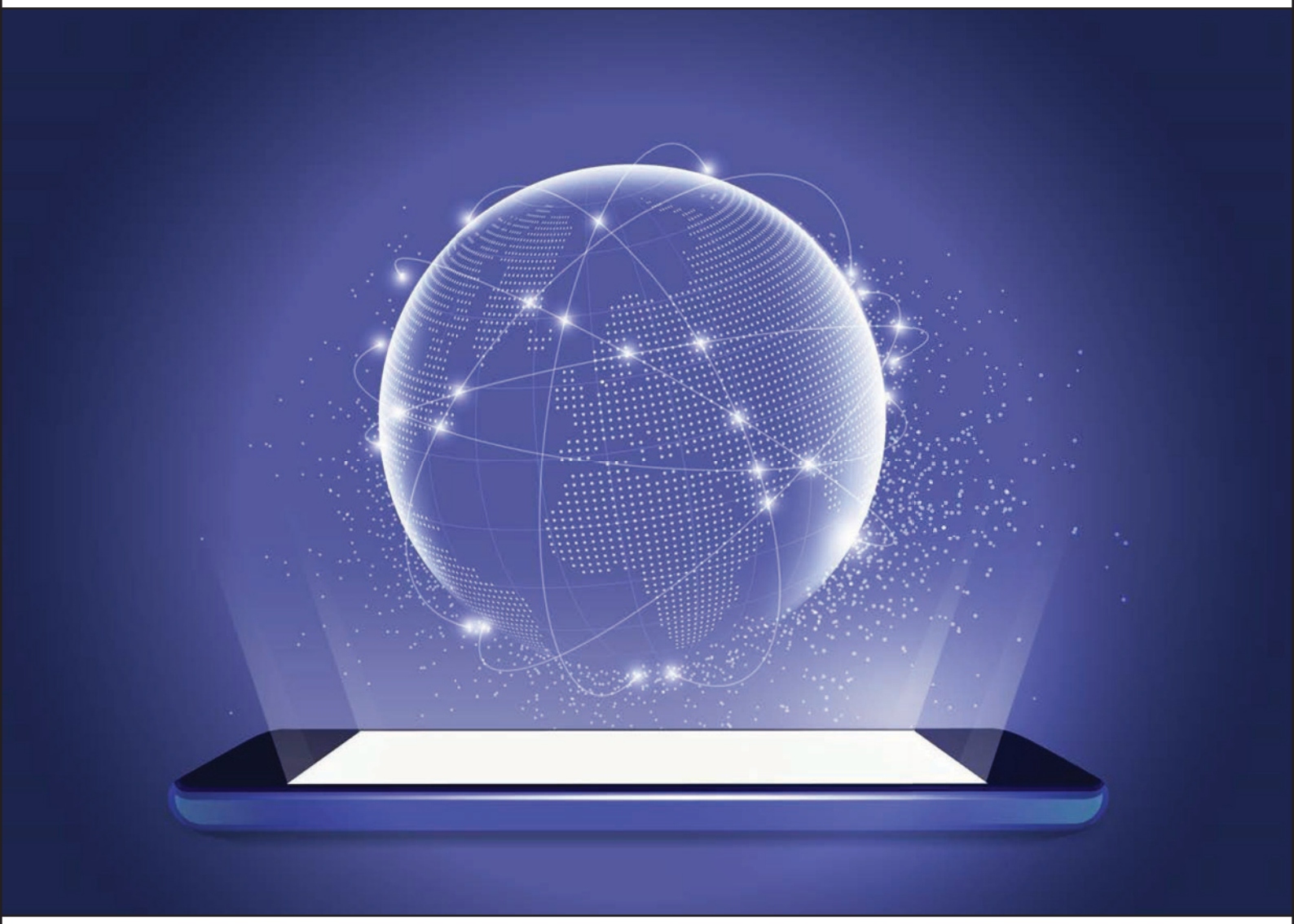
Working Group Report on Smartphone Access

Strategies Towards Universal Smartphone Access

September 2022



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Acknowledgements

This report and its recommendations are a collective endeavour drawing on contributions and insights from the participants of the ITU/UNESCO Broadband Commission for Sustainable Development's Working Group on Smartphone Access.

The Working Group on Smartphone Access was co-chaired by Nick Read, CEO of Vodafone Group, Houlin Zhao, Secretary General of the International Telecommunication Union and Rabab Fatima, UN High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS).

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This report has been informed by research from GSMA, ITU and 19 structured expert interviews, as well as insights from International Trade Centre (ITC) convened focus group of entrepreneurs (listed below) and extensive desk research. We gratefully acknowledge all for sharing their time and expertise to develop the report and we extend our sincere gratitude to H.E. Emma Inamutila Theofelus, Deputy Minister of Information and Communication Technology, Republic of Namibia, for sharing her views and perspective on the topic.

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Working Group Members: Commissioners and Focal Points

- America Móvil: Commissioner Dr. Carlos Jarque
- Benin: Commissioner H.E. Aurélie Adam-Soule Zoumarou and Bleck Yoro
- FAO: Commissioner Dr. Qu Dongyu, Maximo Torero Cullen and Henry Burgsteden
- Ghana: Commissioner H.E. Ursula Owusu-Ekufu, Afua Mensah and Kwame Baah-Acheamfuor
- GSMA: Commissioner Mr. Mats Granryd , Belinda Exelby and Luca Elmosi
- ITC: Commissioner Ms. Pamela Coke-Hamilton, James Howe, Riefqah Jappie and John Ndabarasa
- Intelsat: Former Commissioner Mr. Stephen Spengler and Jose Toscano
- International Science Technology and Innovation Centre for South-South Cooperation: Commissioner Dato' Lee Yee Cheong
- Millicom: Commissioner Mr. Mauricio Ramos, Aidan McCartan, Horacio Romanelli and Karim Lesina
- Smart Africa: Commissioner Mr. Lacina Koné, Thelma Efua Quaye, Osman Issah, Calvain Nangue and Wilgon Tsib
- UNESCO: Co-Vice Chair of the Commission, Ms. Audrey Azoulay and Borhene Chakroun

- ZTE: Commissioner Mr. Ziyang Xu, Lei Xue and Tian Dao

External Experts

- Alliance for Affordable Internet (A4AI): Sonia Jorge and Teddy Woodhouse
- ARM: Neil Fletcher
- AST: Clemens Wolbers and Chris Ivory
- Google: Mariam Abdullahi, Vinod Nenwani and Aleksandra Stremidlo
- HMD/Nokia: Alain Lejeune, Won Chang, Florian Seiche and Justin Maier
- Intel: John M Roman and Turhan Muluk
- Mara Phone: Ashish J. Thakkar and Eddy Sebera K.
- PayJoy: Deepak Murthy and Dominique Friedl
- Softbank: Jingyi Huang, Osamu Kamimura and Masumi Oyama
- TCT: Aaron Zhang, Ernst Wittmann and Guoqing Yao
- Transsion: Steven Huang and Yoyo Zhang
- Trustonic: Dion Price and Craige Fleischer
- World Bank Digital Development Global Practice: Doyle Gallegos

ITC-convened Focus Group

- Aspira (Kenya): Irshad Muttur
- FollowMeTalk (Kenya): Edwin Okoye
- Intelligra (Nigeria): Tayo Ogundipe
- Kei Phone (Uganda): Maria Nampijja
- Lipalater (Uganda): Ephraim Okalebo
- Nuovo Pay (Nigeria): Nitesh Bhalothia
- PayJoy (Nigeria): Dominique Friedl
- Superfluid (Ghana): Winifred Kotin

Disclaimer

This research report, titled Strategies Towards Universal Smartphone Access is based on data and material accessible as of 31 Aug 2022 and may not reflect circumstances thereafter.

This report has been prepared, with the support of experts under the supervision of Professor Christopher Yoo, John H. Chestnut Professor of Law, Communication, and Computer & Information Science at the University of Pennsylvania, and the members of the Broadband Commission Working Group on Smartphone Access co-chaired by Nick Read, CEO Vodafone Group; Houlin Zhao, Secretary General of the International Telecommunication Union and Rabab Fatima, UN High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States.

The ideas and opinions expressed in this publication do not necessarily reflect the views of the Broadband Commission members or their organizations. This Working Group report does not commit the Broadband Commission for Sustainable Development.

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Vodafone Group foreword

Over the last ten years, our daily lives, societies and economies have been transformed by highspeed connectivity and smartphones. We can now keep in touch with loved ones wherever they are. We can access key health, education and government services remotely. Entrepreneurs and small businesses can become connected and flourish. And we can entertain ourselves 24/7. Digital connectivity is now a necessity, no longer a luxury.

Now, as much of the world stands on the edge of a 5G revolution with the potential to address some of our biggest challenges, there are still 2.7 billion people who remain on the other side of the digital divide, unconnected. Most of these people live in Low and Middle Income Countries (LMICs), and most are covered by a mobile broadband network.

One of the biggest barriers to access is affordable smartphones. In many LMICs they can cost over 70% of the average monthly income. However, we lacked a collaborative action plan to overcome this barrier to connectivity. That is why in 2021 we launched the Broadband Commission's Working Group on Smartphone Access. This is the first ever cross-industry and government group on affordable access to smartphones, and a continuation of Vodafone's commitment to closing the digital divide through our Africa.connected programme.

Over recent months, the group has studied the biggest barriers to smartphone access, and tested initiatives designed to improve access, with the aim of producing clear recommendations to policy makers, industry and international organisations. This report is the culmination of those efforts.

We know that if we solve the problem of global smartphone access, the benefits will be enormous. According to the World Economic Forum, a 10% increase in access to mobile broadband would lead to an average 1.5% increase in GDP. In Africa, the increase would be 2.5%. For the individual, the impact is also lifechanging. Studies show that mobile Internet adoption is linked to a 3% rise in socioeconomic wellbeing. We also know that efforts to close the digital divide must not come at the cost of the planet, and we have explored interventions that may concurrently address growing levels of e-waste.

This report recommends a five point action plan to increase smartphone ownership for all. It's important that we now agree on continued cooperation to translate this action plan into positive outcomes.

I would like to thank every member of the Working Group for the energy, expertise and insight they contributed to this report. I look forward to working with governments, international organisations, and other technology companies to make the recommendations of this report a reality.

Vodafone's purpose is to connect for a better future by using technology to improve lives, digitalise critical sectors, and enable inclusive and sustainable digital societies. To achieve this, we cannot - and must not - leave anyone behind. By acting on the recommendations of the report, we can ensure that is the case.

Nick Read
CEO Vodafone Group

ITU foreword

It is with great pleasure that the International Telecommunication Union (ITU) presents this Broadband Commission Working Group Report as a contribution towards promoting universal and meaningful connectivity against the backdrop of a pandemic-impacted world with growing digital inequalities.

Since it was founded in 1865, the ITU has contributed to connecting people globally with our role in managing radio-frequency spectrum and satellite orbit resources, developing technical standards to ensure interoperability and interconnection of networks and technologies, as well as promoting connectivity and access to information and communication technologies (ICTs) to underserved and unserved communities worldwide.

There have been tremendous strides in terms of connectivity, however, as at 2022, ITU estimates that there are still 2.7 billion people worldwide who do not use the Internet. This is despite the fact that at least 95 per cent of the world's population live within the range of mobile broadband network. According to the ITU Global Connectivity Report 2022, affordability and connectivity go hand in hand. In countries where broadband is affordable, this leads to a high number of Internet users; conversely, in countries where broadband is not affordable, there exists a high percentage of users who are unconnected. Further, the lower the share of Internet users in a country, the less affordable the devices are. In addition, the least mature ICT regulatory environment also goes hand in hand with the least affordable prices in countries.

In recognizing that affordability is a key element of achieving universal connectivity, the Broadband Commission for Sustainable Development has set the target to reduce the price of entry-level fixed or mobile broadband services in low- and middle-income countries to less than 2 per cent of monthly Gross National Income (GNI) per capita by 2025.

In this regard, the Broadband Commission Working Group on Smartphone Access was established in November 2021 to address the device gap in order to enhance affordability and digital inclusion. Co-chaired by Vodafone, ITU, and UN-OHRLLS, this group brings together members from the Broadband Commission and external experts to examine the barriers to smartphone access and to explore initiatives to overcome these barriers.

Thanks to the collaborative efforts of all members of the Working Group and their valuable input, commitment and contributions, this report moves the conversation forward by providing detailed case studies on initiatives implemented globally to address the challenges in providing affordable broadband and smartphone access. This report is just the first step. For the next phase, I would like to invite you to join us to implement the recommended initiatives and the five-point action plan to reduce the device gap for the underserved communities globally, as we move towards building a more inclusive, equitable and sustainable world.

Achieving universal and meaningful connectivity and the Sustainable Development Goals (SDGs) requires a multistakeholder approach, and national, regional, and global collaboration on an unprecedented scale. We invite you all to join the Broadband Commission to implement the recommendations to address affordability, reduce the smartphone device gap and enable digital inclusion. Our goal is to leave no one behind.

Houlin Zhao
Secretary General of the International Telecommunication Union

UN-OHRLLS foreword

For many of us – the lucky ones – the mobile phone in our hand is a link to friends and colleagues, a first line of defence in an emergency, and a tool of research. And yet, billions of people remain without this most fundamental form of connection. This denies whole communities economic, educational, and social opportunities, and it holds back the earning power of less developed nations.

The situation is most acute in the world's most vulnerable countries – the Least Developed Countries, Landlocked Developing Countries, and Small Island Developing States – where most of the 2.7 billion people without Internet access live. And within these countries and communities, it is often the people already at the margins, especially women, who struggle to get online.

Indeed, this report shows that women in low- and middle-income countries are 18% less likely than men to own a smartphone. This exclusion is worse in the least developed countries, especially in the most rural areas, and it reinforces and exacerbates their marginalisation.

Smartphone exclusion also acts as a significant brake on growth: a strong correlation exists between access to mobile Internet services and GDP, with studies showing that as little as a 10% access increase in 3G services or higher can deliver as much as a 2.46% growth in GDP in low- and middle-income countries in Africa, and 2.44% in Asia-Pacific.

Infrastructure challenges remain, but this is a crisis of adoption, not connectivity. Mobile coverage is widely available, but Internet uptake and usage remain low. This report proposes a plan to bridge that digital divide with clear recommendations based on evidence and lived experience.

In the short term, governments should reduce tax and duties on devices to reflect their growing centrality to developing economies and telecom operators should introduce more flexible financing and improved distribution focusing on the most marginalised, especially women and rural communities.

And in the long term, tackling value chain issues, and greatly improving device recycling, can close the Internet adoption gap. Like a new train with no passengers, there is little benefit from increasing Internet coverage without adoption and access.

This is the first time a report of this kind has presented new strategies for universal smartphone access, and I want to thank my co-chairs from ITU and Vodafone for their leadership and vision, as well as the rest of the working group for their guidance and expertise. And to the Broadband Commission, under whose leadership this work has been commissioned, I offer my unwavering support and that of my office to support the delivery of the solutions proposed herein.

For individuals, institutions and nations alike, the benefits are clear; universal smartphone access can change lives, bridge divides, and boost economies. We must share these benefits and opportunities with all.

Rabab Fatima
UN High Representative for the Least Developed Countries,
Landlocked Developing Countries and Small Island Developing States

Executive summary

An estimated 2.7 billion people globally remain offline today. Most of these people are in low- and middle-income countries (LMICs), and most of them live within good Internet coverage. However, the cost of a smartphone to access the Internet can exceed 70% of the average income in LMICs, presenting a significant barrier to digital inclusion.

The adoption gap for mobile Internet – which arises when people do not use the Internet even when there is mobile network coverage available – is now over seven times larger than the coverage gap globally.

Furthermore, most people in LMICs who do access the Internet are still using 2G and 3G, which is preventing them from realizing the full social and economic benefits of high-speed Internet connectivity.

This study represents the first multi-stakeholder dialogue and analysis on the topic of smartphone access, under the ITU/UNESCO Broadband Commission for Sustainable Development.

This report examines the barriers to smartphone ownership and usage, and provides recommendations based on empirical evidence to overcome those barriers, with a special focus on LMICs. The report categorises the assessed interventions into; "High Priority" interventions, interventions that "Warrant Further Investigation", and "Low Priority" interventions. These findings have been informed by research from GSMA, ITU and 19 structured expert interviews, as well as insights from an ITC-convened focus group of entrepreneurs, and extensive desk research.

The report's actionable recommendations are designed to guide stakeholders when determining how to address smartphone access challenges, and provide a clear roadmap forward.

