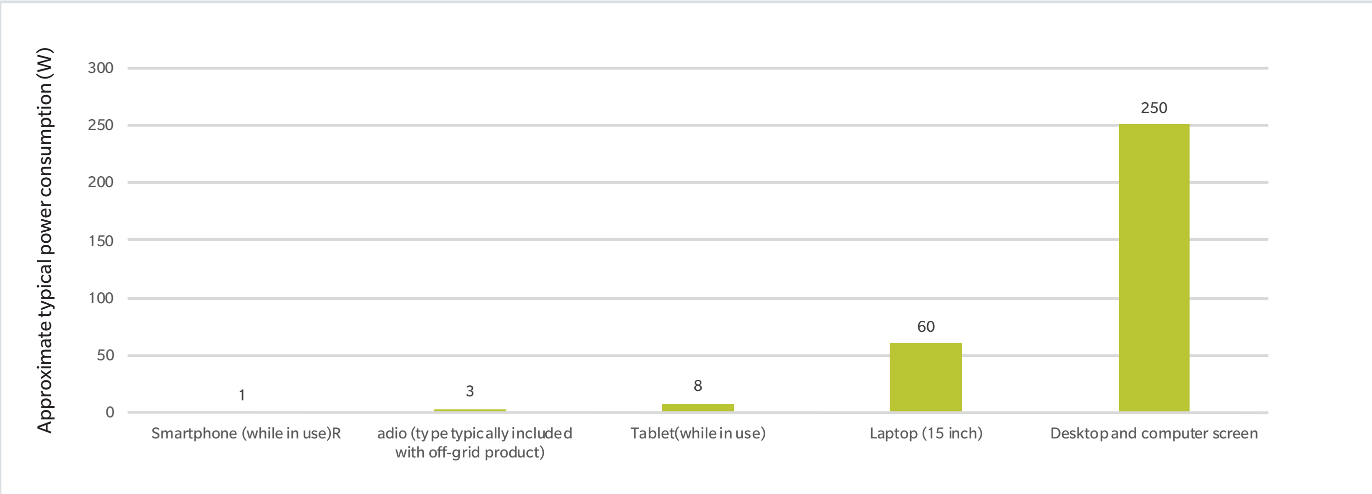
As with mobile phones, tablet and laptop battery sizes have increased over time as battery technology improved and prices fell. This means that more energy is similarly needed to charge tablets and laptops.

Many government, international aid and philanthropic initiatives have provided computers for educational purposes to rural students in developing countries. These initiatives fall under the broad term of mobile learning, which refers to the process of learning via the internet or a network using personal mobile devices such as smartphones, tablets, laptops and digital notebooks. The most prominent of these initiatives is the One Laptop Per Child (OLPC) initiative, which has distributed over 2.4 million laptops to nearly 2 million students and teachers,[16] including in Ethiopia and Rwanda.[17] However, the OLPC Foundation shut down in 2014 due to low sales and criticisms around high costs and lack of teacher support. Many other mobile learning initiatives provide devices, apps and training for off-grid students.[18]

Companies are also increasingly focusing on developing solar-powered desktop computers, including Jirogasy, Niwa Solar and Endless Solutions are targeting the off-grid, government and education sectors with their product offerings.

Health ICT includes telemedicine and e-health approaches that aim to improve access to care and medical information, improve diagnosis (e.g., using mobile technologies as low-cost diagnostic tools) and provide remote health worker training. Public health education is also delivered through mobile

Figure 2. Some typical power consumptions values of ICT devices[19,20]



