Digital Lives

Meaningful Connections for the Next 3 Billion

Pathways for Prosperity Commission
Technology & Inclusive Development

Blavatnik School of Government
University of Oxford

Cover Image, 12 year old Lakshita
looks at her phone, Udaipur, Rajasthan, India.
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FOREWORD

This report is guided by two central truths. The first is that digital technologies are rapidly revolutionising almost every aspect of life as we know it. The second is that access to these technologies is not equally available to all people.

Women, people living in poverty, and rural communities often find themselves on the wrong side of a dangerous digital divide. Unless we are deliberate about empowering these already marginalised groups to participate in our increasingly digital economies, societies and political systems, new digital opportunities may only magnify inequality and exclusion.

As co-chairs of the Pathways for Prosperity Commission on Technology and Inclusive Development, we are proud to be working with a talented and diverse group of commissioners from government, the private sector and academia. Hosted and managed by Oxford University's Blavatnik School of Government, the Commission aims to catalyse a new dialogue and encourage country-led solutions to make frontier technologies work for all.

To ensure the next three billion people are included in the promise of a digitally-enhanced future, we urge anyone with a stake in this – citizen or cabinet minister, entrepreneur or corporation – to focus action on four priorities:

- Urgently connect the poorest and other excluded groups to digital infrastructure;
- Address the fundamental barriers that prevent take-up and effective usage, including social discrimination and educational hurdles;
- Encourage a vibrant digital ecosystem of innovative entrepreneurs and businesses; and
- Ensure that the most vulnerable are empowered in demanding transparent and trustworthy digital services.

While we are aware of the potential perils of this moment, we are fundamentally optimistic about the role technology can play in driving progress toward a more equal world. We hope that this report – and the stories it highlights – contribute to a necessary conversation about ensuring the promises of the digital age extend to everyone.

Melinda Gates **Sri Mulyani Indrawati** **Strive Masiyiwa**

ACKNOWLEDGEMENTS

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The breadth of this report was made possible through a number of partnerships and collaborations. Financial Inclusion Insights shared with us their full 2017 survey dataset across seven countries, which forms the basis of several insights about access and usage. Chapter W, an NGO based in Singapore and Indonesia helped coordinate field interviews in West Nusa Tenggara, Indonesia. The UNICEF Innocenti Research Centre shared unpublished analysis on Ghanaian youth's access to and usage of the internet (more insights from this will be published separately). And digital finance company TALA (the CEO of which is a Pathways for Prosperity commissioner) shared aggregated data from their work in the Philippines, Mexico, Tanzania and Kenya.

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ABOUT THE PATHWAYS COMMISSION

The Pathways for Prosperity Commission on Technology and Inclusive Development is proud to work with a talented and diverse group of commissioners who are global leaders from government, the private sector and academia.

Hosted and managed by Oxford University's Blavatnik School of Government, the Commission collaborates with international development partners, developing country governments, private sector leaders, emerging entrepreneurs and civil society.

The Commission aims to catalyse new conversations and to encourage the co-design of country-level solutions aimed at making frontier technologies work for the benefit of the world's poorest and most marginalised men and women.

Pathways Commissioners:

- Melinda Gates – Co-chair of the Bill & Melinda Gates Foundation
- Sri Mulyani Indrawati – Minister of Finance in Indonesia
- Strive Masiyiwa – Founder and Executive Chairman of Econet Group
- Professor Stefan Dercon – Professor of Economic Policy at the Blavatnik School of Government and the Economics Department, and a Fellow of Jesus College. Director of the Centre for the Study of African Economies
- Professor Benno Ndulu – former Governor of the Central Bank of Tanzania
- Dr Kamal Bhattacharya – CEO of Mojochat
- Shanta Devarajan – Senior Director for Development Economics and Acting Chief Economist at the World Bank
- Sigrid Kaag – Minister for Foreign Trade and Development Cooperation in the Netherlands
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- Maria Ramos – Chief Executive Officer of Absa Group Limited
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- Shivani Siroya – Founder and CEO of TALA