Key findings

The research found three high priority interventions that are proven to increase smartphone ownership:

1. Smartphone financing schemes
2. Reduction of taxes and import duties on smartphones
3. Improvement of smartphone distribution channels

We also found two interventions that warrant further investigation:

1. Device subsidies
2. Increasing use of refurbished/preowned devices

Two interventions studied were classified as low priority, meaning that they lacked evidence of increasing smartphone ownership at scale, but may achieve results at a smaller scale in some countries:

1. Local manufacturing
2. Supply of smart feature phones

Translating our findings into action: a five-point plan to increase smartphone ownership

This report has been created as a starting point for policymakers, governments, and businesses to take action on increasing smartphone access. As such, the report provides a five-point action plan to translate the findings into action, outlined below. Most of the actions require cross-party collaboration and, as such, the report recommends the establishment of taskforces to drive concrete commitments, conduct further research, and implement pilots.

Action 1: Initiate win-win partnerships with players across the digital value chain

Action 2: Improve regulation on smartphone recycling and develop quality standards for preowned smartphones

Action 3: Develop strategies for recycling of mid- and lower-tier devices

Action 4: Explore the use of Universal Service Funds and other government subsidies for smartphones

Action 5: Further explore the overall economic benefits of reducing tax and import duties on smartphones

1

Introduction: The opportunity

Section 1: Introduction: The opportunity

1.1 The benefits of Internet connectivity

Photo credit: ©Asian Development Bank

The policy debate over the global digital divide and digital equity is undergoing a fundamental transformation. A growing body of empirical research has demonstrated the economic and social benefits of connecting people.[1] Any remaining doubts were effectively laid to rest by the COVID-19 pandemic, which eloquently demonstrated the key role that Internet access plays in critical areas such as agriculture, education, health care, remote working, economic development, public services delivery, financial services, and disaster recovery. A recent International Telecommunication Union (ITU) study estimates that the number of Internet users surged by 800 million people in 2020.[2] That study also estimates that 97% of the world population now has access to a mobile cellular data network, and that 95% has access to at least a 3G signal, and the quality of broadband has also improved with 4G network coverage doubling between 2015 and 2021 to reach 88% of the world's population. Mobile phones continue to be the primary way, and in many cases, the only way, most people access the Internet, particularly in low- and middle-income countries (LMICs).[3] Wi-Fi is also a standard feature of smartphones that people use to access the Internet in homes, public hotspots, and community centres.

Despite these gains, in 2022, an estimated 2.7 billion people still cannot or do not access the Internet.[4] Furthermore, most of those still offline live in fragile and conflict-affected areas, least developed countries (LDCs), landlocked developing countries (LLDCs) and small island developing states (SIDS). By way of comparison, 92% of residents in high-income country populations are Internet users, while adoption rates in SIDS (66%), LLDCs (36%), and LDCs (36%) continue to lag far behind.[5] Research has also shown that overcoming the barriers to mobile Internet adoption would yield substantial benefits. Studies conducted at a national or similarly large-scale level consistently found that Internet adoption has a positive impact on national GDP. For example, the ITU estimates that a 10% increase in fixed broadband adoption yields a 1.4% increase in GDP in Europe, 1.9% in the Americas, and 2.5% in Africa.[6] Other studies have corroborated these findings:

- A Broadband Commission study of Rwanda, Senegal, and Vanuatu from 2010-16 estimates that the information and communications sector contributed to a 0.3% to 0.5% increase in GDP.[7]
- A study of 220 towns in 10 sub-Saharan African countries employing a new methodology that uses satellite images of night-time lights as a proxy for changes in economic activities estimates that basic Internet coverage leads to a 2% increase in economic growth rates.[8]

Studies of benefits to individual wellbeing are beginning to emerge as well.[9], For example, surveys of individual users conducted in Bangladesh and Ghana in 2020 found that mobile Internet adoption is associated with a 3% increase in individual socioeconomic wellbeing, with the effect being larger among women (4% to 6%) and those with at least a primary education (5%).[10] Wellbeing is enhanced by broader access to financial services, e-commerce, and government

services.[11] Other studies have found that Internet access increases women's participation in society as well as their social and economic resilience.[12]

Due to COVID-19 and its consequent lockdowns and social distancing measures, people relied on their mobile networks to stay connected with each other and the rest of the world. Despite the pandemic's impact on the economy and consumer incomes, mobile adoption continued to increase in 2020, justifying the mobile industry's contribution to the UN Sustainable Development Goals (SDGs). Some contributions to SDGs included increased use of mobile financial services, access to government services, and online learning.[13]

Mobile Internet connectivity also creates benefits during natural disasters both in terms of sending early-warning alerts to people and allowing them to share information about the disaster with authorities.[14] Furthermore, mobile devices improve coordination and rescue efforts by enabling rescue teams to communicate and access key information such as visuals required for planning.[15] Access to the Internet is particularly beneficial to women faced with natural disasters or other threats that force them to become refugees.[16] During disasters, vulnerable groups, including persons with disabilities, can use new technologies to share their location and improve their chances of receiving assistance. Applications such as Facebook Disaster Maps help rescue teams and victims to establish their location during disasters.[17]

Similar applications and other technologies are being used to collect data essential for reviews of disasters.[18] Given the importance of technologies before, during, and after disasters, equitable access and use of technologies, especially among women, is therefore important.[19] Next generation technologies, including smartphones and 4G/5G, promise improved approaches and coordination before, during, and after the disaster.[20] For example, Google's earthquake detection and alert application for smartphones can help people to prepare before disaster strikes.[21]

Governments can also derive several benefits from increased access to smartphones among the citizens. Research shows that smartphones enhance opportunities for digital government and citizen engagement. There is evidence that increased smartphone access enables more citizens to participate on social media platforms that have augmented traditional channels to interact with governments, report concerns, and provide feedback.[22] In addition, increased smartphone access also enables sourcing of open public data that governments can use to make real time decisions.

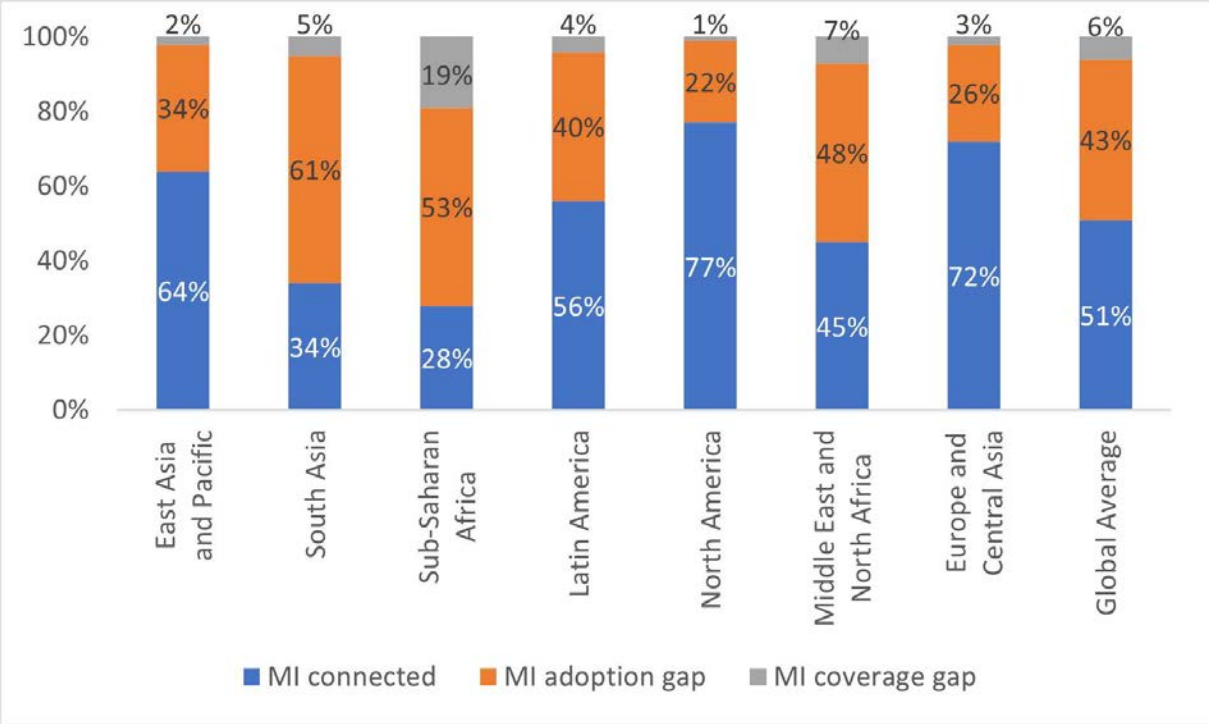
1.2 Shifting focus from the "coverage gap" to the "adoption gap"

Until recently, investments to close the connectivity gap have focused on rolling out infrastructure to expand mobile Internet coverage. These efforts have achieved a significant degree of success.

The ITU estimates that in 2021, 95% of the world's population was covered by at least a 3G signal. Moreover, of the 2.7 billion who remain offline, only 390 million were not covered by a mobile Internet 3G signal or better, although these shortfalls are not evenly distributed. Specifically, more than 99% of people in high-income countries have access to mobile coverage, while only 86% of residents of low-income countries do.[23] Rural coverage rates lag behind urban rates as well with respect to basic mobile cellular coverage (100% for urban areas vs. 93% for rural areas, for a disparity of 7%), 3G coverage (100% for urban areas vs. 88% for rural areas, for a disparity of 12%), and 4G coverage (97% for urban areas vs. 75% for rural areas, for a disparity of 22%). The urban-rural disparity is particularly severe in LLDCs (69%), LDCs (54%), and SIDS (46%).[24]

Despite the success in extending mobile broadband coverage to an ever-increasing proportion of the world's population, a large number of people have access to a network but remain offline. The significant number

Figure 1: Mobile Internet (MI) connectedness, adoption gap, and coverage gap by region, 2020



Source : GSMA[26]

of people who have the opportunity to adopt the Internet but choose not to do so underscores the need to refocus efforts to close the digital divide beyond merely expanding coverage. Policymakers need a more complete understanding of the barriers to mobile Internet adoption and how to overcome them. Studies have increasingly shown that in addition to "coverage gaps," the digital divide is also the product of an "adoption gap," which arises when individuals do not use the Internet even when mobile network coverage exists.[25] Figure 1 shows that the worldwide adoption gap of 43% is much larger than the 6% coverage gap, with the adoption gaps in South Asia (61% vs. 5% coverage gap), sub-Saharan Africa (53% vs. 19% coverage gap), and the Middle East and North Africa (48% vs. 7% coverage gap) all exceeding the global average. The size of these adoption gaps makes clear that significant barriers to adoption exist aside from coverage.

1.3 The "consumption gap" as the next frontier and the benefits of upgrading to smartphones and broadband

Photo credit: ©OCHA / IRIN

Studies have found that accessing the Internet through feature phones connected to 2G networks can enhance economic and social welfare.[27] However, there are suggestions that users can gain further benefits by moving beyond 2G and 3G and connecting to high-speed broadband services such as 4G and eventually 5G. For example, a GSMA working paper studying a panel of 160 countries found

that upgrading from 2G to 3G increases the GDP impact of mobile connectivity by 15% and that upgrading from 2G to 4G increases the impact by 25%.[28] Analyses that attempted to identify how broadband connectivity conveys benefits further underscore the importance of 4G adoption. A World Bank study identified six foundational online activities—news, government, health, education, shopping, and social media—and that realizing the benefits of these foundational activities requires a minimum of 6GB per month.[29] A4AI has emphasized that realizing the benefits of these more advanced services requires "meaningful connectivity" that allows individuals to *use the Internet every day using an appropriate device with enough data and a fast connection*.[30]

Consistent with this concern, industry observers have cautioned that the fact that most mobile Internet users are still using 2G and 3G in most LMICs is preventing them from realizing the full benefits of Internet connectivity.[31] Using education as an example, 2G and 3G support file sharing only in limited formats, while 4G and 5G can deliver seamless online interactions such as video tutorials and interactive learning exercises.[32]

Available data suggest that adoption of mobile broadband would enable users to access these services. For example, upgrading users from 2G to 3G increases their data capacity by 9.4 times and data performance by 112 times. Upgrading users from 3G to 4G increases data capacity by 4.2 times and data performance by 4.6 times. 5G is expected to deliver higher peak data speeds, lower latencies, and higher data capacity. By 2027, 5G subscriptions across the globe are forecast to reach 4.4 billion, nearly half of all mobile subscriptions.[33]

Studies conducted at the country level have consistently found that adoption of mobile broadband services such as 3G, 4G, and 5G would provide significant economic and social benefits:

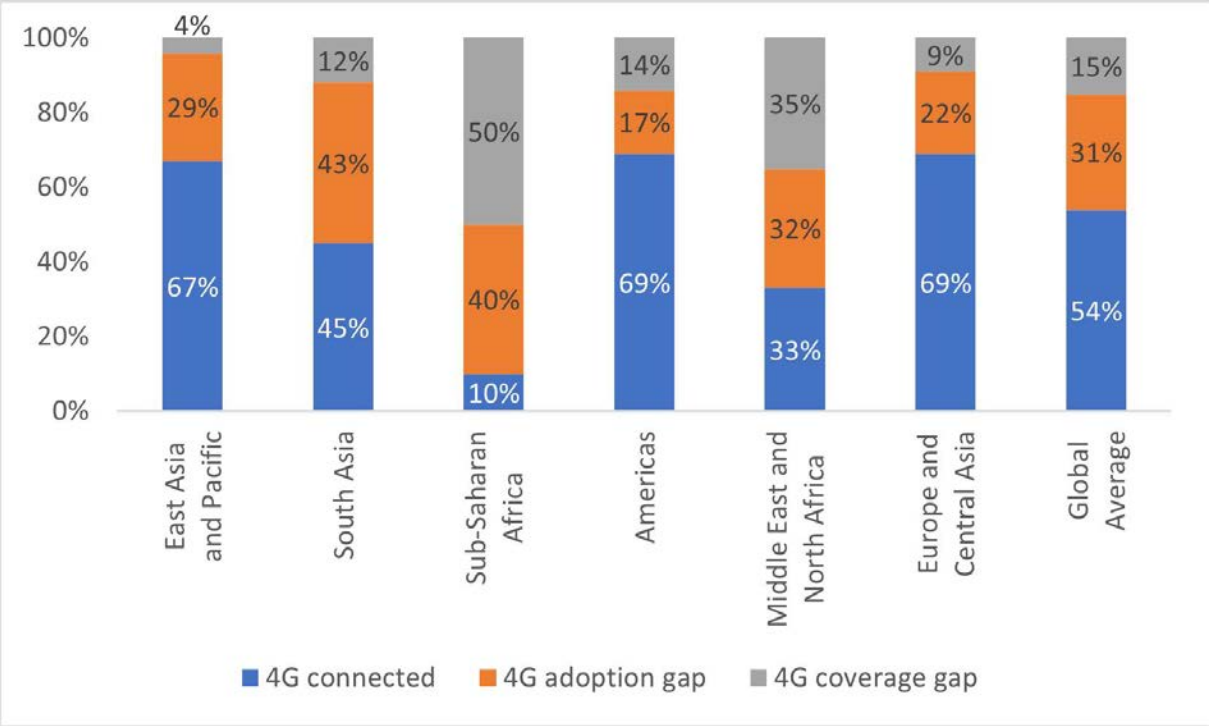
- An ITU study of 145 countries between 2010-18 found that a 10% increase in unique subscriber penetration for 3G or higher services yielded a 1.50% increase in GDP driven by a 1.76% increase in middle-income countries and a 1.98% increase in low-income countries.[34] This effect was particularly strong in Africa (2.46% increase), Asia Pacific middle- and low-income countries (2.44%), European low-income countries (2.00%), Arab states (1.82%), and Latin American and Caribbean states (1.73%).
- A UN-OHRLLS and ITU study of 91 LDCs, LLDCs, and SIDS from 2000-17 found that a 10% increase in 3G, 4G, and WiMAX penetration generated a 2.8% increase in GDP.[35]
- IHS Markit has predicted that by 2035, 5G will enable USD 13.2 trillion of global economic output and will represent about 5.0% of all global real output.[36]

Studies conducted at the household level that used consumption as a proxy for income corroborated these findings:

- Surveys conducted in Senegal in 2011 and 2017 indicate that household consumption is 14% higher and that the extreme poverty rate is 10% lower in areas covered by 3G.[37]
- Three rounds of household surveys conducted in Nigeria between 2010-16 revealed that at least one year of 3G or 4G mobile broadband coverage increased household consumption by 6% and reduced extreme and moderate poverty by 4.3% and 2.6% respectively.[38]
- Three rounds of surveys administered in Tanzania between 2008 to 2013 found that 3G coverage was associated with a 10% increase in household consumption and that one year of coverage was associated with a 3%-8% increase in labour force participation, wage employment, and non-farm employment.[39]

The benefits from 3G, 4G, and 5G mobile broadband connectivity appear to have increased during the COVID-19 pandemic. For example, a new ITU study that extended the previous ITU study found that including 2019 and 2020 in the analysis caused the GDP increase associated with a 10% increase in mobile broadband penetration to grow from 1.50% to 1.60% worldwide, driven by a 2.04% increase in GDP in low-income countries and a 162% increase in GDP growth in middle-income countries.[40]

Figure 2: 4G connectedness, adoption gap, and coverage gap by region, 2019



Source: ITU[41]

Despite the benefits that come from adopting 3G and 4G mobile broadband services, adoption rates remain low. This problem is especially prominent in LMICs.