10. FAO, Using radio and interactive ICTs to improve food security among smallholder farmers in Sub-Saharan Africa, (Rome, Italy: 2019), http://www.fao.org/e-agriculture/blog/using-radio-and-interactive-icts-improve-food-security-among-smallholder-farmers-sub-saharan-0.
11. Partho Dasgupta, "Media penetration: A sneak into households," The Economic Times, 2016, https://economictimes.indiatimes.com/blogs/et-commentary/media-penetration-a-sneak-into-households/.
12. GOGLA, Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data, (2020), https://www.gogla.org/sites/default/files/resource_docs/global_off_grid_solar_market_report_h1_2020.pdf
13. Statista, https://www.statista.com/statistics/748549/africa-households-with-computer/.
14. Emilie Iob, "Pushing Computers into Africa's Classrooms," Voa News, 2016, https://www.voanews.com/africa/pushing-computers-africas-classrooms.
15. World Bank, " Households w/ personal computer, %," distributed by the World Bank, https://tcdata360.worldbank.org/indicators/entrp.household.computer.
16. French Development Agency, "Digital services for education in Africa," 2015, access 5 August 2021, https://unesdoc.unesco.org/ark:/48223/pf0000231867_eng.
17. One Laptop Per Child, " One Laptop per Child Deployments", accessed 5 August 2021, http://laptop.org/en/children/countries/index.shtml.
18. See for example Aakash Tablet, Slate2Learn, BRCK, Computer Aid, Worldreader or eLimu
19. Chris Colwill, "How Much Electricity Does a Computer Use If Left On?," Home Network Geek, https://homenetworkgeek.com/how-much-electricity-does-a-computer-use-if-left-on/.
20. JOTEO, "Power Consumption Of A Tablet Computer,", accessed 5 August 2021, https://joteo.net/en-au/electricity-usage-calculator/electricity-usage-of-a-tablet-computer.

Photo Credit: Jirogasy

Madagascar

Developing a Solar PC

Jirogasy, a Madagascan company, is developing a energy-efficient, solar-powered desktop computer. Jirodesk2 is an all-in-one device that combines a solar home system, a computer system, a Pay-As-You-Go module and mesh communication capabilities through a 0G protocol, all integrated within a 21" touchscreen monitor. The device consumes an averages 40W. The target price of the entire system, with solar PV modules, is USD 550. Jirogasy aims to assemble as much as possible locally in Madagascar. The project being funded by the Efficiency for Access Research and Development Fund involves developing this product to increase digitisation in Africa, starting with providing computer access to high school students in Madagascar. Jirogasy aims to scale up to provide computer access to over 10,000 students in Madagascar per year.

Yann Kasay, founder of Jirogasy, states that their motivation for developing the product is that 80% of jobs in the western world and in urban regions of Africa require the use of a desktop computer, and therefore wants to give the opportunity to anyone in Africa to acquire digital literacy.

communication, internet, television and radio. The use of health ICT varies by country but is generally relatively low.

In recent years, the electrification of health facilities and use of health ICT in off- and weak-grid areas has become a greater focus of international development interventions. This has significantly increased since the COVID-19 pandemic began. A number of technologies and interventions have been developed for resource constrained settings, some examples of which are:[21]

- **Swasthya Slate:** a device that allows 'Android Tablets and Phones to conduct 33 diagnostic tests on the mobile device'
- **Medic Mobile:** a software toolkit that combines smart messaging with decision support, data gathering and management and health system analysis
- **Peek Vision:** a tool that turns a smartphone into a 'comprehensive eye exam tool'
- **hearScreen:** a quick and reliable hearing check using automated protocols and user-friendly designs[22]
- **cerVIA:** an affordable, accessible and accurate cervical cancer screening tool that attaches to any Android device[23]
- **Signalytic:** Country-wide ICT platform for low-resource health facility management [24]

Increased mobile coverage and decreasing costs have unlocked opportunities for health ICT. In resource-constrained settings, however, the implementation of public health efforts involving health ICT is dependent on international donor funding.

Internet and networking technologies

40% of the world's population lacks internet access.[25] Although mobile internet coverage is continually expanding in developing countries, there are many areas where installing cell towers is not financially viable for mobile service providers. To address this, Facebook has experimented with flying drones. Google has tested balloons to provide internet access and TV white space technology has been trialed in many African countries.[26]

The introduction of technologies like satellite internet constellations could make the use of wireless community networks a more viable approach to expanding internet access in the future.