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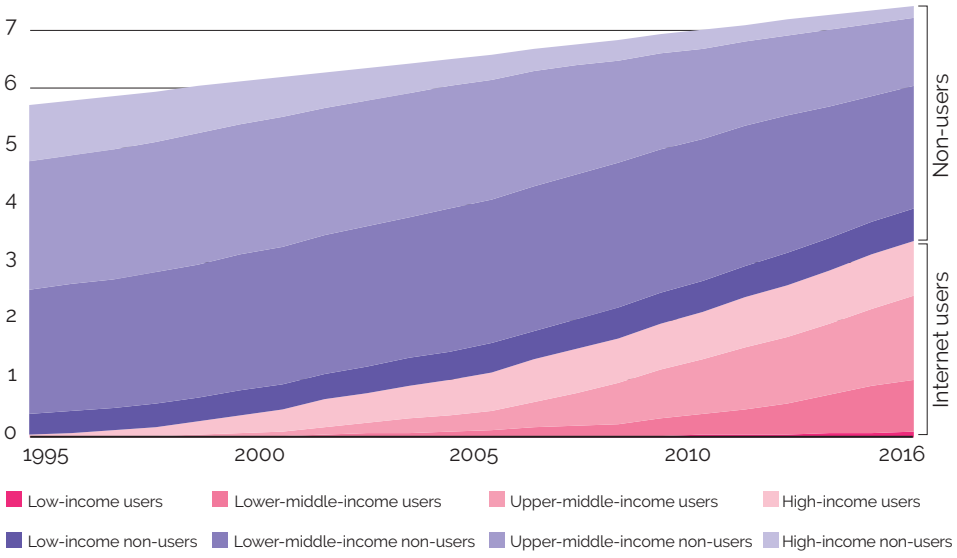
EXECUTIVE SUMMARY

Digital services are connecting people in developing countries to knowledge, jobs, businesses, their governments and to other people. Digital platforms have connected more than a million self-employed motorbike drivers in Indonesia to customers, and allow Indian citizens to safely and instantly report bribery. Simple SMS reminders are improving the quality of treatment and thereby health outcomes for people living with HIV in Nigeria, Cameroon and Brazil.[1] There has been great progress over recent decades in expanding networks – with 80% of the population covered across even low-income countries. Yet barriers to access remain considerable. Despite the expansion of cellular networks, Figure ES1 shows that less than 12% of the population in low-income countries use the internet. But even at current growth rates, three billion people in developing countries will not be using the internet by 2023. There is still much work to realise the great potential of digital access.

Figure ES1. **Internet users and non-users by their country's income class**

Population in billions of people



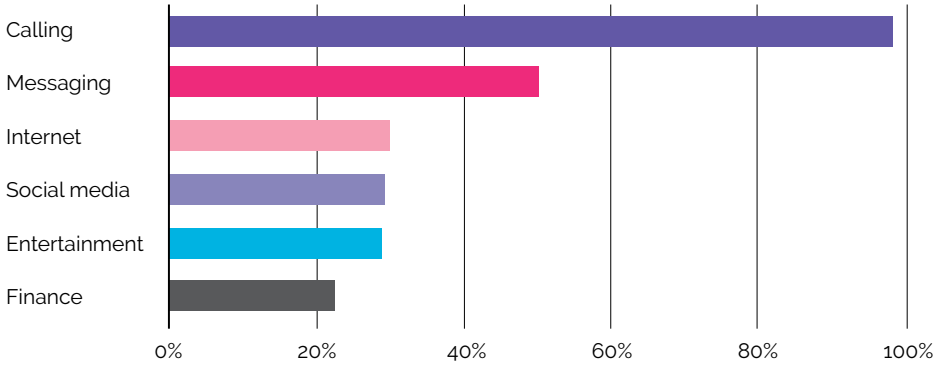
Source: ITU (2018) ICT Indicators Database, Pathways Commission analysis.

Note: country groups are based on income status in 2016; these categories are for the total population, including children and infants.

Impact is ultimately determined by usage; access alone is not sufficient. The global debate focuses significant attention on access – closing the infrastructure gap and connecting the unconnected. But we find that the gap in usage among those who have a connection is equally problematic; only a minority of people in developing countries actually use digital services. Figure ES2 illustrates levels of digital experience across seven countries in Africa and South Asia. Almost everyone has made a phone call at some point in their lives, but usage drops off rapidly for more complex digital functions. Even the most rudimentary of digital services, such as SMS, are not being used by the majority of people.