4G adoption similarly continues to lag, although 4G coverage gaps remain significant in some areas. The ITU reports a global 4G adoption gap of 31% vs. a coverage gap of 15%. The adoption gap exceeds the global average in South Asia (43% vs. 12% coverage gap) and sub-Saharan Africa (40% vs. 50% coverage gap), and Middle East and North Africa (32% vs. 35% coverage gap).

These data suggest that simply closing the coverage gap (by extending mobile networks to cover unserved areas) and closing the adoption gap (by getting people with access to a mobile signal to subscribe) would not be enough to ensure that people obtain the full benefit of Internet connectivity. Policymakers must also address what the World Bank calls the "consumption gap," which arises when Internet data consumption among people who have adopted the Internet remains low.[42] Closing the consumption gap will require interventions beyond those necessary to close the coverage gap and the adoption gap. Beyond providing simple network connectivity and a device capable of connecting to the mobile Internet, enabling people to use the full capabilities that the Internet has to offer requires extending higher level connectivity (4G and 5G) and expanding access to higher level devices such as smartphones.

1.4 Mobile Internet access for sector-specific use cases

In addition to individual level use of connectivity, research shows the importance of the mobile Internet at an institutional level. Mobile Internet is reported to support activities in agricultural, educational, and health-care institutions. However, use patterns and mechanisms are likely to vary across sectors. [43] The different use patterns result in demands for different levels of connectivity and devices across different institutions. For example, schools need more devices and power than clinics, with a typical school needing at least one device per every two students. In contrast, a clinic, depending on its size, could get by with a few devices at crucial points of care for

Photo credit: ©Asian Development Bank

registering patients, consulting patients, and managing medicines.[44]

The fact that this Working Group's charter focusses on smartphone access inevitably drew attention away from issues surrounding access to laptops, tablets, and other similar devices. The relative lack of attention on other types of devices in this report reflects that no study can address every aspect of every issue and is not meant to suggest that that such issues are unimportant.

Endnotes

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2

Smartphone access as a barrier to adoption

Section 2: Smartphone access as a barrier to adoption

The fact that many people do not adopt mobile broadband even when it is available underscores that closing the digital divide is not simply a matter of extending network coverage. Policymakers wishing for their people to realize the benefits of Internet connectivity must understand the other potential barriers to adoption.

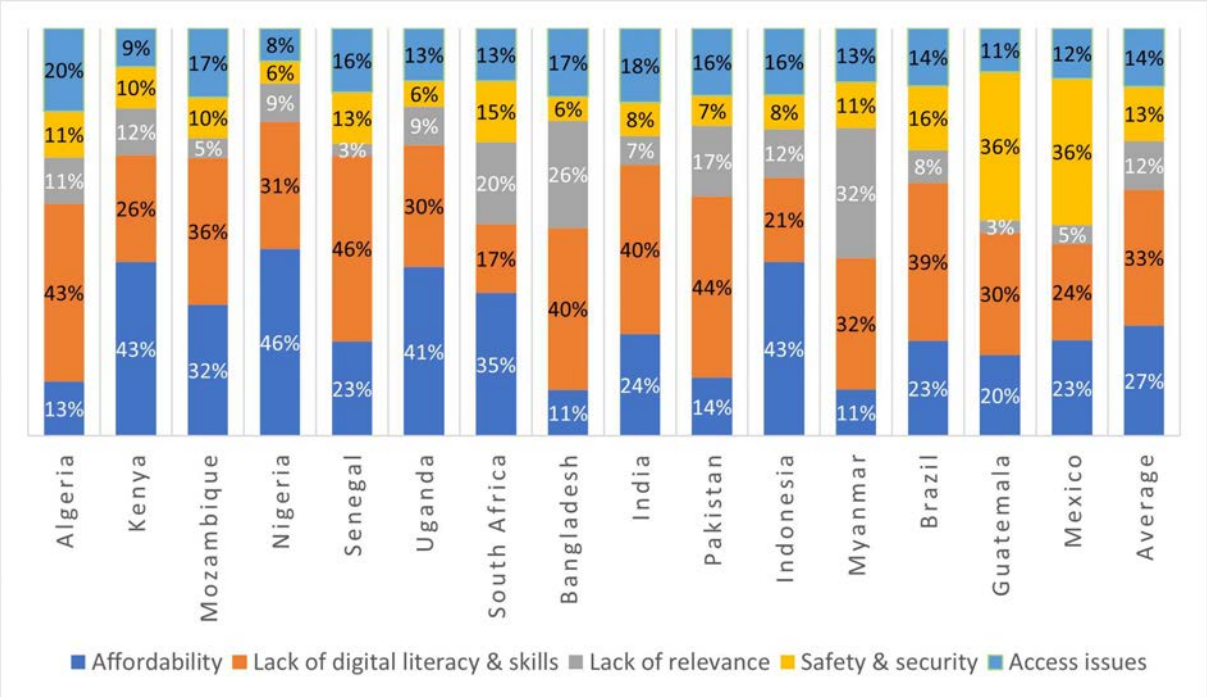
A study conducted of mobile users who do not use mobile Internet in 15 countries in 2019-20 found that lack of access to devices was the second-most frequently cited reason for not using the Internet (Figure 3).

This insight was confirmed by a World Bank phone survey of 22 Latin American countries conducted in June-July 2021, which found that lack of access to a network signal was only the third-most cited obstacle to Internet access (10%), behind the high cost of data (60%) and device cost (14%), and ahead of the lack of digital skills (4%).[2] Other studies similarly report that the adoption gap is the product of several factors, including affordability of both devices and data, lack of digital skills, relevance, and inadequate safety and security, among others.[3]

Access to a device thus emerges as one of the critical barriers that must be overcome for people to be able to access the Internet. Enjoying the benefits of higher speed services such as 4G requires access to not just any device; it requires access to a smartphone.

Obstacles to smartphone ownership exist worldwide but are particularly acute in lesser developed areas of the world. A Pew Research Centre study that compared smartphone ownership in 19 advanced economies and nine emerging economies found that the percentage of adults owning any kind of mobile

Figure 3: Main reason for not using the mobile Internet, 2019-20



Source: GSMA[1]

phone reached 94% in advanced economies and 83% in emerging economies.[4] However, in terms of adults owning a *smartphone*, the gap between advanced and emerging economies widens. At least 76% of adults in advanced economies own a smartphone compared to only 45% in emerging economies. As an example, at the end of June 2019, MTN had 240 million subscribers on its network in Africa and the Middle East but only 108 million of these were using smartphones.[5]

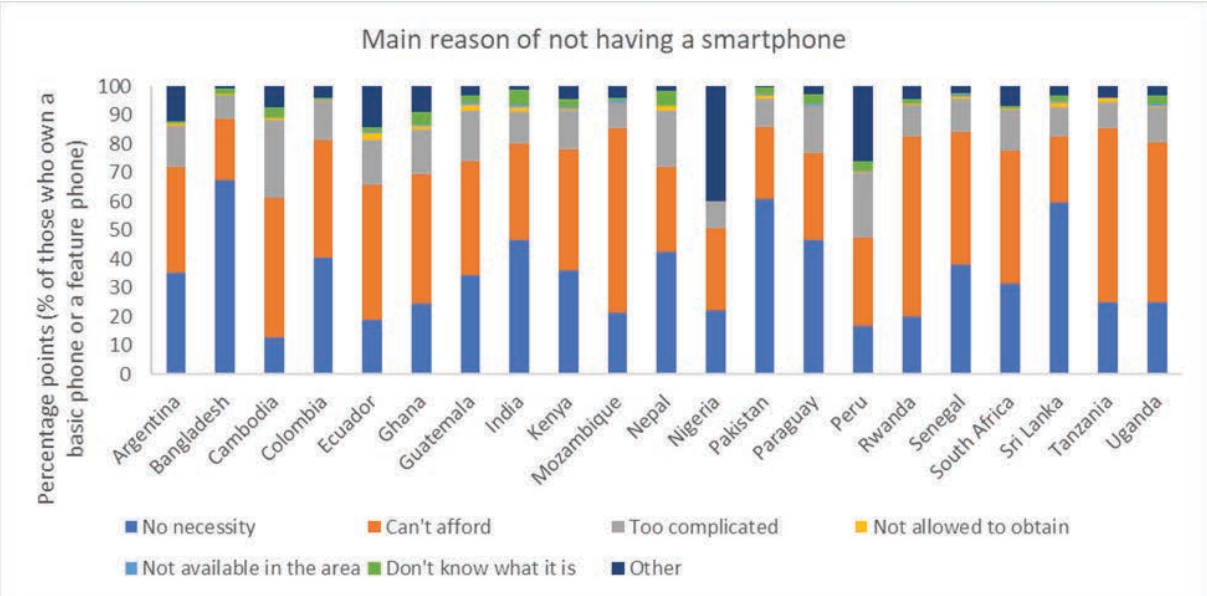
A World Bank phone survey conducted in 2017-18 among owners of a basic mobile phone in 22 countries across Africa, Latin America, and Asia found that the reasons for not owning a smartphone include affordability (39%), lack of electricity at home (18%), and lack of mobile coverage (16%). Moreover, around 70% of phone owners have only a basic or feature phone, particularly in African countries. The study also finds that affordability is among the top three reasons that device owners have chosen not to obtain a smartphone in every country surveyed.[6]

As shown in Figure 4, many factors contribute to the lack of access to smartphones. Efforts to address these challenges have been hindered by a lack of concrete information regarding their relative importance and the effectiveness of interventions to address them. An extensive review of literature suggests that a study by GSMA presents one of the more comprehensive lists of barriers to smartphone access.[8] This study classifies the barriers to smartphone access and ownership into four main categories: income and affordability, incentives to own and use a smartphone, user capability and design, and infrastructure.

Understanding barriers to device access is thus a critical step in making sure that everyone can enjoy the benefits of Internet connectivity.

In this report, we classify the barriers to smartphone access into two main categories: supply-side and demand-side, each with its own subcategories.[9] Other barriers to smartphone access, such as device refurbishment, fall into neither the supply nor demand-side category. These are discussed further in the report with the help of existing literature such as Chen.[10] We also note that productivity applications in key sectors, such as agriculture, education, manufacturing, and health care, may require devices with larger form factors, such as laptops and tablets.[11] However, several questions remain: For example, in what context are different devices relevant? Even when this is answered, there is

Figure 4: Main reason for not having a smartphone, 2017-18



Source: Chen[7]

a need to establish the impact that universal access to device has across social groups.

2.1 Supply-side barriers

Supply-side barriers are constraints that device suppliers face when attempting to deliver affordable devices. These mainly result from business limitations, such as high operating costs and legacy business models.[12] These barriers affect the retail prices for smartphones and distribution channels respectively.

2.1.1 Supply-side barrier – handset affordability

Handset affordability is one of the most important barriers to smartphone access and ownership.[13] Despite the continued decline in the cost of Internet-enabled handsets, retail prices of smartphones vary widely across the globe, driven by factors such as distribution costs and taxes.[14]

Handset affordability appears to affect women more than men in many low- and middle-income countries and is cited as the top barrier preventing women from owning a mobile phone.[15] In Pakistan, for example, men were approximately three times more likely to own a mobile phone than women.[16]

Retail costs of handsets

A GSMA survey on barriers to mobile Internet use reported that handset cost was the single most important barrier to using the mobile Internet.[17] The cost of smartphones remains high relative to average income, especially in LMICs. A survey of 187 countries conducted by A4AI suggests that the retail cost of a smartphone averages 26% of the average monthly income across the globe. In the U.S. and Europe, the cost fell below 5% of the average monthly income, while in the low-income countries, it exceeds 70%.[18] As a result, smartphones are not affordable for most people in most LMICs. This pushes most individuals to buy 2G phones, which can cost between USD 6-10, while 4G smartphones often cost more than USD 40.

An analysis of the handset cost composition and retail price formation indicates that the retail cost of a device is determined by a combination of production costs, logistics costs, intellectual property rights costs, retailers' margins, and relevant taxes, such as import duties and VAT. Research further suggests that the global technology value chain has been undergoing significant transformations in recent years, but the onset of the COVID-19 pandemic exacerbated the already present tension and created excess demand in the chipset supply sector.[19] Despite new innovations, the retail costs of mobile handsets continue to be influenced by the costs of hardware and operating systems.[20] Additionally, the disruption of global and local logistics caused smartphone prices to rise during the early days of the pandemic[21] only to see them fall again in response to oversupply in the face of softening demand.[22] The spectre of further lockdowns could cause prices to rise again.[23]

High taxes and device import duties on smartphones

Although taxes and import duties are factored in the retail prices discussed above, they are a policy component and warrant a separate discussion. Evidence from studies such as GSMA indicates that different governments, especially in LMICs, have been imposing sector-specific taxes and import duties on smartphones that makes them inaccessible to many.[24] Taxes on smartphones vary from country to country, and justifications for imposing import taxes on smartphones include stimulating local industry. However, in countries where local industry is non-existent, taxes and duties on mobile phones are imposed to boost government revenue.[25]

In addition, some governments, especially in Africa, are levying taxes on smartphones in a way similar to luxury goods, resulting in excessively high final prices for devices.[26] Reports in Pakistan indicated a 240% hike in import duties on mobile phones,[27] while in

Zimbabwe, the Ministry of Finance proposed a USD 50 levy for the registration of imported handsets onto a mobile network in addition to a 25% import tax on mobile handsets.[28] Other countries have large sector-specific tax rates and excise duties, including Tanzania, which charges excise duties on mobile services of 17% of revenue. The sector-specific tax rate on mobile devices was 18%.[29] Collectively, taxes and device import duties translate into high costs of devices which act as a barrier to smartphone access.

Studies by the OECD and ITU have raised questions about whether taxes targeting the digital sector may have adverse distributional consequences and may dampen the spillover benefits that the adoption of digital technologies creates for the entire economy.[30]

Other costs affecting handset affordability

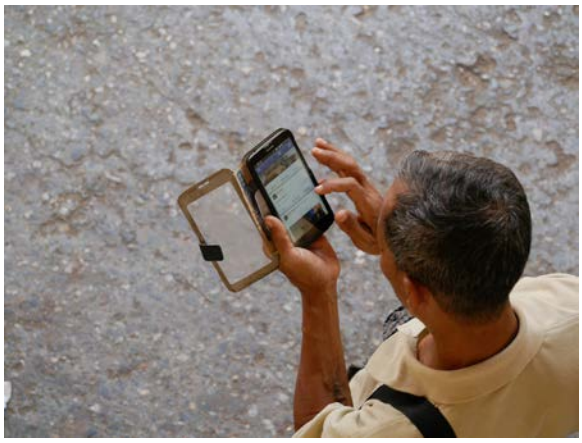


Photo credit: ©Asian Development Bank

The total costs of owning a smartphone or general mobile phone extend beyond solely the retail price. In the 2017 GSMA report, additional costs identified include SIM cost, credit cost, and battery charging costs. However, the extent to which these costs are barriers to smartphone access differs across countries. SIM card costs appear not to be of concern for participants in Colombia, DRC, and Indonesia but were reported as a major barrier in Turkey. At the same time, credit costs appeared as a moderately universal barrier in the surveyed countries and one that disproportionately affects more women. Niger and Kenya had the most respondents indicating that cost of battery charging was a barrier, and likely due to the limited battery charging infrastructure in those countries. These additional costs often result in individuals selecting feature phones, which cost less and have a reputation of longer battery life and durability.[31]

Unregulated markets

Due to the high cost of smartphones, distribution channels unauthorized by device manufacturers have emerged. These are referred to as parallel or black markets. Devices sold in these markets are often produced from components copied from original devices, resulting in inferior quality devices.[32] Usually, parallel import flourishes in markets with high import duties. Markets with high duties tend to be very inefficient as the duties reduce legal import significantly, and illegal import then spikes with the cost and quality issues. Parallel markets are often used as routes to sell illegally imported devices, i.e., devices imported without paying appropriate duties and taxes. In Nepal, the government's introduction of a 5% excise duty on smartphone imports reduced the legally imported devices while at the same time fuelling a growth in the black markets for devices.[33]

There are several issues associated with purchasing smartphones from parallel markets that can act as barriers to smartphone access. Most devices purchased from parallel markets are produced from copied parts that often fail after a short time in use.[34] Further, these devices are sold with no warranties or repair options.[35] The non-durability of devices purchased from parallel markets, the lack of warranties, the limited repair options, and the risk of phone data being stolen through invasive software contribute to the negative perceptions towards smartphones, thereby acting as a barrier to smartphone access.[36]

2.1.2 Supply-side barrier – last-mile supply chain issues

Another barrier to smartphone access is last-mile supply issues resulting from the challenges faced by smartphone retailers serving remote communities and the difficulties they face making their products visible to populations in such communities. Rural areas are difficult to access, making transport and logistics costs significant.[37] Furthermore, there are fewer retailers of smartphones in rural areas, which limits options for customers, limits competition, and complicates the regulation of retail prices.[38]

Most device retailers perceive demand in remote communities to be low due to poor mobile networks, resulting in fewer retailers in these communities. In addition to low demand, remote locations, especially in LMICs, lack facilities, such as retail space, where mobile phone retailers can operate, requiring them to construct their own units. This further increases the required initial capital outlay to serve the remote locations.