IoT refers to the network of devices (e.g., appliances) that are embedded with sensors, software and other technologies for the purpose of connecting and exchanging data with other

21. Smart Villages, Electrification of health clinics in rural areas: Challenges and opportunities, (2017), https://e4sv.org/wp-content/uploads/2017/05/TR12-Electrification-of-health-clinics-in-rural-areas-Challenges-and-opportunities_web.pdf.
22. The Conversation, "We Used Smartphones to Screen Children for Vision and Hearing Loss." Engineering for Change, 2019, accessed 5 August, 2021, https://www.engineeringforchange.org/news/used-smartphones-screen-children-vision-hearing-loss/.
23. June Sugiyama, "A Developer's Challenge: Building Mobile Tech for the Developing World," Engineering for Change, 2018, accessed 5 August 2021, https://www.engineeringforchange.org/news/developers-challenge-building-mobile-tech-developing-world/.
24. Signalytic, " Signalytic_Uganda Use Case_Stock Visibility ," YouTube Video, 06:51, 31 August, 2020, https://www.youtube.com/watch?v=EaNILR05uwY.
25. Statista, Global digital population as of January 2021, (January 2021), https://www.statista.com/statistics/617136/digital-population-worldwide/.
26. Alex Green, Victor Gimeneze, ICT4D: Connecting the unconnected tech trends, Engineering for Change, 2019, accessed 5 August 2021, https://www.engineeringforchange.org/research/ict4d-connecting-unconnected-tech-trends/.

However, satellite internet constellations, such as Starlink (SpaceX), Kuiper (Amazon) and OneWeb are closest to achieving this goal. Satellite internet constellations are large group of next generation satellites in low-Earth orbit (LEO) that provide low-latency, high bandwidth (broadband) internet service. The companies in the sector have proposed launching upwards of 100,000 satellites (combined).[27] To connect to the service, end users must purchase a terminal (satellite dish receiver). Starlink has developed terminals that are only 50 centimetres wide, with a target price of USD 200.[28] The current power consumption of the terminals is about 100W, however, Starlink is working to reduce power consumption through software updates.[29]

As of 2020, there were 2,612 LEO satellites orbiting Earth.[30] Starlink is currently charging USD 99/month and an up-front hardware fee of USD 499 for users in the US.[31] Prices, however, are expected to fall, particularly if the target of launching 100,000 LEO satellites is achieved. Current prices are unaffordable for individual low-income, rural users in developing countries. However, rural users may be able to pool resources and the share a terminal and internet service. A Wi-Fi router or network would be needed to share the internet service among users, who could access the service on their mobile and computing devices.

Wireless community networks are small-scale connectivity initiatives that are built, managed and used by small communities. They usually employ low-cost equipment, open-source software, and licence-free operations to address last-mile connectivity.[32] Universities and non-governmental organizations tend to support wireless community networks due to their highly technical nature and opportunity to serve low-income, remote communities.

A typical Wi-Fi router node used for a wireless community network costs about USD 100 and uses up to 6.5W continuously.[33] There are various other costs involved, however, including antennae, mounting hardware, cables and installation costs.[34]

IoT technology has been used in a variety of off- and weak-grid contexts, including solar home systems and appliances, solar water pumps, agricultural sensors, wearable health appliances, vaccine transportation, water filters, cookstoves and wearable sensors worn by animals for animal husbandry.[35]

IoT can contribute to increased appliance efficiency and affordability through real-time data gathering, remote appliance control for PAYGo, use of AI to optimise performance and the use of advanced sensors (e.g. soil moisture sensing for agriculture and solar water pumps). Remote monitoring of appliances allows for more efficient maintenance and repair, while feeding back into the design process to improve appliance and solar home system design as a whole. Efficiency for Access' Compatibility and Interoperability Technology Roadmap discusses further how IoT can contribute to interoperability and the benefits in the weak- and off-grid context.

The average price of an IoT sensor has fallen from USD 1.30 in 2004 to USD 0.44 in 2018.[36] This has enabled an increasing number of product developers to consider IoT integration to make products ''smart''. The power consumption of IoT sensors is designed to be very low as well, with IoT wireless standards such as Bluetooth Low Energy (LE) using 35mW and LoRaWan using 115mW.