Figure ES2. **People do not take advantage of all the available functions on a digital device**

Percentage of people in developing countries who have ever used specific digital functions



Source: Financial Inclusion Insights (2017), Pathways Commission analysis.

Note: These are average numbers from a dataset covering Kenya, Tanzania, Uganda, Nigeria, Bangladesh, Pakistan and India.

Digital exclusion – both in terms of access and effective usage – is not random; it mirrors, and risks exacerbating, long-established inequalities. People with limited education, women, and those in poverty are the least likely to benefit from digital technology. In Pakistan, women are half as likely as men to own a phone. People without secondary education are less than a third as likely to have used the internet than the rest of the population.[2] Even for those who do own a phone, or who have used the internet, the inequalities persist in terms of the *amount* of usage. **Marginalised people use functions like messaging and the internet less often and less intensively than the general population.** This is driven by a number of factors: lower-educated groups are excluded due to a lack of basic literacy or digital skills, women are excluded by restrictive social norms, people who live in rural areas can be excluded due to limited infrastructure. Unless these fundamental barriers are addressed, the marginalised will remain excluded from the benefits of a fulfilled digital life.

The choices made by businesses and governments will shape digital access and usage. Digital architectures – the choices made by businesses and government and the ecosystem that emerges – are the fundamental background forces that shape the types of digital lives available. Major components of this are business models and pricing. Connecting people in poverty is predominantly a matter of affordability, but the business-as-usual approach – setting prices to recover infrastructure investment – will never be affordable for the poorest in society.

Indeed, the challenge for access is less about the "last mile" – over 80% of the world's population, including those in poverty, live near cell towers – **and more about finding business models or technologies that make it profitable to serve the lowest-income consumers.** This could be in the form of public funding – as in Indonesia where government and private investors are joining forces to connect the archipelago with a 13,000-kilometre fibre optic network. There are also initiatives like CSquared, a partnership involving the International Finance Corporation and Google to finance wholesale network construction. Or, it could be a cross-subsidy between customers, where businesses like Facebook and Jio have provided data for free or at low prices by cross-subsidising lower-income customers with revenues from other parts of the business. In some countries this cross-subsidisation is mandated by government regulation, such as placing statutory obligations on providers to reach a certain proportion of the population.

These projects are succeeding in getting infrastructure on the ground or temporarily boosting access along limited dimensions, **but networks still need to cover their costs, and these subsidies do not seem sustainable in the long term.** In the absence of new business models, or significantly lower-cost technologies, driving access to the poorest may require trade-offs that lead to lower-quality digital services – such as public WiFi hotspots or "edge-of-the-network" caching of content for offline access.[3] These products provide limited windows of access to digital services. While they are no substitute for real access, they may be one of the only ways to get digital content into the hands of people in poverty.

Looking beyond the price of digital services, the design of these services will also influence user behaviour. Today, an increasingly large component of communication between individuals takes place across digital platforms where the algorithms behind these platforms frequently influence who can see what, or if they see it at all. More than half of all mobile traffic in Kenya is mediated through apps owned by Facebook and Google;[4] the algorithms that run these apps are biased towards shareable or engaging content, and they have potentially substantial power to shape people's digital lives. This can influence personal matters such as individual relationships or an online hustle for work. But, it can also influence major events, such as civil strife in Venezuela or ethnic and religious violence in Myanmar, Sri Lanka and India. There is no perfect model for digital service design, but it is incumbent upon business, government and citizens to contribute to shape this digital architecture. Connection is not valuable in and of itself; so, the question becomes, what are people being connected to?

Ideally, people would be connected to a rich offering of digital services that are locally relevant and contribute meaning and benefit to the user's life. This requires the private sector and government to foster a broad ecosystem, investing in the "soft infrastructure" of integrated and interoperable services – such as digital identification or payment systems – that can deepen and diversify ecosystems. These building blocks provide a platform for innovation, and will make services more efficient and so more affordable for low-income customers. For example, the Government of India has already made huge investments in soft infrastructure, allowing third-party digital service providers to authenticate documents or verify user identity. This increases functionality of other apps and decreases the cost of developing locally relevant digital products.