Hard-to-reach remote communities are also often off-grid, which means, apart from the challenge of accessing devices, individuals also worry about their ability to recharge their devices. This issue is compounded by the high costs of battery charging.[39] Literature highlights the importance of access to electricity towards digital inclusion. Studies report that "households without access to electricity, on-grid or off-grid, need to rely on more expensive sources of energy to power their mobile handsets.[40] Therefore, last-mile supply chain challenges facing smartphone retailers and electricity supply companies contribute as barriers to smartphone access and ownership.

2.1.3 Supply-side barrier – foreign currency availability and exchange rate volatility

Lack of access to hard currency and exchange rate volatility represent other commonly cited barriers to obtaining smartphones. For example, in Ethiopia, where device manufacturer Transsion operates, the currency allocation rules prioritize sectors such as pharmaceuticals, which limits the foreign currency available for procuring devices and device components.[41] In addition, the fact that most devices are imported necessarily means that fluctuations in foreign exchange rates, especially currency depreciation, present additional challenges to entities seeking to market devices in LMICs.

2.2 Demand-side barriers

Demand-side barriers are constraints that individuals face when trying to obtain access to devices. The 2017 GSMA report suggests that demand-side barriers can be classified into main categories such as lack of consumer understanding and information, lack of consumer incentives to own and use smartphones, digital literacy, social and cultural norms, and issues of security and harassment for smartphone owners.

2.2.1 Demand-side barrier – lack of consumer understanding and information

Finding a balance between the price of smartphones and the perceived value from quality is a concern for consumers in multiple LMICs.[42] However, consumers often have an exaggerated understanding of the cost of smartphones. This is compounded by a misconception that entry-level smartphones break easily or are of poor quality, leading consumers to believe that higher-end premium smartphone models are more desirable.[43]

Refurbished devices are becoming increasingly common, with the goal of creating a more "circular economy". However, consumers remain concerned that refurbished phones may have short lifespans.[44] This could cause scepticism over the quality of these devices and act as a barrier to device uptake.

In most LMICs, and particularly in rural communities, potential customers lack the traditional credit history retailers need to assess credit worthiness for instalment plans.

In addition to the above, people in the lowest quintile of socioeconomic status (who tend to live disproportionately in rural areas) cannot raise the upfront costs required to purchase a device. Thus, they become excluded from accessing smartphones.

2.2.2 Demand-side barrier – lack of sufficient incentives

McKinsey and Co. suggests that another barrier to smartphone access is a lack of incentives.[45] This includes "a lack of awareness of the Internet or use cases that create value for the offline user" and "a lack of relevant (that is, local or localized) content and services." This barrier is especially common among people in the lowest quintile of socioeconomic status (who tend to live disproportionately in rural areas). As an example, prior to the COVID-19 pandemic, most services were accessible in person. However, COVID-19 restrictions resulted in some services being accessible only online, which incentivized individuals to acquire Internet-enabled devices like smartphones.[46] The lack of perceived relevance and necessity of smartphones, coupled with concerns over device cost, remain barriers despite the pandemic.[47]

2.2.3 Demand-side barrier – digital illiteracy

Photo credit: ©Asian Development Bank

Another demand-side barrier to smartphone access is a lack of basic literacy and digital skills. Digital skills, categorized into low-level, medium-level, and advanced skills, often determine the extent of the benefits that smartphone ownership offers individuals. Literature indicates that a lack of digital skills acts as a barrier for adoption and use of smartphones by instilling fear of using smartphones and the Internet, which delays adoption.[48] Studies show that technical and financial literacy contribute to consumer confidence in owning and using smartphones in these emerging markets.[49]

Inequalities in education, in some instances prompted by social and cultural norms, are major contributors to gender gaps in digital illiteracy. In low- and middle-income countries, women are less likely than men to have mobile phone access and are less likely to be Internet literate. This is particularly the case among those who have low income and basic literacy levels, live in rural areas, or are disabled.[50] Digital literacy thus determines whether users can achieve meaningful outcomes and make beneficial use of smartphones. AI-based voice assistants (such as Google Assistant and Apple Siri) can also help people who lack digital literacy to use the Internet by speaking directly to their smartphones. For example, a farmer could ask "what will the weather be tomorrow" and students could ask any question relating to their education. Voice assistants depend on widespread adoption of 4G and 5G services.

2.2.4 Demand-side barrier – social and cultural norms

Research has long established the impacts of social and cultural norms on device access across different communities.[51] A study on mobile Internet use in Bangladesh and Ghana highlights that women's use of the mobile Internet is likely to be impacted more by social norms than men's use.[52] Even though this study focused on mobile Internet use, the findings echo those of the study on smartphone ownership conducted by GSMA Connected Women, which shows that women are 18% less likely than men to own a smartphone. In addition, women in LMICs are 16% less likely to use the mobile Internet.[53]

In countries with stringent social norms, women's access to and use of devices are often limited, as women in such societies often lack financial autonomy. In addition, social and cultural norms also dictate acceptable use of smartphones by women. For example, too much use of smartphones by women can be associated with wasting time (that could be used for other chores), immoral activities, and illicit extra-marital affairs.[54]

Another dimension of social and cultural norms that affects women's access to smartphone devices is discouraging women's uptake and use of technologies. Research conducted at the Consultative Group to Assist the Poor (CGAP) indicates that the lack of confidence in how to use technology is adversely affecting smartphone uptake.[55] Further, when family members (or even members of the society) are uncomfortable with one member owning or using a smartphone, this discomfort acts as another potential cultural barrier. This can be particularly challenging for women, but it often applies to any consumer relying on their family for funds to purchase or access smartphones.[56]

2.2.5 Demand-side barrier – security and harassment

Security and harassment are usually encountered after an individual acquires a smartphone. In most LMICs, device purchases are significant investments. At the same time, device theft is prevalent, with thousands of devices being stolen each day.[57] The situation is further complicated by the lack of and high cost of device insurance options in most LMICs.

In addition to the negative financial consequences associated with device loss, Deloitte indicates that device theft also exposes personal private information, including contacts, email addresses, and payments details.[58]

Lower-end devices are also vulnerable to damage. Participants in the focus group convened by the International Trade Center report that the average lifespan of such devices may be as short as six months.

Some consumers in LMICs share safety concerns of using smartphones and the Internet. Mobile devices have the potential to make owners feel safer by acting as immediate channels for contact, as well as offering safety apps, mobile money, and other services. However, this is a benefit cited more by male mobile owners than female mobile owners due to the online harassment and lack of awareness for mobile-related safety features and apps of women.[59]

Furthermore, reports by GSMA identified concerns over online harassment and the potential for misuse of personal images and data as barriers, contributing to consumer perceptions of safety.[60] Some consumers in Latin American countries cite security threats as a reason for not owning a mobile phone much more often as a top barrier than any other region. At least 16% of men and 13% of women who do not own a mobile phone in Guatemala share concerns of physical safety as a main barrier for phone ownership.[61] Personal safety, unwanted contact with strangers, and information security remain large barriers to mobile phone ownership.[62]

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3

Case studies and evaluation

Section 3: Case studies and evaluation

Sections 1 and 2 of the report focus on the benefits of increasing mobile Internet and broadband connectivity and the barriers faced by individuals seeking to acquire Internet-enabled phones. Section 3 explores real-world case studies of interventions that have been implemented to address these barriers and make smartphones accessible to all.

3.1 Methodology

Research methodology

The work presented in this report was completed through a series of engagements of the Broadband Commission Working Group on Smartphone Access between November 2021 and August 2022. Initial discussions of the Working Group focused on the current state of smartphone access and barriers to smartphone access. Insights from these discussions contributed to sections 1 and 2 of the report.

Empirical evidence presented in section 3 was gathered through extensive desk research supported by structured interviews with experts well-versed in the initiatives implemented to address smartphone access. In total, 19 expert interviews were conducted. The International Trade Center convened a focus group of ten entrepreneurs involved in smartphone distribution. In addition to the interviews and focus group discussions, data were also generated through review of documents, some not publicly available, provided by the participants.

The input from Working Group members and other interviewees suggested seven categories of interventions to promote smartphone access. Where possible, these interventions were evaluated based on their positive impact on reducing device cost or on the number of total devices sold. When specific data on financial outcomes were unavailable, success was inferred from other criteria, such as whether the initiative remained ongoing or had been terminated (which was often the case), the number of times it had been renewed, and the extent to which experts characterized an initiative as a success. These data support classifying them into higher priority interventions, interventions that merit further exploration, and lower priority interventions.

3.2 Higher priority interventions

3.2.1 Higher priority intervention – device financing

Device financing represents one of the most common interventions in promoting smartphone access.

Converting the upfront cost of smartphones into instalment payments makes devices affordable for those unable to save enough money to cover the purchase price of the device. Effective designs for device financing,

Table 1: Classification of case study interventions

Classification	Intervention	Case study count
Higher priority interventions	Device financing	12
	Taxes and import duties	8
	Improved distribution channels	11
Interventions that merit further exploration	Device subsidies	11
	Reuse of preowned	6
Lower priority interventions	Local manufacturing	3
	Smart feature phones	6

like affordable loans with flexible payments, help to make 4G devices easily available and enable control of payment patterns according to incomes. Customers can access device financing through Mobile Network Operators (MNOs), formal and informal financial institutions, alternative credit providers, or government initiatives.

Opportunities for device financing

Photo credit: ©ITU

Flexible options to help customers fit their payments to their income

Customers who earn money daily often find it difficult to set aside funds for monthly or even weekly payments. Steps that make it easier for customers to meet their financing obligations lower the risk that device financing programmes must bear.

In addition, a large population of low-income customers live on unpredictable income cycles that are prone to economic and seasonal fluctuations.[1] Most of such individuals do not have access to Internet-enabled mobile devices. Many device financing schemes fail to consider that customers (like small-holder farmers) may have lumpy income streams. Having fixed payment structures may force such customers to default on their payments.

MNOs, device manufacturers, and other financiers have become increasingly open to helping such individuals by providing them with greater flexibility in setting the payments in their device financing schemes.

Mobile money to improve customers' repayment options

Mobile money provides smartphone financiers with a cost-effective way to collect regular payments from customers dwelling in remote areas with relatively low transfer fees. This is especially helpful to customers who cannot afford the regular travel costs to service centres to pay in cash. Smartphone financiers have taken advantage of mobile money platforms for promoting digital and financial inclusion and have witnessed significant uptakes among regions with active mobile money users.

Alternative credit assessment to include customers with no formal credit history

Unorthodox credit rating mechanisms are especially helpful to customers whose only other option to purchase a smartphone would have been to carve out cash from their savings.

Financiers can use information from mobile money transactions, such as current income levels, transaction records, saving patterns, utility bill payments, and cash flow data to assess the creditworthiness of potential recipients of device financing. Financiers can also use mobile money data to observe repayment patterns of active loans, which help them manage and reduce default risk. Such mechanisms are especially helpful for the underbanked populations with no formal credit histories.

Other non-traditional methods for assessing creditworthiness, such as assessing airtime, data consumption, and household expenses, allow for vast expansion of smartphone access while also improving financial inclusion in communities that need it the most. Globally, there are more than 200 start-ups with promising innovations on alternative credit assessment.[2]

Device locking mechanisms to reduce the risks of bad debt and theft

Device locking mechanisms allow lenders of smartphones to remotely lock an Internet-enabled phone if it is stolen or if customers fail

to make their repayments. This technology is especially helpful for customers vulnerable to theft and those whose creditworthiness cannot be determined.

Today, manufacturers use innovative technologies to implement effective hardware and software locks. Smartphone manufacturers have devised their own methods to lock smartphones, including Google's Device Lock Controller (DLC), which operates on Android, and Samsung's Knox. With the advancement of the locking technology, software companies like PayJoy and NewPath have specialized in smartphone financing with remote locking and partnered with various lenders to offer device financing services.

Partnerships with outside organizations to share financing burden

MNOs and device manufacturers often partner with financial institutions to take the burden off their balance sheet and share the risks.

Formal financial institutions can rely on traditional approaches to credit assessment to provide smartphone financing. Formal institutions have a significant advantage in being able to efficiently assess their customers' credit risk based on bank account tenure, incomes, and credit histories when those data are available.

Informal financial organizations like microfinance institutions (MFIs), self-help groups, joint liability groups, and cooperatives can help expand digital inclusion to underbanked communities by utilizing their established credit scoring mechanisms or existing group liability programmes to help their customers access smartphones.

Governments can partner with formal banks or MFIs to provide device financing by providing risk capital for smartphone loans and low or zero interest liquidity. Governments can use their involvement in such partnerships to target populations that would benefit the most from increased smartphone access.

Challenges for device financing

Large initial capital requirement to finance devices

Firms offering device financing need first to purchase the devices and then recoup that investment through instalments payments from customers over several months. Any actor seeking to offer device financing must thus raise a significant amount of capital to finance the purchase of the devices and then carry the value of the devices on their balance sheets.

Risk of bad debt

Individuals targeted by device financing initiatives, especially those aiming to use low and flexible instalment plans, might not be able to repay these loans. This in turn requires firms offering device financing to incur costs for bad debt. Financiers who do not have information about their creditworthiness must necessarily charge higher interest rates to compensate for their higher bad debt costs. This effectively increases the price these customers must pay to acquire mobile phones, which makes them less accessible.

Lack of handset insurance for financed devices

The customer base that needs device financing the most also requires protection against damage and theft, as they cannot afford to continually pay for repair or for new handsets. However, adding insurance against theft or damage increases the overall price of the smartphones, which the customers may not be able to afford.

Further, the smartphones purchased among the low-income households are entry level devices, a difficult segment for insurance companies' risk assessment.

Photo credit: © WHO / Faith Kilford Vorting

Gender bias in credit assessment

Several analyses by MFIs have shown that women are often lower risk customers than men.[3] Despite such evidence, alternative credit score assessment algorithms have been reported to be unintentionally biased against women. For example, using credit scoring thresholds for the number of SMS sent, time spent on calls, or the number of top-ups might be biased against women. This can result in the widening of the gender gap in mobile Internet usage, as creditworthy women are more likely to be denied credit than creditworthy men.[4]

Empirical evidence for device financing

Device financing appears to be the most frequently pursued programme for increasing smartphone access. The Working Group identified 20 case studies on device financing and profiled 11 of them in depth for this report. Flexible payment options were implemented by seven case studies. Seven case studies expanded upon partnerships with financial institutions, five of which were long-running initiatives. Four programmes employed device lock technologies and four used alternative credit scoring mechanisms. Four initiatives used mobile money for efficient payment processes. The report also evaluated three case studies on government device financing initiatives.

The sheer number of initiatives on device financing demonstrates its popularity and relevance in addressing key barriers to smartphone access. This study also conducted extensive key stakeholder interviews and focus group discussions with industry experts to drive deeper understanding about smartphone financing. The following are some key elements of device financing observed in different case studies from the analysis.

Empirical evidence for flexible payment options

Seven case studies in this research confirmed that successful device financing programmes allowed customers to choose between daily, weekly, or monthly regular payment options according to their convenience.

As an example, MTN Uganda offered their customers a scheme to purchase their 4G MTN Kabode smartphones through six-month instalment loans. This initiative allowed early payments, daily, weekly, or monthly payments so long as the required amount of UGX 50,000 (USD 5.7) was paid per month.[5]

M-KOPA offered one of the most popular mid-tier phones (Samsung A12) for a deposit of KSH 4499 (USD 40) and daily payments of KSH 70 (USD 0.6) over twelve months. In the retail market, the same phone would cost an upfront payment of KSH 19,199 (USD 171). They also helped customers who have seasonal income by assisting them to make their micropayments in advance depending on when they have financial inflows.[6]

Safaricom's device financing partnership with Google known as Lipa Mdogo Mdogo (which means 'pay little and often' in Swahili) allows existing customers with 2G or 3G phones and no pending loans to purchase their flagship Neon Ray 4G device and other smartphones.[7]

The above initiatives also allowed for flexible payments where customers were encouraged to make payments higher than the required amount when they could.