Figure 3. A starlink terminal[37]

27. Loren Grush, A future with tens of thousands of new satellites could 'fundamentally change' astronomy: report, The Verge (2020), https://www.theverge.com/2020/8/26/21401455/satellite-mega-constellations-astronomy-spacex-amazon-oneweb-bright-internet-space.
28. SCR00CHY, ElonX (2019), https://www.elonx.net/starlink-compendium/.
29.Jon Brodkin, SpaceX Starlink engineers take questions in Reddit AMA—here are highlights, ars technical, (2020), https://arstechnica.com/information-technology/2020/11/spacex-starlink-questions-answered-wider-beta-soon-no-plan-for-data-caps/.
30.UCS Satellite Database, Union of Concerned Scientists, (2005), https://www.ucsusa.org/resources/satellite-database.
31. Imad Khan, Starlink internet coverage, speed, cost, satellites, IPO and latest news, tom's guide (2021), https://www.tomsguide.com/news/starlink-internet-speed-cost-coverage-map-and-everything-you-need-to-know.
32. Senka Hazdic, Connecting the Unconnected: A Human-Centric Approach to Internet Access, Engineering for Change (2019), https://www.engineeringforchange.org/news/connecting-unconnected-human-centric-approach/.
33. Ubiquiti, RocketM datasheet, https://dl.ubnt.com/datasheets/rocketm/RocketM_DS.pdf.
34. GitHub, Neighborhood Network Construction Kit, https://communitytechnology.github.io/docs/cck/building-mounting/gather-tools-and-wireless-equipment/.
35.Rob Goodier, How the Internet of Things Is Improving Lives and Livelihoods in Developing Countries, Engineering for Change (2016), https://www.engineeringforchange.org/news/how-the-internet-of-things-is-improving-lives-and-livelihoods-in-developing-countries/.
36. Microsoft, 2019 Manufacturing Trends Report, (2019), https://info.microsoft.com/rs/157-GQE-382/images/EN-US-CNTNT-Report-2019-Manufacturing-Trends.pdf.
37. Elon Musk, twitter (2020), https://twitter.com/elonmusk/status/1323431066158452736.

Consumer Impacts

Mobile technology has significant social and economic development impacts and has enabled and accelerated many of the innovations discussed in education, health and financial services, as well as in business, agriculture, digital identity, data collection, mapping and IoT. Regarding perceived business appliance demand, they ranked computers sixth. The mobile industry association, GSMA, details many of the impacts of mobile technology on underserved populations through its Mobile for Development (M4D) programme.[39]

One study on ICT's impact on consumers found that the internet can bridge the gap between rural and urban schools, whether through access to educational materials and web pages, or the ability to watch lectures via satellite or online.[40] Another study based on more than 40 years of research summarising 25 previous meta-analyses found that computer use has a positive overall effect on achievement. Another study found that access to telemedicine can reduce transportation costs and enable remote consultation through communication with medical experts located elsewhere. [41] Disease management, data collection, and home monitoring can also be facilitated and can be carried out in new, more efficient ways.

Current Success and Remaining Challenges

The uptake of mobile technology in off- and weak-grid areas has been rapid and largely driven by the virtuous cycle of off-grid solar product adoption boosting mobile phone adoption and vice versa. This was a key enabler in the development of the off-grid PAYGo solar sector. Radios were one of the first ICT that benefited from the wide solar home system adoption. They have become the dominant ICT medium in Sub-Saharan Africa, thanks to their ability to be run using low-power batteries and to the wide coverage area of radio networks.

However, most ICT are still at a relatively early stage. Scaling pilot projects has been problematic in the past in the international development sector, with one approach or product working in a specific context but not in another. For example, device reliability is particularly challenging in off-grid areas due to harsh conditions, and often leads to technical issues. Product design for these technologies needs to remain contextually appropriate and relevant, while maximising replicability and affordability. The lack of energy infrastructure and mobile/data coverage are major barriers to the expansion of most ICT technologies. While off-grid solar products, along with installations of mini-grids and grid expansion, are addressing the need for more energy infrastructure, profitability is still holding back mobile service providers from installing cell towers in sparsely populated areas. Government intervention is required to address both these market challenges.