Finally, government, the private sector and civil society must establish the rules and norms that shape digital architectures. Different governments are taking vastly different approaches to the question of what data should be allowed to flow across a network. At one end of the spectrum is what some call "China's great firewall", at the other end are countries that legislate "net neutrality" to outlaw any form of content filtering or moderating. Few developing countries have a clear approach to this foundational question of digital governance, and even fewer, if any, have a clear approach to regulating digital design and user protection. Digital lives are increasingly mediated through algorithms and servers, and the risk of abuse or unintended harm is real. While many regulatory remedies have been proposed, from data portability to a legal "data fiduciary duty" for data holders, this seems to be an instance where policy responses are lagging behind practice. Indeed, **this might be an opportunity where business and civil society can take the lead in developing trustworthy and transparent digital services.** This may be less about rule-setting and more about norm-setting; such as the recent Ethical OS toolkit developed to help product developers think through the implications of their design choices.[5] Nudging the design of digital services in a pro-user direction should lead to richer digital lives for all.

The challenge ahead is clear: connect the next three billion users to a positive, productive and fulfilling digital life. From the analysis described above, and detailed in this report, there are four areas where action is needed. Everyone can contribute to realising these priorities – citizen or cabinet minister, entrepreneur or corporation.

1. Drive access to the poorest and those facing exclusion, by investing in hard infrastructure and developing new business models.
2. Address the fundamental barriers that prevent take-up and effective usage, by addressing restrictive social norms and investing in basic and digital education.
3. Encourage innovation and a dynamic ecosystem of digital services, by building soft infrastructure and sensible regulatory frameworks.
4. Push for transparent and trustworthy digital services, by empowering users to understand and control their digital lives.

Now is the time to create the digital architectures for the future. Digital technologies offer such great promise to transform economies and societies, creating new opportunities for better service delivery in health, education and social protection, connecting people to loved ones, providing new pathways for economic growth and opening up new jobs and livelihoods. But, without concerted action to encourage inclusive access and effective usage, they will only entrench inequalities and leave marginalised people even further behind.

Mobile phone charging, Tanini Village, Nusa Tenggara Tengah, Eastern Indonesia. Photograph: Santirta Martendano A, Pathways Commission 2018

CHAPTER 1
Introduction

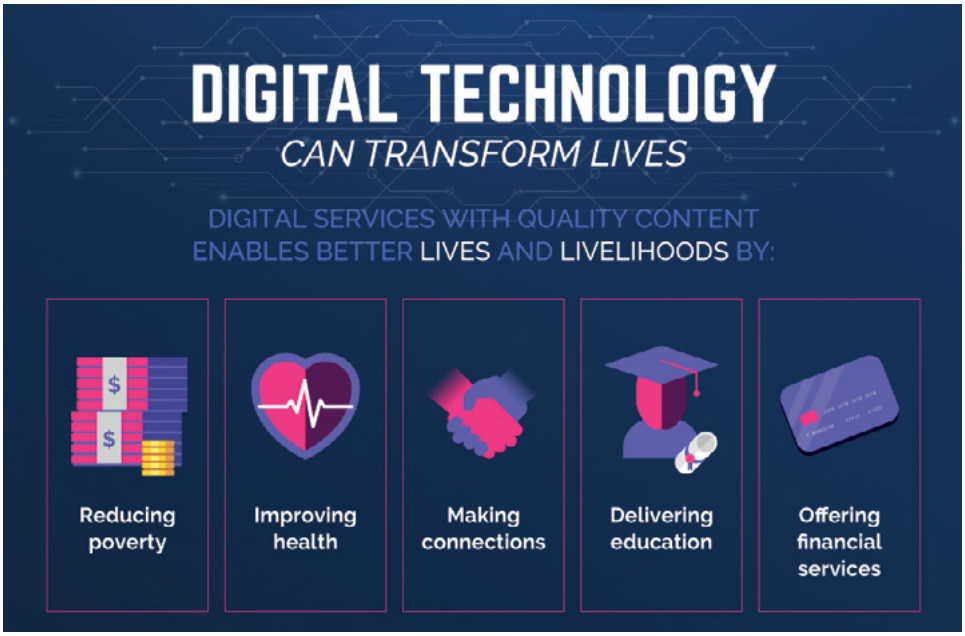
Digital inclusion matters. Digital services can facilitate development by connecting people to information, social networks, markets and their government. With businesses and governments increasingly offering services online, those that are still offline or that cannot use digital services effectively, are at risk of being left behind. Not only will they miss out on the benefits from better connectivity itself, but also potentially from the gains in income, health or education to be had from it. The fact that the digitally excluded are usually poor, rural, old, less educated or female, compounds the urgency of the situation: if unaddressed, digital inequalities will exacerbate existing socio-economic inequalities. Crucially, unlocking these benefits will not only require access to cellular network coverage and an affordable mobile phone, but also the take-up and effective usage of digital technology. And in turn, this will be driven by digital architectures: choices made by governments and businesses. This report will address the barriers that hold back effective usage, and discuss the implications for existing business models and policy choices. The message is clear: business, citizens and governments must together actively design digital architectures that are geared towards inclusion.