Empirical evidence for device financing for marginalized communities

Sonata Finance and Vodafone Smart Snehidi initiatives, both in India, addressed the key gender gap between men and women

accessing smartphones by focusing on women entrepreneurs of microenterprises to help them acquire Internet-enabled devices to aid their businesses. Such women-centric approaches are especially helpful in India where women are around 21% less likely than men to use mobile Internet.[8] Smart Snehidi provided microloans to low-income women entrepreneurs for the purchase of smartphones. Sonata Finance also took the additional initiative to help educate people about the advantages of women using mobile Internet and owning smartphones by building a rapport with the elders of rural communities and directly addressing the cultural barrier of female smartphone access.

Empirical evidence for use of mobile money platforms for device financing

Device financing programmes have depended on several enabling technologies. Over the past decade, mobile money has become a mainstream financial service. There are an estimated 1.35 billion registered mobile accounts carrying out over USD 1 trillion transactions in a year.[9]

Four device financing initiatives studied in this report—Fenix International device financing, Mobisol device financing, (now called Engie), Safaricom Lipa Mdogo Mdogo, and M-KOPA—use mobile money. Safaricom indicated that M-PESA was a vital part of their device financing programmes, helping them not only to improve their customers' repayment experience but also to screen and qualify them for device financing using M-PESA data. As of December 2021, the M-PESA app was downloaded by more than 4.2 million users.[10]

M-KOPA financed a significantly higher number of smartphones in countries with deeper penetration of mobile money, such as Kenya, Ghana, and Uganda, despite lower customer purchasing power compared to regions like Nigeria, where mobile money is still developing.

Safaricom, in partnership with CBA, launched M-Shwari, a savings and loan product that utilized mobile money data to analyse their existing customer base and extend six-month loans to provide smartphone access.[11]

Empirical evidence for alternative credit scoring

Four case studies reviewed in this report involved innovative methodologies for assessing customer credit when traditional measures of creditworthiness were unavailable. The use of alternative credit scoring gives financiers a chance to reduce bad debt risk by pre-vetting the potential borrowers.

For example, MNOs like Vodacom use network data to assess their existing customers for loan eligibility by monitoring their talk time, top ups, SMS rates, data consumption patterns, and number of years on the network.

Mobisol, a solar energy company in East Africa, used data points such as family size, household income and expenses, and land tenure, to build a reliable credit profile for their customers.

Safaricom employs its own scoring system based on machine learning algorithms that assess users' creditworthiness. It uses data gathered from M-PESA payments to qualify their customers for device financing.

While these credit assessments may not provide as much insight as traditional measures of creditworthiness, they facilitate providing digital and financial inclusion to people who would otherwise not be able to enjoy those benefits.

Empirical evidence for device locking technologies

Three device financing programmes in this study implemented some form of device locking technology. Safaricom's Lipa Mdogo Mdogo uses device locks technologies to reduce bad debt expenses by nudging customers to make regular payments. When the customer is delayed in their payment, MNOs take a series of steps until the payments resume. Device locking helped reduce default rates for this programme to as low as 10%.

Vodacom launched the Easy2Own device financing programme in 2021 to accelerate migrations from 2G and 3G devices to 4G devices with two complementary solutions, both of which used device locking mechanisms. Initially, Easy2Own targeted Vodacom's current 2G and 3G customers, assessing their creditworthiness based on the company's experience with them and carrying the financial risk on its own balance sheet. Vodacom now partners with PayJoy and other commercial financing institutions to offer financing to non-Vodacom customers, with their financing institutions carrying the risk instead. In both cases, device locking technologies help reduced bad debt risk.

Trustonic's locking system sends full screen warning messages on smartphones upon late payment and locks the device upon non-payment. An anonymous Trustonic MNO customer confirmed that smartphone delinquency reduced from 35% to 11% due to Trustonic device locks, reducing MNO risk of bad debt and device theft. It also attested that Trustonic locks allowed it to reduce bad debt by 70% and to recover bad debt 39% faster, reducing it from over a month to less than fifteen days, with 70% increase in debt collection rates. With lowered commercial risk, credit application approvals increased over 100%, allowing the MNO to offer loans to more customers and broaden digital inclusion.

While the results from programmes with device locks look impressive, it is important to note that most of these initiatives are fairly new (the above have been available for less than three years) and that detailed data on their impact on the willingness to extend credit remain scarce. Further studies are needed to demonstrate concrete success in device financing.

Empirical evidence for strategic partnerships with formal financial institutions for device financing

Device financing programmes have also benefited from strategic partnerships with formal and informal financial institutions. In total, seven case studies evaluated in this research showed the benefits of MNOs, device manufacturers, and other mobile phone creditors seeking out financial partners to take the large investments off their balance sheets and share the burden of high risk.

The First National Bank (FNB) of South Africa partnered with MNO Cell-C in 2015 to provide device financing to FNB customers through a programme called FNB Connect. This initiative was able to provide loans for up to 24 months. The resulting prices are cheaper than the retail prices for the same phones. Over 800,000 customers had employed FNB Connect's financing scheme to purchase smartphones by 2020, which earned FNB Connect the Virtual Network Operator of the Year award in 2022.

In Vodacom's Easy2Own initiative, PayJoy was one of the official financial partners that allowed Vodacom to open up its programme for existing prepaid customers to any customer, including those who lacked creditworthiness information. As the financial partner, PayJoy carried the full risk of all financing extended to customers without credit histories, which led it to charge them higher prices for smartphones than Vodacom was able to charge its existing customers. Since its launch in December 2021, the Easy2Own PayJoy initiative has reached 20,000 customers.

Similarly, the M-KOPA device financing programme in Africa partnered with MNOs in Kenya, Uganda, Nigeria, and Ghana to acquire 1 million smartphone customers in just one year, enabling approximately 750,000 customers to purchase a smartphone for the first time.[12] This programme has benefitted from synergies with M-KOPA's longstanding programme for financing for solar home systems.

Equity Bank in Kenya partnered with Airtel Kenya in 2015 to launch their own MVNO called Equitel. Equitel offered affordable loans for dual SIM Samsung and Alcatel smartphones between a four to twelve-month loan period through their "Loans for Smartphones" initiative.

Warid, a Pakistani MNO, partnered with Bank Alfalah to offer its postpaid customers owning

Bank Alfalah Credit Cards an instalment plan to purchase smartphones at 0% interest over six to twelve months. The programme also includes 8 GB of free Internet per month for the duration of the loans.[13]

Empirical evidence for strategic partnerships with informal financial institutions for device financing

Informal MFIs and other informal institutions, like MFIs, such as cooperatives, self-help groups, and joint liability groups, have the advantage of pre-existing networks of individuals which can offset the high risk through group collateral systems. For example, Sonata Finance leveraged their pre-existing joint liability groups to offer credit to women entrepreneurs belonging to low-income households to purchase smartphones without the prerequisite of collateral.

Informal financial institutions are also partnering with MNOs to provide affordable handsets to their customers. For example, Vodafone India's Smart Snehidi microloan programme partnered with nonprofit organization Hand in Hand and utilized the strong network of women in self-help groups and used the group liability model as a contract for settlement.[14]

Empirical evidence for government initiatives for device financing

This report evaluated three case studies on government initiatives for device financing, two of which partnered with MNOs to meet their socioeconomic goals of improving smartphone access.

In Pakistan, the government of Punjab partnered with Tameer MFI and MNO Telenor to increase smartphone access among approximately 490,000 small-holder farmers in the province by distributing Rs. 79 billion (USD 11.4 million) in interest-free loans. These smartphones also had preinstalled agriculture related apps for their target customer base to help them increase their income.

In 2013, the Malaysian Government encouraged 3G smartphone purchase among its youth by offering USD 45 rebates on USD 112 handsets. MNOs acted as a channel to facilitate the rebates between the customers and the government.

In 2016, the President of Argentina launched the "Plan Mobile Internet Access" initiative to help 8 million individuals to migrate from 2G feature phones to 4G smartphones by providing asset financing for the same.

Empirical evidence for customer engagement to support device financing

Many initiatives lacked an integrated approach to smartphone financing that addressed other barriers to adoption. It is difficult to generate demand for smartphones when financing initiatives do not make efforts to engage with their customers and address issues like lack of confidence or awareness.

Safaricom's Lipa Mdogo Mdogo initiative helps their customers by engaging with them through their sales team, interacting with them through customer value management (CVM) models, bringing distributors to their areas, and guiding the customers through the journey of smartphone acquisition. This holistic approach has helped Safaricom acquire new customers, improve customer loyalty, and improve smartphone access by being proactive in increasing their device financing application approvals.[15]

It is important to highlight that this study did not come across sufficient evidence to draw strong conclusions on customer journey assistance being necessary for device financing, but it is helpful in making the device financing programmes more effective.

3.2.2 Higher priority intervention – taxes and import duties

Taxes such as excise taxes, VAT, and import duties are components of the total device cost. Higher taxes and import duties translate into higher retail prices for smartphone devices. They also create an environment that encourages black markets (which mainly sell

Recommendations for device financing

The large number and longstanding persistence of device financing case studies attests to the popularity and effectiveness of these programmes. This well-received intervention can be implemented by stakeholders with some learnings in mind.

- Allow customers to choose the frequency of their instalments to enable them to control their finances and increase confidence in loan repayments
- Design targeted financing for marginalized communities, such as women, people from remote locations, and low-income individuals
- Integrate device financing initiatives with mobile money to support customer repayment practices and provide potential financiers with creditworthiness data
- Use device lock technologies to reduce the cost of device financing
- Take a holistic approach by increasing customer engagement with the financing service and guiding them through the whole process of acquiring and using a smartphone

illegally imported devices) to become the main distribution channel for smartphones. These black-market phones are often of lower quality and poorer purchase experiences. A reduction of taxes and import duties has the potential to reduce device costs, which can improve affordability and result in increased access to smartphones and boost the digital economy.[16] However, taxes are important to support an economy, and reducing dependence on imports helps in protecting local industry. Thus, a balanced approach is required towards adjusting taxes and import duties.

Opportunities for taxes and import duties

Increased consumption of digital services

Governments express concerns that the reduction and/or removal of taxes and import duties can negatively impact revenue targets. However, evidence indicates that reductions in taxes lead to increased penetration of Internet-enabled devices (smartphones), which in turn translates into increased consumption of digital services and other services accessible through digital platforms.

In 2021, mobile technologies and services generated USD 4.5 trillion of economic value added, or 5% of GDP, globally. Reduction in taxes for mobile handsets and services reduces the total cost of mobile ownership to customers, thus increasing demand for smartphones and mobile Internet and contributing to the global GDP. The mobile industry is also rigorously increasing jobs and investments, which has a further positive impact on the economy.

In Africa, the International Telecommunication Union (ITU) estimated that a 10% increase in mobile broadband penetration would yield a 2.5% increase in GDP per capita.[17] Taxes on smartphones provide short-term revenue gains but may prolong or dampen other government initiatives aimed at increasing levels of digital connectivity. Increased connectivity generates revenue for the government through higher economic activities and taxes levied. Furthermore, digital connectivity positively impacts foreign direct investment as investors find countries with higher Internet-related services and digitally engaged consumer markets to be attractive investment opportunities. Governments may also consider studying the short- and long-

term economic and social benefits of reducing taxes and import duties on smartphones and other ICT devices. This study can also include the economic benefits of increased use of e-government and e-commerce services.

Joining trade blocs reduces taxes and duties

Another opportunity for reducing taxes and import duties is an increase in regional trading blocs. As an example, African countries can participate in the African Continental Free Trade Area (AfCFTA). This agreement allows for free movement of goods. Given that the number of smartphone manufacturing factories are increasing on the continent, there is an opportunity that AfCFTA could play an important role in reducing taxes and import duties.

Challenges for taxes and import duties

Replacement of taxes/import duty revenue reductions with new digital taxes

Taxes and import duties contribute significantly to government revenue. Any attempts to reduce and/or eliminate these taxes and import duties are often met with resistance from ministries of finance. To compensate for lost revenue, some governments are introducing new forms of taxes, mainly focusing on digital services. These taxes result in an increase in the overall cost of mobile ownership to the customer, raising the affordability barrier and limiting smartphone penetration.

Beliefs that mobile phones have reached critical mass

There are also indications that some governments believe that mobile phones have reached a saturation point. This has resulted in governments levying taxes on these devices in the same bracket as luxury goods.

Empirical evidence for taxes and import duties reform

In this study, mobile-related tax policies of 13 countries were evaluated. Evidence shows that the taxes imposed on customers are a significant determining factor of affordability. Consumer taxes are approximately 19% of the total cost of mobile ownership globally. Countries with highest mobile-related taxes report to have the highest total cost of mobile ownership.[18] Consumers from low-income backgrounds are particularly sensitive to price changes in mobile services, and over-taxation on digital goods and services can limit their adoption of the mobile Internet.

Research found that lowering the burden of taxes for customers is associated with higher potential for mobile connectivity, especially with low-income populations. Countries with lower taxation levels have more affordable mobile services and better connectivity performance.[19]

Empirical evidence for different approaches to taxes and import duties

In 2021, the Tanzanian authorities announced a value-added tax exemption on smartphones to encourage the use of telecommunication services and increase Internet penetration from 46% to 80% by 2025.[20] The government believed that the budget proposal would encourage increased data consumption in the country and would expand the number of citizens who are financially and digitally included, although discussed later, the benefits of this tax cut were mitigated by the increase in taxes on mobile money transactions.

Similarly, in 2016, to make basic smartphones more affordable, the Colombian government removed VAT from mobile devices costing less than USD 225. Most importantly, this cost threshold led mobile device manufacturers to re-price handsets that were just above the VAT exemption threshold to just below it, making medium and lower tier mobile phones even more affordable for Colombians. Countries such as Rwanda and Senegal also exempted handsets from VAT.

On the contrary, in 2009, authorities in Kenya exempted mobile handsets from VAT, only to reverse course in early 2022 by imposing a 10% excise duty on the importation of cellular phones in addition to a KSH 50 excise duty on every imported ready-to-use SIM card. Pakistan increased import duties by 240% in 2021 to encourage local production. Similarly, the Ugandan government also imposed 10% tax on imported smartphones in 2020.

Empirical evidence for the contribution of tax reductions to increasing smartphone penetration

Reductions in value-added taxes and excise duties reduce the total cost of ownership of the nation's mobile users, improving affordability for smartphone access. However, it is important to note that the tax reforms must be studied over an adequate period to make a reasonable cost-benefit analysis.

Vodacom reports show after the reduction of VAT in Tanzania, smartphone penetration and data use increased. Smartphone penetration in Tanzania improved from 31.2% to 33% between August 2021 and May 2022. However, it is noteworthy to indicate that the increase in smartphone penetration and data use cannot be entirely attributed to VAT reduction given that Vodacom had other initiatives.

Smartphone adoption in Colombia before the VAT exemption was well below regional averages, but it had one of the region's highest mobile ownership rates after the tax reform.[21] Samsung Colombia reported a 28% increase in units sold in the first quarter of 2017 compared to the same period in the previous year. Huawei reported that their sales increased, since 80% of their sales constituted medium-to-low range devices that fell within the VAT exemption.[22]

In 2016, Pakistan also removed the 16% VAT on mobile handsets. Handset sales increased by 25% in Pakistan after the VAT exemption, compared to an average of around 3% in India and Bangladesh.[23]

The 2009 exemption of 16% VAT on mobile handsets in Kenya resulted in over 200% increase in the sales of mobile devices and increase in unique mobile subscriber penetration from 29% to about 40% in the following three years. During these three years, the contribution of mobile to the Kenyan economy grew by over 250%, and employment related to mobile services increased by 67%.[24]

Although there is insufficient evidence of the latest impact of VAT reduction/exemption on mobile phone penetration in these countries, the immediate results that followed the tax reforms suggest that they led to substantial improvements in mobile affordability.

Empirical evidence for substitution of tax reductions with other tax increases

Several countries explored compensating for the loss in revenue due to mobile tax reductions with an increase in taxes on Internet-related services. One such example is an increase in mobile money taxes. Most of the customers benefiting from mobile money are from marginalized groups who were previously financially and digitally excluded. Increases in taxes on mobile money can have a large impact on their mobile usage patterns and negatively affect their livelihoods.

For example, shortly after the VAT exemption for smartphones in Tanzania, the government imposed a levy on mobile money of TZS 10,000 (USD 4.29) per transaction.[25] Many mobile money agents lost more than half of their customers when the tax was imposed. The Vodacom Group reported that their revenue from international operations was dragged down by over 40% due to the concomitant introduction of a tax on mobile money transactions.[26] Peer-to-peer transactions on mobile money in Tanzania dropped by 38% from 30 million to 18 million per month.[27] The government reduced this tax soon after the backlash to TZS 7,000 (USD 3) per transaction and then in June 2022 to TZS 4,000 (USD 1.72) per transaction.