Finally, with the expanded integration of IoT in off- and weak-grid technologies, privacy and security are becoming more signficant issues. Users should be advised about what personal information is being collected. Devices must be designed to be secure, so that hackers are unable to hijack them, as has already occurred with many IoT devices in the developed world.[42]

39. GSMA, "Mobile for Development,"2021, accessed 5 August 2021, https://www.gsma.com/mobilefordevelopment/.

40.Smart Villages, Education and the Electrification of Rural schools, (2017), https://e4sv.org/wp-content/uploads/2017/05/TR13-Education-and-the-Electrification-of-Rural-Schools_web-1.pdf.

41.Smart Villages, Electrification of health clinics in rural areas: Challenges and opportunities, (2019), https://e4sv.org/wp-content/uploads/2017/05/TR12-Electrification-of-health-clinics-in-rural-areas-Challenges-and-opportunities_web.pdf.

42. Sophie Edwards, "Examining the potential and limitations of the 'internet of things' for developing countries," Devex, 2016, accessed 5 August 2021, https://www.devex.com/news/examining-the-potential-and-limitations-of-the-internet-of-things-for-developing-countries-89257.

Fund technology innovation and research and development

As many of the technologies discussed are still at a relatively early stage, they require funding for further development, field testing, and scale up. Many of the technologies are designed for developed country contexts, and funding could be focused on modifying and testing the technologies to ensure the designs are appropriate for off- and weak-grid contexts. Funding could also be provided to ensure that more appliances are designed to integrate IoT, with security and privacy in mind.

Find sustainable funding models for public good technologies

Many of the education and health focused technologies are public goods, and the customers for these technologies will be governments. Finding sustainable funding models for distributing these technologies will therefore be essential to ensuring they scale up and are able to be used sustainably over the long term. This may involve smart subsidies with assistance from donors in low-resource areas.

Facilitate access to finance

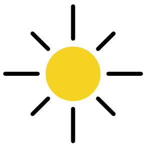
Companies in niche markets like solar-powered desktop computers may find it difficult to attract financing to scale up. Assistance in accessing this financing via the donor community or impact investing may be required.

Provide focused market intelligence

Market intelligence for off-grid applications is lacking for computers, health and education technologies. This is a gap which is not covered by actors who focus more on the household and business sectors, such as GOGLA and GSMA. This market intelligence could help inform investment and create more successful scaling projects.

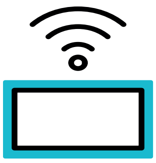
Train teachers and healthcare professionals in ICT use

Funding for training and capacity building of teachers and health ICT users is often lacking when these technological solutions are implemented in rural areas. This is one of the greatest sources of failure when implementing these solutions. Providing or facilitating funding for training is essential to scaling these technologies.



Raise government and consumer awareness of new technologies

Government actors working in health and education need to be made aware of new health and education technologies that can be employed in off- and weak-grid areas. Similarly, governments may benefit from being educated on the benefits of digital identity and blockchain. Consumers, such as small business owners in off-grid areas, may also benefit from awareness raising activities related to solar-powered computers and new internet and networking technologies.



Help satellite providers better understand and supply the off-grid market

Companies like Starlink are currently focused on providing solutions for more profitable markets and may not sufficiently understand the energy access context and market. Aggregated data around viable business models and pricing would help providers understand the scope and needs of the market.

Facilitate effective, multi-stakeholder partnerships and collaboration across nexus sectors such as energy, education, health and development

Many of the above recommendations require effective partnerships with a diverse range of stakeholders from different sectors. Industry associations such as GOGLA, GSMA and large donors in health and education, such as the Bill & Melinda Gates Foundation, are essential to this effort. This is because of the lack of energy infrastructure and mobile data coverage, which are major barriers to the expansion of most ICT. Collaboration would ensure both of these barriers could be addressed simultaneously.

EFFICIENCY FOR ACCESS

Photo Credit: Jirogasy

CONTACT US

efficiencyforaccess.org
info@efficiencyforaccess.org
@EforA_Coalition