Digital services can contribute to longer, more prosperous and qualitatively better lives for many poor people. While digital technology alone will not eradicate malaria, put food on a plate or remove corrupt officeholders, there are many examples where it has helped to reduce poverty, improve health, increase social capital, create business opportunities for people in poverty, and improve governance. During health emergencies, the availability of fast, cheap and reliable mobile cash transfers has meant that many Kenyans no longer have to reduce their consumption of other goods (which could include a reduction in food or clothing).[6] For HIV patients in poverty, a big constraint to treatment can be adherence to an antiretroviral schedule; regularly receiving SMS reminders has significantly improved the health of patients in Nigeria, Cameroon and Brazil.[7] Digital services have provided small businesses access to loans and have connected well over a million self-employed informal sector motorbike drivers to customers in Indonesia.[8] And digital services are helping to ensure better and fairer links with government, such as through bribe-reporting platforms or better access to benefits via biometric identification in India.[9]

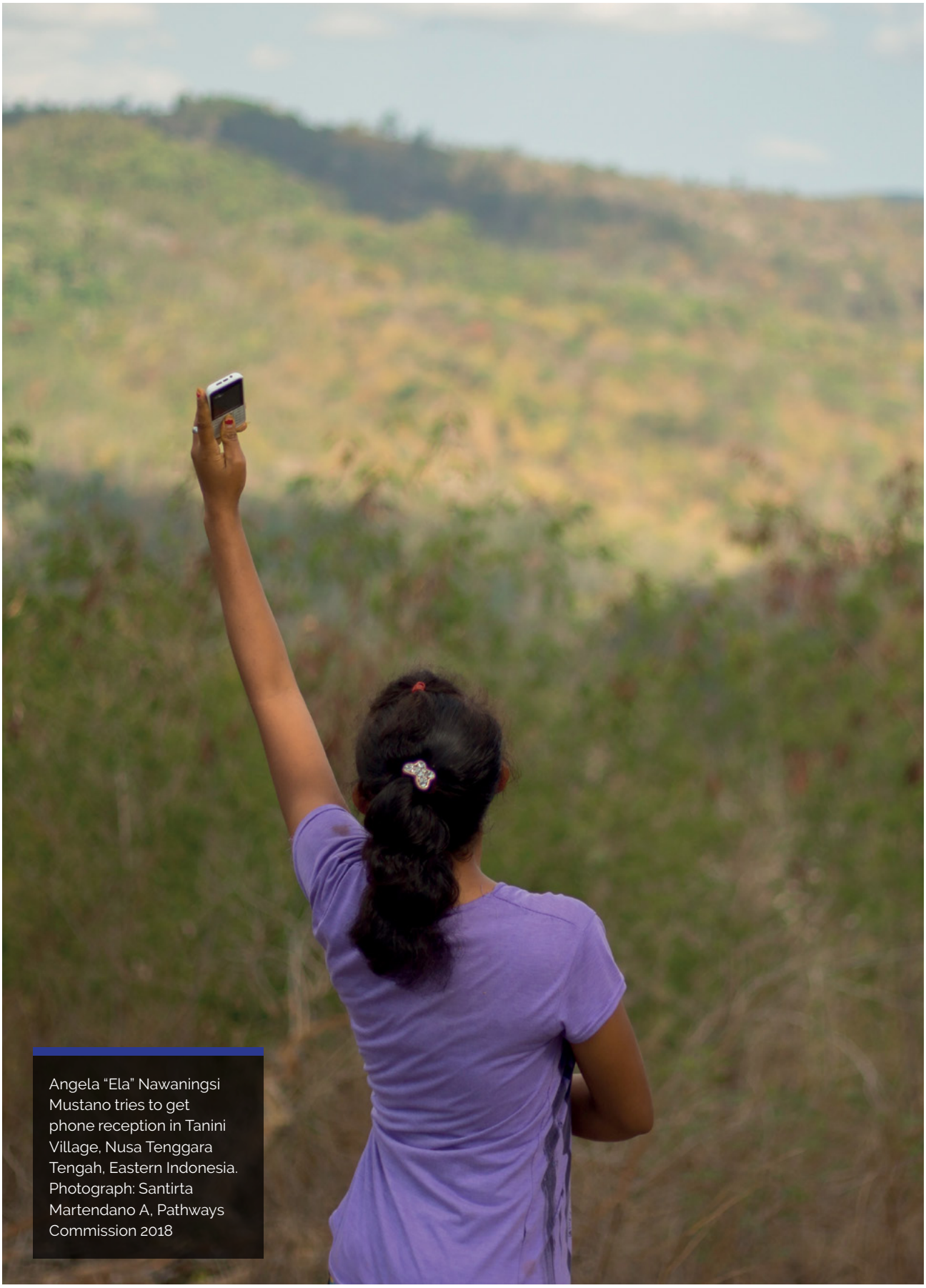
Digital services in themselves will never be a panacea – they are only one part of the development jigsaw. If health systems are poorly functioning or lack accountability in their management, then digital technologies alone cannot fix them.[10] If the investment climate is poor or human capital formation is lacking due to failing education systems, then digital technological investment will not guarantee high returns. If women or other marginalised groups continue to suffer broad patterns of social and economic discrimination, access to broadband or better network coverage will not be truly transformative. The World Development Report of 2016 called these the "analogue complements" for generating digital dividends.[11] While these are not the main focus of our report, this does not mean that these complementary conditions are of less importance.