In 2017, at the same time the Colombian government exempted mid-low range smartphones from VAT, it increased VAT on mobile services from 16% to 19% and

imposed an additional 4% consumption tax for mobile data plans above USD 16, which had serious implications for the country's data consumption.[28]

The increase in tax burden on customers due to taxes on sectors related to smartphone access has raised concerns in many countries, with experts worrying that the higher taxes may reverse the improvements made in financial and digital inclusion.

For example, in 2019, the Ghanaian government increased the communications service tax from 6% to 9%, announcing that the higher rate was intended to develop the foundation for the creation of a viable technology ecosystem in the country. During the COVID-19 pandemic, Ghana reduced its communications service tax from 9% to 5% in mid-2020 to assist people who work remotely and use online services. Ghana also imposed a 1.5% tax on mobile money transactions above USD 13 after the pandemic, which popularly came to be known as e-levy. This resulted in the population of Ghana turning back to paying with cash rather than using electronic payments, resulting in substantial losses to the industry and forgone benefits to consumers.[29]

Research shows that increasing taxes on mobile services, including electronic transactions, may not significantly increase the tax base but can overturn achievements in access and inclusion. Low-income earners are most sensitive to price changes in digital services, and such taxes discourage and disincentivize them from smartphone and mobile Internet usage. For example, the total contribution of mobile money taxes in Kenya represented less than 1% of total tax revenue, which is negligible for the government but imposes high economic costs on low-income customers.[30]

However, reduction in such taxes can bring significant economic benefits. GSMA estimates that the removal of 4.2% excise duty on mobile services in Argentina would result in mobile penetration increasing by 1 million unique subscribers, a 2.1% increase. As a result, GDP can grow by USD 1.83 billion.[31]

Empirical evidence of the ineffectiveness of import duties in protecting local industries

Many countries in the emerging markets impose customs duties on imported smartphones. Often, these increases in import duties are imposed to encourage local manufacturing. Research shows that import duties do not yet have a clear impact on protecting domestic industries.[32]

In 2021, Pakistan increased import duty on smartphones by up to 240%. According to the Pakistan Bureau of Statistics, the import of smartphones still increased by 7.43% in the first ten months of the 2021-22 despite the increase in local manufacturing.[33]

The government of Uganda imposed a 10% import duty on smartphones in 2020 with the aim of increasing the adoption of locally manufactured devices as the country was gearing up for the mass production of its first smartphones.[34] The study did not find any information on the overall reduction of costs to customers due to local manufacturing.[35]

Increased import duties raise the cost of ownership to customers of impacted phones, limiting mobile Internet penetration. A report by the GSMA found that a reduction in customs duties of 35% to 12% in Argentina would increase unique subscribers by 0.17 million.[36] Reflecting this insight, Colombia has decided to exempt digital services from import duties to decrease the cost of acquiring these services to customers and improve ICT adoption.[37]

Empirical evidence for removal of VAT exemptions

In its Finance Budget of 2022, the Tanzanian government announced the removal of VAT exemption for smartphones, as they believed it did not lead to reduction of final prices to customers but only benefited traders.[38] Analysts report that there are no data to support this claim.

Tax reforms on mobile usage take time to reap benefits and demonstrate success on a national scale. Besides, quick changes to such taxes can

Recommendations for taxes and import duties

- Design tax reforms to consider the benefits of mobile broadband penetration.
- Set a long-term, balanced approach to taxation to meet domestic revenue collection objectives and provide a conducive environment for digital inclusion and economic development.
- Examine the total cost and net impact of mobile ownership when designing tax reforms.
- Reduce taxes for devices below certain thresholds to incentivize smartphone manufacturers to cut prices to make their smartphones eligible for tax reduction/ exemption.
- Provide a simple, progressive, equitable and stable tax system to attract international investments and facilitate a nation's transition into a digital economy.

cause an environment of instability and would discourage international investments in the mobile sector.

3.2.3 Higher priority intervention - improved distribution channels

Photo credit: ©Asian Development Bank

Efficient distribution channels address the issue of lack of availability of handsets for those living in remote locations with limited retail stores, ensuring that the handsets reach people at lower costs. In these areas, customers are susceptible to inflated prices due to low supply and distance from nearby towns.

On average, existing retail and wholesale distribution channels in emerging markets do not sufficiently cater to all potential customers. Opportunities exist to fill this gap and provide better service while reducing costs to customers. New opportunities for partnerships with different stakeholders have emerged to improve last-mile distribution networks due to the common interest of the parties to increase availability and affordability of smartphones.

Opportunities for improved distribution channels

Expanding retail footprints

MNOs, device manufacturers, and other stakeholders can collaborate with established retail chains to widen their reach. Retail outlets can also help by raising awareness of the services offered and provide a trusted point of contact with local communities.

Agent-based distribution models

In areas with limited retail presence, agent-based models are utilized. These models depend on a network of agents who are trained to make orders of smartphones on behalf of customers and to help them select a device

based on their needs. Agents must also have the capacity to manage liquidity and accept deliveries.[39]

Online marketplaces

Online platforms and social media platforms provide options for accessing new and refurbished low-cost Internet-enabled handsets without having to travel to specific locations that have established retail stores.

Organized communities for distribution

Many emerging markets have established savings-based cooperatives and joint liability groups. These groups typically have strong interpersonal networks with high engagement and trust levels among their members. Further, they also serve as a base for device financing initiatives.

Replacement for parallel markets

Parallel markets, also known as black markets, for electronics proliferate particularly in rural and low-income areas. Mobile devices sold through these markets are often of low-quality with no maintenance or warranty offerings. Even though devices sold in these markets seem cheaper, customers often end up receiving very less value for the money they spend on such smartphones.

Challenges for improved distribution channels

First-time smartphone buyers' preference to see devices before purchasing them

Some low-income customers in emerging markets still distrust e-commerce platforms and would prefer to physically examine the products before purchasing them. This is particularly true for smartphones, which are costly. Even in the agent-based distribution model, most sales agents only have a catalogue or tablet with product ranges shown and typically do not carry any sample phones to show customers.

Low skills of some agent-based distribution channels

The effectiveness of agent-based distribution models is highly dependent on the skills of the agents. If the agents are not well-informed about the smartphone products offered, customer acquisition can be limited. Some agents are also not aware of the supportive offerings provided by distributors, like saving schemes or financing, which could vastly help customers acquire smartphones and increase the company's customer base.

Empirical evidence for improved distribution channels

This research studied eight cases on distribution channels and found that effective ways to provide last-mile coverage for distribution channels, especially to rural and low-income people, have the potential to broaden reach and improve smartphone access. The distribution of these case studies was as follows: two case studies on expanding retail footprints, one case study on structured agent-based distribution models, three case studies on online marketplaces serving as substitutes to retail outlets, and three case studies on leveraging organized communities for improved distribution channels.

The study found that rural and low-income communities have less time on their hands and lower disposable income, especially for women. Bringing handset offerings to their doorstep reduces the time and cost barriers to smartphone ownership. The following are some of the key findings of the research.

Empirical evidence for expanding retail footprints

MNOs can broaden their customer base in rural areas by partnering with pre-established retailers in nearby areas. For example, MTN South Africa partnered with the Edcon retail group during the launch of their flagship MTN Steppa phones. MTN leveraged the footprint of Edcon group through this alliance, which had 1,273 stores nationally. [40]

Tecno Mobiles operates a franchise retail distribution network in Ghana, Cameroon, Nigeria, Mozambique, Kenya, Tanzania, Uganda, and Ethiopia to sell Tecno Mobiles' devices. In countries like Tanzania, this retail franchise network has established a strong presence in rural areas, improving smartphone access to populations that are typically harder to reach.[41] Tecno Mobiles has sold more than 45 million mobile phones in the African market and accounts for approximately 50% of the market share.

Empirical evidence for structured agent-based models for rural distribution

Structured networks of agents help meet the demand for smartphones in peri-urban and rural areas. They communicate with local residents and provide them product catalogues. They may also offer an individual or group-based savings plans to assist customers in purchasing the device of their choice. Some networks also offer mobile money as a method of making payments.

Copia, launched in 2013, is a consumer catalogue order and delivery company which uses the agency model to sell smartphones to the base of the pyramid (BoP) customers. Copia's strategy is to recruit small business owners who have established relationships with local populations and train them to be sales agents. [42]

With the Copia agent-based distribution model, a typical rural customer from Kenya could avoid KSH 500 (USD 5) on a roundtrip bus fare to the nearest town to acquire a smartphone. Customers can also have a savings plan with the local sales agent through a "layaway plan," where they deposit money with the agents until they have accumulated enough capital to purchase a smartphone. However, some Copia sales agents are not well-versed in Copia's offerings and often need focused training sessions to assist their customers. Copia customers also reported being unsure of buying smartphones from catalogue pictures or application-based information.

Empirical evidence for online marketplaces to improve distribution

In 2015, Alibaba partnered with China Telecom to launch a pilot programme that relied on e-commerce to sell low-cost mobile handsets to rural and underserved populations across China. The "Tianyi Taobao" handsets in this initiative came with pre-installed Taobao shopping applications or the YunOS mobile operating system developed by Alibaba as a default feature, depending on the target customer base. Alibaba also leveraged the 15,000 retail outlets of China Telecom in rural China for this project.[43]

In 2016, Kilimall Uganda partnered with device manufacturer Infinix Mobility to launch the Infinix Note 3 mobile devices at approximately USD 148 and the Hot 4 mobile device at approximately USD 115. This partnership also sold refurbished Apple smartphones. Kilimall, in partnership with Safaricom, allowed its customers to purchase subsidized smartphones online using their Bonga loyalty points. The Kilimall messenger delivery network allows delivery of the smartphones to rural areas across Kenya and Uganda.[44]

Jumia partnered with MTN Kenya and MTN Nigeria to sell a range of sub-USD 100 smartphones on their online platform. They sold the MTN-branded Smart S720i (USD 57) and Smart Mini S620 (USD 47). Jumia also partnered with Tigo in Ghana to sell smartphones on their online platform with a 1 GB free data bundle offering. MTN and Tigo benefitted with higher customer acquisition during their partnership with Jumia.[45]

However, research shows that some rural and low-income communities still distrust e-commerce platforms to make purchases of such high expenditure products.

Empirical evidence for leveraging organized communities

Mara Phones in Zambia launched a pilot project to sell and finance smartphones that utilized pre-established and organized cooperatives

such as tea farmers, coffee farmers, private security guards, teachers, and nurses. These cooperatives acted not only as institutions to offer device financing but also as aggregated delivery points for distributing smartphones purchased by its members.

RUMA (Rekan Usaha Mikro Anda) collaborates with community-based savings groups to enable its members to acquire smartphones in rural and peri-urban Indonesian regions by employing dedicated and authorized RUMA agents to facilitate the process. RUMA offers a catalogue ordering model, similar to Copia, to help the savings group members in rural areas access mobile Internet at fair prices.[46]

Similarly, Savex, an electronic distributor that manages the supply chain process for Samsung smartphones, partnered with Sonata Finance, an MFI in India, to launch a programme that distributed Samsung J2 smartphones to rural areas in North India.

3.3 Interventions that merit further exploration

3.3.1 Intervention for further exploration - device subsidies

Device subsidies are one of the most universal ways of making smartphones affordable to customers who do not have mobile Internet access. Many MNOs, governments, handset manufacturers, and third-party financers provide device subsidies to promote smartphone access. They often bear a part of the device cost to lower the price for the customers by investing large amounts of money into subsidy programmes. Smartphone providers aim to reduce the price of handsets at the point of sale by identifying potential cost-saving opportunities at different points in the supply chain and by focusing on only the essential features required by the population being served.

Opportunities for device subsidies

Private sector device subsidy programmes

Several MNOs and device manufacturers have researched the essential needs of their customers to provide the most robust smartphone experience at lower costs. Price-conscious customers find it challenging to afford high-end smartphones with multiple functionalities, most of which they may not use. Device manufacturers and MNOs strategize to reduce the cost of production of the smartphones at the manufacturing level by optimizing device hardware and software to only provide customers with the services that are beneficial to them.

With improved technology, the development of lightweight mobile operating systems allows cost savings in the manufacturing level,

Recommendations for improved distribution channels

- Partner with local retail chains and community organizations with whom local customers already engage have high levels of trust.
- Invest in training sales agents so they can effectively assist customers through the process of smartphone purchase and acquisition. This can also help to expand the awareness of potential customers on various services available.
- Provide agents with sample handsets to help first-time and price-sensitive customers decide on smartphone purchases.

which translates to lower price for customers. Such operating systems are also optimized to consume less data, reducing the ongoing costs of owning the smartphones.

Device manufacturers also save manufacturing costs and offer lower prices by omitting higher-end features of smartphones that are not essential to the everyday lives of their customers. They must balance low-cost components with maintaining a good quality end product by keeping in mind the price-to-quality ratio as the customers who need device subsidies will also require robust handsets that last longer to give them value for their money.[47]

Strategies to reduce device costs

Improving efficiency throughout the value chain reduces the per unit cost of manufacturing handsets, allowing smartphone providers to reduce the overall price charged to customers.

There are several ways for device manufacturers to reduce procurement costs, including:

- Facilitating centralized procurement to achieve purchasing economies and joint marketing.
- Vertical integration, where a company that owns more than one part of the supply chain can restructure costs and reduce prices.[48] For example, when a company owns and controls both design and distribution channels of a smartphone, they can subsidize the handset price for the end user.
- MNOs partnering with device manufacturers to produce smartphones under their own brand name avoid royalty fees and profit from bulk purchases, passing on the cost reduction to the customers.

An overall assessment of joint marketing indicates that this initiative is growing in popularity and is contributing towards addressing smartphone access, especially in emerging markets. Innovative approaches to selling devices developed jointly by key stakeholders deliver acceptable services while keeping prices down. Joint marketing can leverage common goals pursued by different entities. Some of the key opportunities for collaborations are among MNOs, emerging mobile phone manufacturers, and emerging software developers who are thriving towards optimized customer experiences that fully leverage the device's capabilities with an attempt to break the monopoly of international companies.[49]

Government initiatives

Governments are partnering with MNOs to effectively subsidize smartphone devices for people belonging to low-income, rural, and marginalized populations. These subsidies are often paired with mobile data bundles to help customers access the Internet as soon as they acquire a smartphone and aid their data consumption. Government subsidies usually focus on targeted groups like low-income households, telehealth workers, microentrepreneurs, teachers, students, and persons with disabilities. Governments also provide allocated funds to third parties involved in improving smartphone access in their nations.

Another possibility is the use of Universal Service Funds (USFs) to subsidize devices. USFs are public funds, financed primarily through contributions made by MNOs and other telecommunication companies, intended to expand communications services to underserved areas and populations.[50] Currently, USFs are used primarily to build higher-bandwidth infrastructures and provide better mobile coverage. But without affordable devices to access the Internet, higher coverage cannot be productive in improving connectivity. USFs can be used to provide device subsidies to communities that need them the most and to expand mobile Internet usage.[51]

Various reports have demonstrated the underutilization of USFs in many countries across the globe, estimating that USD 408 million were left unused in 2017 across Africa alone.[52] This fund is said to be sufficient to provide smartphone access to over 6 million women. As of 2021, Latin America and the Caribbean has at least USD 7 billion in USFs

that are not being used for the purpose of telecom projects.[53]

Device replacement to facilitate the transition from 3G to 4G/5G

There is consensus among MNOs and regulators on the need to transition customers from 2G/3G to 4G/5G networks. The potential benefits associated with new generation technologies (4G/5G) include faster speeds and powerful advanced applications. The advanced technologies also benefit service providers as they are economical to maintain.[54] Currently, higher income countries are at the forefront of transitioning customers to next generation technologies, but this process is also gaining traction in LMICs which are capitalizing on several opportunities. Stakeholders are offering subsidized devices to accelerate the adoption of 4G devices and limit legacy technologies, arguing that 4G network offers near-nationwide coverage and better user experience for voice and data traffic.

Photo credit: ©WHO

Challenges for device subsidies

Requirement of large up-front investments

Device subsidy initiatives require a large initial investment from the parties providing the subsidies. There is not enough evidence to prove that this large investment will be entirely covered by new customer acquisition and increased data consumption from the device subsidy programmes.

Ongoing costs of owning smartphones

Even if customers can pay the subsidized upfront cost of smartphones, they may not be able to afford the on-going maintenance and usage costs.[55] Accessing mobile Internet through smartphones requires reasonably priced data plans and a consistent source of electricity for charging mobile phones, which may not be available to all customers. Among the device subsidy programmes analysed in this study, a considerable number of them omitted provisions of free data bundles or discounted data offerings along with reduced device costs. Apart from the Pay As You Go schemes, many initiatives also did not provide any solutions to address the electricity costs of owning a smartphone.

Risk of theft or sale of the device

Theft of subsidized devices necessarily prevents the firm underwriting the subsidy from recovering any of the benefits from data usage. In addition, customers who receive valuable devices at a discount or for free can make money by reselling the device for something close to the full price.

Empirical evidence for device subsidies

In this report, device subsidy emerged as the second-most common mechanism used by different parties for improving smartphone access, including MNOs, device manufacturers, and governments. In this research, 13 examples of device subsidies were identified, out of which five were documented, along with conducting stakeholder interviews and desk

research. Seven case studies involved private sector device subsidy initiatives, and two were on government subsidies. Four case studies identified methods to improve efficiency gains to provide subsidies, and two case studies demonstrated the utilization of USFs for smartphone subsidy programmes. Most of the device subsidy initiatives were long-running and well-established, having been around (on an average) for four years or more.

Device subsidies have been reliable in increasing smartphone access as they provide relief to customers who cannot afford the average retail price of good quality smartphones. Our research-based case studies had the following findings on device subsidies.

Empirical evidence for the popularity of private subsidy programmes

Seven case studies in this research consisted of private sector device subsidy initiatives. Four of the most prominent among them were programmes in which private sector parties such as device manufacturers and MNOs partnered to optimize the operating system and hardware components of the smartphones to address only the most essential needs of the customers.

For example, Safaricom launched the Maisha Ni Digital (Life is Digital) campaign in 2018 by partnering with Google to provide entry-level smartphones to low-income customers at reduced prices, particularly among women in rural areas. These phones ran on Google-owned Android (Go Edition) designed specifically for low-end and ultra-budget smartphones, which uses less memory, storage, and data than the base-level operating system. Safaricom's flagship Neon Ray smartphone costs KSH 3,999 (USD 35) making it one of the cheapest 4G enabled smartphones in Africa. Smartphones with similar specifications cost over USD 60 in the retail market. Device subsidies through this programme were so successful that over 900,000 smartphones were sold in Kenya through this initiative in the first three years.[56] As of July 2022, 2 million Safaricom devices had been sold through Maisha Ni Digital, and the programme remains ongoing.

Similarly in South Africa, MTN teamed up with Qualcomm in 2013 to help customers upgrade from feature phones to smartphones by launching the MTN Steppa phone. This phone ran on a customized version of Android Gingerbread and Qualcomm Snapdragon processor with pre-loaded applications to serve the needs of their customer base, undercutting the cheapest phones available at the time.[57] The MTN Steppa device subsidy resulted in over 200,000 smartphones sold in just the first four months of the initiative.[58]

Some MNOs did report transitioning away from subsidies in favour of device financing programmes. For example, Safaricom has invested over 1 billion KSH (USD 10 million) on subsidizing smartphones between 2018 and 2022, requiring subsidies as high as USD 13 per device. Safaricom has reduced its reliance on device subsidy programmes to less than 15% of earlier investments in favour of increasing its focus on device financing.

Empirical evidence for programmes to address the ongoing costs of smartphone ownership

A few private subsidy programmes also addressed the customers' ongoing costs of owning a smartphone. For example, the customers of the Vodafone Smart Kicka phones received five free 50 MB power bundles, which functioned as an additional incentive to purchase and to continue mobile Internet use, increasing data consumption. Making its device subsidy programme more attractive with data bundles helped Vodacom sell over 3 million low-cost smart devices in just one year.

Empirical evidence for strategies to reduce the costs of device acquisition

Four case studies in this research showed that attempts to reduce costs at every level of the supply chain go a long way in subsidizing the selling price to customers.

For example, MTN's centralized procurement for the entire MTN Group approved a set of handsets for all businesses within a country which helps them reduce costs across the value chain.

Vodafone leveraged central purchasing centres to create the Vodafone-branded device line up, optimizing costs. More than 100 million Vodafone-branded devices have been sold worldwide. Moon Senegal manages both the design of its smartphones, which balances affordability with high-quality, and the implementation of door-to-door distribution by a network of Moon agents to reduce overall cost of devices.[59]

In some cases, MNOs have partnered with phone manufacturers to reduce device costs. Vodacom partnered with manufacturer Alcatel to launch a Vodacom-branded smartphone called the Smart Kicka. Orange, in partnership with Google, also launched a smartphone under its own brand, allowing them to offer smartphones for less than USD 30 by avoiding royalty fees on branded handsets.[60]

Such cost reductions at different levels of the supply chain get passed on to the customer as device subsidies.

Empirical evidence for strategic partnerships with providers of complementary services

In other cases, device manufacturers teamed with advertising providers to reduce costs. Social Eco devised a pilot Humanity $1 Smartphones initiative that utilized pre-loaded advertising applications on Social Eco smartphones that cost on average USD 50 as an alternative way to generate funding to reduce per device cost to customers. This programme decreased the price of a smartphone by up to 98% for low-income individuals, slashing the cost to low-income households by about USD 49. Social Eco expanded the advertisement strategy to provide USD 10 smartphones as well. Social Eco also encouraged donors on their platform to help support their low-income customer base either by purchasing a smartphone for them or by supporting them by funding their monthly broadband connectivity bills which range from USD 5 to USD 10 per month.

KEIPhone is a Ugandan company that assists unconnected women by providing them free smartphones and solar power chargers to promote gender equality and female empowerment.[61] These smartphones are paid for by ad-based revenue models. Customers with KEIPhone devices get personalized advertisements, video content, and surveys that pay for the cost of both the mobile devices and the smartphone chargers.

Empirical evidence for government initiatives, including USFs

Governments are important stakeholders that can afford the large initial investments required for device subsidy programmes to help communities access the mobile Internet. Two case studies showed that governments can successfully help their citizens purchase smartphones at lower costs.

For example, the Government of Colombia executed the "Internet Móvil Social para la Gente" policy in 2016 to provide smartphone and mobile data subsidies to low-income communities. The Colombian Government allocated USD 90 million over three years for this initiative. In 2017, Colombia was ranked first among 58 developing nations for providing affordable Internet access to its citizens.[62]

The Malaysian government provided subsidies for smartphones and data plans to provide the Bottom 40 (B40) with affordable Internet access. Supported by government subsidies, Malaysia's smartphone market grew by 10.6% in 2021, with over 12 million devices sold.[63]

Two case studies demonstrated how countries can leverage USFs to help their marginalized communities access smartphones through device subsidies. However, many countries have massively underutilized their USF budgets.

In 2014, the Malaysian government launched its Smart Device Subsidy initiative to use USFs to provide a selection of smartphones at reduced

prices to communities in rural areas.[64] Eligible individuals received a subsidy of RM 250 (USD 56) and a free Internet subscription for one year.

The government of Pakistan utilized their Universal Access and Service Funds to enable 30,000 working women from low-income households to purchase smartphones to improve digital inclusion. The smartphones provided in this programme were preloaded with a balance of Rs. 250 (USD 1.9) per month on the phones. The government also used this programme to disburse income support through m-money and e-government.

Some governments have subsidized other types of devices. For example, the US government's Affordable Connectivity Programme offers eligible households a one-time discount of up to USD 100 to purchase a laptop, desktop computer, or tablet if they contribute more than USD 10 and less than USD 50 toward the purchase price.

Empirical evidence for device replacement to facilitate the transition from 3G to 4G/5G

Countries are taking different approaches to network upgrades. In Hungary, for example, the national regulator is facilitating the transition to 4G/5G, whereas in most LMICs, such transitions appear to be led by MNOs.

In September 2019, Vodacom deployed 3G and 4G sites in Wakkerstroom, South Africa and later moved over 1,500 farm workers from 2G feature phones to 3G- and 4G-enabled smartphones. Vodacom partnered with BPG Langfontein, a farming business in Mpumalanga province, to turn Wakkerstroom into South Africa's first smartphone-only town. This device-swapping programme cost ZAR 1.9 million (USD 114,000). The initiative provided 3G and 4G smartphones to drive digital inclusion and access to services and currently, Wakkerstroom enjoys 100% Internet access for all Vodacom customers. The initiative reported some key results.

- Many rural dwellers participated in the digital economy for the first time. Examples include farmers receiving their salary via their mobile phone, and receiving skills tutorials to enhance their learning and job skills.
- Through 4G digital devices and connectivity, the people of Wakkerstroom could connect with each other in new ways. They also used the Internet to access essential government services and e-commerce.
- The area experienced a 40% increase in data usage, data traffic grew by 205% year on year, with data active customers increasing by 82%.
- School children could access the Internet and use Vodacom e-School free of charge.
- Job seekers could use their smartphones to apply for jobs over the Internet on Vodacom's zero-rated platforms through Vodacom ConnectU.[65]

In Hungary, customers are offered subsidies to purchase 4G/5G devices in exchange for their 3G devices. In the initial phase, Hungary's telecoms regulator, the National Media & Infocommunications Authority (NMHH), offered a subsidy scheme for owners of 2G and 3G devices to claim HUF 20,000 (USD 55.40). To accelerate the transition, in the second phase the regulator doubled the maximum individual allocation for upgrading a 2G/3G phone to a 4G/5G device to HUF 40,000 (USD 100).[66]

3.3.2 Interventions for further exploration – reuse of preowned smartphones

Reuse of preowned smartphones represents another widely used potential strategy for improving smartphone access across the globe. This strategy requires evaluation of the quality of used devices. Preowned devices are sold "as is" or with necessary refurbishment (normally comprising of physical intervention on the devices e.g. changing the battery).

Existing evidence does not sufficiently validate the contribution of refurbished devices towards improving smartphone access, especially in countries with significant barriers to device access. Two main concerns regarding refurbished devices are that the retail prices

Recommendations for device subsidies

While device subsidy initiatives are some of the most common, well-established, and long-running interventions for improving smartphone access, industry experts are slowly moving away from them or reducing their investments in subsidy programmes due to previously discussed long-term challenges. Some key lessons from the research can assist stakeholders in providing subsidies to manage their risks and extend support to the underserved populations.

- Identify partners willing to finance the large investments required for device subsidy, which would otherwise take a heavy toll on a single company's balance sheet. Governments must consider the development and coordination of national device and connectivity subsidy programmes in collaboration with other partners.
- Reduce ongoing costs of smartphone ownership by pairing device subsidy with data bundles. This is especially helpful for customers who cannot afford the ongoing costs of accessing mobile Internet through smartphones.
- Encourage better utilization of USFs. The strategy for meaningful utilization of USFs for connectivity should extend to include smartphone affordability and adoption.
- Budgeting for device swapping during upgrading of networks 2G/3G to 4G/5G as most devices owned by users might not work on the new generation network.
- Partner with providers of complementary services, such as advertisers. However, this study did not find sufficient evidence to prove that such ad-revenue based device subsidies are sustainable and can improve smartphone access over the long-term. Some studies also found that the advertisements that run on the smart devices may be irrelevant to low-income household individuals who cannot afford an average smartphone.

for refurbished devices may not be sufficiently different from those of new devices to attract incremental demand and that customers may have concerns about the quality of refurbished devices.

Nonetheless, there are several opportunities for device refurbishment which entities such as Vodacom are capitalizing on.

Opportunities for reuse of preowned smartphones

Substantial supply of preowned devices

The demand for new smartphones with new features remains strong. The global smartphone shipments for 2022 are expected to reach 1.3 billion units.[67] Although this marks a decline from past year shipments, future annual shipments are expected to grow as most services, including basic services, move online. The persistence of demand for new devices ensures the existence of a steady supply of preowned devices potentially available for resale.

Frequent upgrades and replacements of smartphones

Many MNOs around the world offer financial inducements to customers who trade in their old devices. Smartphones are also status symbols in some markets, which leads many individuals to purchase new devices even when

their current device has substantial usable life left. In addition, corporations bound by company policies often regularly upgrade electronic devices, including smartphones, laptops, and tablets. All of these phenomena create sources of second-hand devices that can be reused by other institutions and individuals.

Upgrades prompted by COVID-19 restrictions

Recent developments have heightened the demand for preowned devices. The shift toward working from home accelerated by the COVID-19 pandemic has led many consumers to upgrade their mobile devices to smartphones, while the general curtailment of economic activity has made many customers increasingly price sensitive. In addition, sharp increases in the cost of new semiconductor chips caused by the disruption of supply chains have made preowned devices more attractive.

Mobile network upgrades

Globally, MNOs are pursuing programmes to transition their customers from 2G/3G to 4G/5G. Mobile network upgrades to 4G/5G often require customers to upgrade their devices. MNOs, with support of regulators, are offering subsidies for customers to purchase 4G devices as they move towards shutdown of 3G networks.[68] Devices swapped during network upgrades, especially those with 3G capabilities, can be reused in countries still using 3G, although the ongoing shift toward 4G networks limits the long-term potential of this.

Enactment of e-waste management and environment protection measures

Electronic waste has increased substantially in the past few years, and it is expected to reach 75 million metric tonnes by 2030.[69] Device reuse can help reduce the amount of e-waste by extending the devices' useful lives.[70] Higher income countries, especially within the European Union, are imposing strict e-waste regulations.[71] The enactment of environmental policies promoting responsible disposal and management of electronic waste can strengthen incentives to promote device reuse.[72]

Challenges for reuse of preowned smartphones

The lack of middle- and lower-tier preowned devices

Many reuse programmes focus on premium devices, such as iPhones. The high cost of these devices means they remain unaffordable to many people even taking into account the 20%-30% discount applied to preowned devices.

Complex coordination and organization of device collection

Device reuse requires several steps, including device collection, evaluation and potential refurbishment, distribution, and disposal. These processes are often complex and challenging. Unorganized channels and strategies increase the cost of device collection and often result in limited intake of devices. Within the telecommunication sector, only a few companies have established networks between higher income countries and LMICs to coordinate device sourcing.

India presents different models for device collection, including remote diagnostics, which can be applied for device collection.

Absence of standardized quality checks

Another important consideration on sourcing of preowned devices is quality inspection. There appears to be no standardized quality assurance for preowned devices, forcing different entities to develop their own criteria and processes.

Regulations on device importation, retailing and disposal

Some countries impose stringent registration requirements on sellers of used goods. Although protecting purchasers of preowned devices is appropriate, the level of these restrictions has a direct impact on their

affordability. In addition, reuse of devices transfers the responsibility for the eventual disposal of the device from the exporting countries to the importing countries, many of which do not have any regulations governing e-waste disposal.

Negative customer perceptions

On the demand side, customers can regard preowned devices as being of lower quality. Reports that refurbished devices sometimes stop working after less than six months of use reinforce these concerns. The association of smartphone ownership and social status is another reason consumers may shun second-hand.

Empirical evidence for reuse of preowned smartphones

Device reuse has met with greater success in some regions of the world than in others. It is most developed in India, where observers estimate that the market for preowned smartphones reached USD 5 billion in 2021 and is expected to grow to USD 10 billion by 2026.[73] Leading entities in India include Cashify, HyperXchange, InstaCash, and Yaantra. These entities buy and sell devices both online and offline through a website and an app. They also partner with smartphone makers including Apple, Samsung, and Xiaomi. Indian companies have begun expanding to other regions. Cashify is expanding operations to countries including the UAE, Turkey and Bangladesh. HyperXchange has launched operations in the UK and the Netherlands.

The market for preowned smartphones is picking up in other regions of the world as well. For example, Vodacom launched its Good As New initiative to distribute refurbished iPhones in South Africa in mid-2022.[74]

Photo credit: ©ITU

Empirical evidence for sources of preowned smartphones

Resellers of preowned devices have taken different approaches to sourcing devices. Indian company HyperXchange relies on e-commerce returns and factory seconds as the primary source of its devices.

Others use retail establishments to gather preowned devices. For example, as of 2019, Yaantra, which was recently acquired by Flipkart, relies on a network of 35,000 retailers across 600 towns as sources of preowned devices. InstaCash established central locations for collecting smartphones, conducting assessments, and making repairs, as well as mobile e-waste kiosks and collections through couriers. Cashify has traditionally focused on buying and selling devices via its online platform, although it has expanded its network of retailers as well.

América Móvil in Latin America has also implemented various device recycling and reuse initiatives across their subsidiaries. They source devices with collection bins placed in stores and corporate offices. América Móvil has effectively collected over 272,000 devices for recycling during 2021 and such devices are refurbished to recover 70-80% of their components for recycling into new devices.

At a national level, the Ministry of ICTs in Namibia facilitates device collection from corporations for distribution to institutions, such as schools and health facilities. The Ministry

has established partnerships with different corporates to source devices such as laptops and tablets.

Empirical evidence for improving customer perceptions of preowned devices

Entities selling preowned devices are devising mechanisms to reassure customers on their quality. As an example, Vodacom named their programme for preowned devices Good As New. In addition, Vodacom sells these devices with a 12-month warranty that covers all repairs on internal components, software reloads, and updates, as well as the battery. It utilizes its aftercare centre (normally reserved for corporate clients) for repair and refurbishment of devices. Indian sellers of preowned devices HyperXchange and Yaantra similarly offer one-year warranties, while Cashify offers up to a six-month warranty on repaired devices.

Companies are also taking steps to verify the quality of devices in order to improve the confidence of customers. For example, Vodacom only imports devices that receive a grade of A+ under its quality tests. The quality tests focus on battery life (acceptable devices must achieve at least 80% capacity), screen, and software.

InstaCash also offers digital assessment and diagnostics of devices both online and offline. HyperXchange uses AI-based diagnostics to assess device quality.

Empirical evidence for regulatory restrictions on resale

In South Africa, entities selling preowned devices are required to secure clearance from the South African regulatory authorities and obtain licenses from the police and department of trade.

Empirical evidence for e-waste management

Engagements with experts produced consensus that device refurbishment was part of the solution towards e-waste management. Device manufacturers indicated that smartphones are designed to ensure durability. Some stakeholders, like América Móvil, partnered with specialized e-waste management firms locally during their device reuse initiatives to help them source and recycle old devices with minimal waste.

Engagements with the Ministry of ICTs in Namibia indicated that the country was developing and implementing e-waste policies to regulate the disposal of electronics.

3.4 Lower priority interventions

3.4.1 Lower priority intervention – local manufacturing

Many observers have long pointed to local manufacturing as a potential strategy to reduce the cost of smartphones and thereby improve smartphone access in emerging markets. There are different levels of local manufacturing, ranging from complete manufacturing of smartphone components to assembly of completed components imported from other countries. Local manufacturing is often held out as a potential way to lower the high retail costs of imported devices by reducing labour costs, avoiding import duties and taxes, taking advantage of government incentives to attract investments, reducing the need for foreign currency deficit, and enabling design for local needs.

Opportunities for local manufacturing

Photo credit: ©Shutterstock

High retail prices of imported smartphones

The retail prices of smartphones in most LMICs, relative to average income, remain high. In part, these high retail prices are attributed to the fact that most smartphone devices sold in these countries are imported. The import costs of smartphone devices are also compounded by the high taxes and import duties on devices imposed by governments, especially in LMICs. Local manufacturing appeals as a way to lower total device costs by reducing labour costs and eliminating import duties/taxes/VAT and other logistics costs.

Attractive government incentives and policies

Governments across the globe are designing policies and offering incentives to attract foreign investments to boost local economies and address high unemployment. As an example, South Africa hosts the South African Investment Conference annually to solicit investments. Other countries such as Rwanda and Ethiopia are creating a conducive environment (economic zones) through policy reforms and infrastructure development to attract foreign investors. Other significant incentives offered to investors by governments include seed capital, grants, and tax exemptions. To boost consumption of locally produced products, governments are also implementing initiatives to support local manufacturers, including placing these as preferred government vendors.

Foreign currency deficit and reliance on imports

The import of smartphone devices requires significant foreign currency, a resource which most emerging markets have in limited supply. As such, reducing imports of smartphones, at times viewed as luxury goods, can lower foreign currency requirements.

Design considerations for local needs

In addition to costs, imported smartphones are often designed with limited considerations for features relevant to the local context. There is a growing need for smartphones (and other devices) which account for local needs, and local manufacturing appears to be a relevant mechanism to achieve this.

Recommendations for reuse of preowned smartphones

- Pursue strategic sourcing of devices to reduce total costs of collecting devices for refurbishment and benefit from economies of scale. The procurement of preowned devices should also include middle- and lower-tier devices that would be sold at more affordable price points in LMICs.
- Standardize device quality testing and assurance to ensure that only devices that satisfy the required standards are imported. Such standards have been established for other types of preowned electronic equipment.[75] Aligned to this, sellers of preowned devices should also provide warranties of at least six months and an acceptable lifespan of a device. There are suggestions this should at least be two to three years for a refurbished device.
- Establish regulations on the importation, resale, and disposal of preowned devices that also avoid putting an undue burden on the distribution of refurbished devices.

Challenges for local manufacturing

Lack of local industrial ecosystems

Many LMICs attempting to improve their local manufacturing output lack the infrastructure and skilled labour needed to manufacture smartphones. Inventory management also proves to be a challenge as manufacturers have to bear the losses in cases of supply-chain disruptions and unexpectedly weak demand. LMICs often lack the industrial ecosystem to adjust to such variations.

The need to achieve scale

Smartphone manufacturing is subject to significant economies of scale that require production to reach certain volumes for the device to be produced at minimum cost. Customers also prefer smartphone brands with multinational recognition. Firms that manufacture for only a single company will struggle to reach the volume necessary to reduce production cost and to appeal to customers.

Underdeveloped supply chains

The supply chain capabilities and logistics of most emerging markets relevant to smartphone manufacturing are in developmental stages. As a result, there are inefficiencies within the supply chains and production facilities that increase the costs of production when compared to established supply chains and production facilities in countries such as China.

Production of low value components

Despite efforts to localize production of smartphone components, most components of smartphones continue to be imported. Despite efforts to increase employee skills and capabilities, factories in developing countries have yet to progress beyond the production of low-value components. This limits the value add of local manufacturing.

Limited supply of foreign currency

Most developing countries lack foreign currency and impose strict foreign currency allocation rules. Smartphone production entities are often not high government priorities, which restricts the ability of local manufacturing firms to procure raw materials and completed units. In the same vein, developing economies often experience currency instabilities that can negatively impact a local manufacturing firm's ability to service its obligations, particularly when local currency depreciates.

Competition and market penetration

Smartphones assembled or produced in local manufacturing plants struggle to penetrate local markets in which other global brands and low-cost smartphone competitors are firmly entrenched. Locally manufactured devices are not always the cheapest and customers often develop brand loyalty making it difficult for new players to penetrate the market.

Competition from phones smuggled into the country

Locally manufactured devices also face stiff competition from phones smuggled into the country. Because these devices do not have to pay import duties or taxes, they can be sold at lower prices.

Empirical evidence for local manufacturing

Local manufacturing initiatives exist in Egypt, India, Pakistan, Rwanda, Ethiopia, and South Africa. India has been producing mobile phones for more than a decade, efforts in Africa are more recent, with start dates ranging from 2011 to 2019.

India offers the most successful example. The number of phone manufacturing facilities in India has increased from two in 2014 to over 200 in 2022.[76] The country is now the second largest mobile handset manufacturer in the world. The growth in production has reduced the number of devices imported in the country

and has turned India into an exporter of devices.

Efforts in Africa have met with more limited success. In 2008, Transsion established a local facility in Nigeria that assembled imported components but eventually shifted its operations to Ethiopia in 2011. Unfortunately, assembly operations in Ethiopia are reportedly facing severe hardship, operating well below capacity and struggling to sell the devices that they are assembling, driven largely by fierce competition from phones smuggled into the country, the lack of foreign currency to import components, and restrictions on internal distribution.[77]

Mara Phone launched local manufacturing operations in South Africa and Rwanda in 2019. Mara closed its South African operations after nine months, although the business may be re-emerging under different leadership.

Empirical evidence for inability to achieve manufacturing economies of scale

The evidence indicates that local manufacturing has not led to lower mobile device costs. The primary reason is the inability to produce at high enough volumes to achieve economies of scale. Transsion reports that it can produce devices at lower cost in its central facility in China than at its local manufacturing facility in Ethiopia.

The small size of most domestic markets relative to the scale needed to realize economies of scale limits the likelihood that local manufacturing will lead to lower device costs. Although some countries aspire to achieve the necessary volume by exporting devices to other countries, such a solution can necessarily succeed only for a small number of countries and cannot support a general strategy that all countries can follow.

Empirical evidence for local manufacturing's limited contribution to the value chain

Analysis of the identified initiatives indicates that value added by local smartphone manufacturing factories remains marginal. As a result, most factories focus on device assembly and production of low-cost products such as cables. In fact, local manufacturing plants continue to import mobile phone components.

Despite decades of producing smartphones, India continues to import most components for mobile phones. Its success in improving its domestic manufacturing capabilities has been limited to low value-added functions, such as assembling imported cells into battery packs. However, one of the initiatives, Mara Phones, is working to address this challenge by engaging in the production of its own smartphone assembly components.

Empirical evidence for limited relief to foreign exchange requirements

The continuing dependence on importation of most components means that local manufacturing has hardly lessened the demand for foreign exchange. In fact, the difficulties of obtaining access to hard currency remains a significant limit on local manufacturing viability.

Empirical evidence for the limits of government incentives to attract local manufacturing

Evidence from the expert interviews and review of reports indicate that investments in local manufacturing are largely motivated by the attractive policies set by host countries to stimulate investments in local manufacturing, improving infrastructure, and labour availability.

For example, Mara Phones was attracted to South Africa by the supportive government policy that extended tax exemptions to the smartphone manufacturing businesses. Despite initial efforts in Nigeria, Transsion transferred its operations to Ethiopia in part to take advantage of an information industrial park created by the Ethiopian government.

India demonstrates the impacts of local manufacturing on reducing imports showing that over seven years, the country shifted from importing USD 8 billion in mobile phones to exporting USD 3 billion in mobile

phones.[78] This success was mainly driven by attractive government policies and reforms such as India's Production Linked Incentives encouraging investments in the electronics sector as well as the Made in India initiative which promoted use of locally manufactured products.

Empirical evidence of competition from established brands

Evidence from expert interviews and catalogues of mobile devices indicate that devices manufactured locally sell for prices that are similar to (and in some cases higher than) those of imported smartphones. This further debunks the perception that local manufacturing contributes to a reduction in the costs of devices.

Empirical evidence regarding strategic partnerships

The success of local manufacturing initiatives relies on strategic partnerships to procure raw materials, device distribution, and financing. In this study, experts reported that Transsion partners with Safaricom, a mobile network operator, to facilitate distribution of its devices. In South Africa, Transsion partners with Vodacom providing Vodacom-branded devices. On the other hand, Mara Phones is establishing partnerships with cooperatives in Rwanda and Zambia to pilot device financing initiatives.

There are also partnerships between device manufacturers and software providers such as Google. However, these partnerships can have constraints when the software companies request specific device features such as minimum memory as part of the arrangement.

Empirical evidence that local manufacturing captures local context features

Local manufacturers such as Transsion produce smartphones that address the needs of the local markets. Examples of adaptations include changes to hardware selection (e.g. cameras that adjust to the local preference/parameters). Further, the manufacturer also designed the device ecosystem to include specific applications appropriate for local needs (e.g. voice assistants, light reader, boom play).

3.4.2 Lower priority intervention – smart feature phones

Another approach to making devices more affordable is the development of smart feature phones that can be manufactured at lower cost than smartphones and still provide basic Internet access and support many other online services. Opportunities for manufacturing smart feature phones include reducing device costs and innovations relating to mobile phone operating systems.

Recommendations for local manufacturing

- Avoid relying on local manufacturing as a primary strategy.
- Develop strategic partnerships between local manufacturers and other value chain stakeholders, such as local cooperatives, to improve smartphone access.
- Develop local supply chain capabilities and logistics which will not only benefit smartphone manufacturing factories but the broader manufacturing sector.

Opportunities for smart feature phones

Reduction of device cost

Retail prices for smartphones are high in developing countries relative to average income. Given that retail prices for mobile phones are influenced by the features of a device, there are suggestions that rethinking the design of devices, e.g. combining features of smartphones and feature phones can deliver affordable handsets with sufficient capabilities.

Innovations on operating systems

Another key development in the mobile phone sector relates to innovations in mobile operating systems. Android and iOS continue to dominate the mobile phone market, but there are emerging alternative operating systems, such as KaiOS, which can support other mobile phones.

Thin clients

Another approach to lowering device costs is reliance on "thin clients". In the extreme, these devices contain only a bare-bones operating system capable of operating a browser and rely exclusively on cloud-based applications accessed through that browser. This design eliminates the need for local storage, simplifies the necessary operating system, and minimizes the hardware required to support the device, although the device would still have to support key physical attributes that users demand, such as adequate screen size and touchscreen features.

Influx of first-time mobile Internet users

As mobile broadband reaches more than 95% of the globe, more people are joining the Internet for the first time. Smart feature phones are cheaper and can deliver key functionalities, such as messaging applications and social media applications appropriate for first-time users.[79]

Challenge for smart feature phones

High costs of mobile phone components

Although smart feature phones can cost less than smartphones, they still rely on many of the same components. Recent trends show component supply constraints that keep prices high. There are also technology-centred limiting factors associated with chipsets and other components, such as patent royalties, that apply to all devices.

Empirical evidence for smart feature phones

Empirical evidence of proof of concept for basic services

Several device retailers are currently selling smart feature phones. Both MTN and Vodacom launched their own smart feature phones in 2019. Furthermore, as proof of concept, there are different smart feature phones developed using the KaiOS. These devices include Nokia 8110 4G (2.4-inch display and a 2-megapixel rear-facing camera), Jio Phone, and Jio Phone 2 (512 MB of RAM and 4 GB of storage).[80] These low-cost devices are not able to support the higher-level functions associated with 4G.

Empirical evidence of smart feature phone's inability to achieve significant reductions in cost

Two initiatives focusing on developing smart feature phones capable of supporting higher-level functions were identified. These were Mozilla and Google. However, the study also identified that several MNOs, including MTN, Vodacom, and Orange, are selling smart feature phones to their customers.

Mozilla's effort focused on developing an alternative operating system in 2015. However, the project faced numerous challenges, resulting in its eventual suspension. Reports suggest that this early work was critical for the development of the KaiOS.

Recommendations for smart feature phones

- Recognize the limits of relying on smart feature phones as a standalone intervention.
- Improve computing abilities of smart feature phones to expand benefits. However, this will necessarily increase the cost of devices.
- Explore thin clients.

On the other hand, Google in conjunction with Vodafone also attempted to develop a smart feature phone but faced challenges similar in nature to those experienced by the Mozilla team. Although they did succeed in developing a smart feature phone, the cost was not sufficiently lower than that of a smartphone to justify the project.

The main finding from both initiatives was that efforts to develop smart feature phones are failing to gain significant traction. Attempts to reduce features of the phone did not translate to the envisioned level of price erosion.

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4

Translating our findings into action: A five-point plan to increase smartphone ownership

Section 4: Translating our findings into action: A five-point plan to increase smartphone ownership

In order to translate our findings into tangible outcomes, it is essential that stakeholders work together on the interventions identified – device financing, taxes and import duties, improved distribution channels, subsidies, and preowned devices. This requires the collaboration of stakeholders and as such, the report recommends a five-point action plan and the establishment of taskforces to drive concrete commitments and to conduct further research and pilots in specific areas. As highlighted throughout the report, all actions must take into consideration existing inequalities and environmental sustainability.

Action 1: Initiate win-win partnerships with players across the digital value chain

Every part of the mobile Internet ecosystem, from hardware manufacturers to service providers, to digital platforms, to governments, benefits when unconnected populations come online. As such, it should become the shared responsibility of all players to undertake joint efforts to overcome the digital divide, and to unlock barriers at their respective stages of the value chain. Other key partners include local retailers, device financing companies, device lock providers, sources of alternative credit scoring, community organizations, cooperatives, and joint liability groups.

Action 2: Improve regulation on smartphone recycling and develop quality standards for preowned smartphones

The establishment of uniform quality assurance standards for preowned smartphones, and harmonized import regulation on e-waste would greatly facilitate the procurement and distribution of preowned devices, protect customers, and begin to address the global e-waste challenge.

Action 3: Develop strategies for recycling of middle- and lower-tier devices

The recycling ecosystem for smartphones prioritizes higher-tier devices, such as iPhones and Samsung-branded phones, whose price point remains too high for residents of LMICs even for preowned devices. Developing new strategies for generating reliable sources of middle- and lower-tier smartphones would generate improved flow of devices at pricepoints suitable for LMICs.

Action 4: Explore the use of Universal Service Funds and other government subsidies for smartphones

Some governments have begun shifting USFs from building infrastructure to projects focused on other elements of connectivity, such as devices. Governments should continue to expand these initiatives, and those without USFs can explore use of subsidy programmes, developed and implemented in consultation with industry and other stakeholders.

Action 5: Further explore the overall economic benefits of reducing tax and import duties on smartphones

Ministries of ICT and Finance should work together to balance tax and custom duty policies with broader Internet adoption and subsequent revenue generation. This may imply undertaking policy research to better understand how tax reductions can stimulate greater levels of economic activity and general revenue. This would include learning more about whether the reduction of import duties can also shift smartphone sales from informal grey markets to more formal markets that are subject to taxation.

5

Conclusion[1]

Conclusion

This report, grounded in in-depth research, is the first multi-stakeholder analysis of the topic under the ITU/UNESCO Broadband Commission for Sustainable Development. The Working Group behind this report has instigated a better understanding of the importance of promoting broader access to smartphones and identified interventions that hold the most promise to help.

Empirical evidence drives the recommendations in this report. It is now up to future working groups, task forces, governments, policymakers, and industry to take the steps necessary to translate the research into outcomes for the 2.7 billion people still offline. The opportunities and benefits are clear. The time for action to achieve universal smartphone access is now.

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