Digital services are fundamentally about connecting people – at their best, they improve lives by facilitating and transforming interactions and relationships; at their worst they can enable manipulation. Digital services increase the ease and reduce the cost of connecting with other people – such as to exchange information or transfer money – and thereby create larger networks that could be used for knowledge, support and economic development. Digital services also allow people to link with businesses more cheaply and in new ways, providing access to goods or services such as transport or banking which would otherwise have been out of reach. Further, they provide new ways of linking to government services and of asserting rights or fulfilling obligations as citizens. However, digital services also provide businesses and governments with unprecedented information about their customers and citizens. These new tools are used to customise and mediate the flow of information but they can also be tools for control and coercion.

Many people are still excluded from the potential of digital services: digital inequalities are decreasing but there is a long way to go. While mobile phone network coverage is rapidly expanding, even in low-income settings – with close to 80% of the population covered – actual digital service use remains limited, with less than 12% of the total population in low-income countries using the internet. These real digital gaps are not on track to be closed, meaning that millions of people, many living in poverty, risk missing out on the benefits of effective digital lives. Digital inequalities will turn into further socio-economic inequalities, as businesses and governments are increasingly delivering more services digitally. Sections 2 and 3 of this report provide an update on the nature, drivers and consequences of digital exclusion. Digital outcomes are already significantly worse for marginalised groups, in particular girls and women; but more importantly, exclusion looks set to persist unless all citizens, businesses and consumers are equipped with the information and capabilities needed to participate fully in an increasingly digital world. It may mean the need to continue to provide considerable services offline for some time to come (or through offline networks of digital agents, as in Rwanda),[12] even if better digital means are possible. More sensibly, it would mean addressing digital inequalities now and with urgency.



Business, government and civil society will be the architects of new digital service ecosystems. Digital architectures – that result from business design choices and government actions – determine, to a large extent, the impact of digital services on different citizens and consumers. Section 4 of this report shows that an inclusive digital ecosystem is by no means inevitable. Large and small firms will need to develop new business models and products to serve three billion disconnected consumers and many more who are under-utilising digital services. Working with business and civil society, governments will need to develop sensible digital regulations, standards and policies with inclusion at their core, and invest with business in digital infrastructure. This means putting in place tech-savvy civil servants, providing them with resources, and placing value on data and evidence-based policy decision-making. Education will be more critical than ever, providing people with the digital capabilities and non-digital skills needed to participate fully in the digital ecosystem. Section 5 of this report concludes with our recommendations for policymakers, but we are clear that no single strategy will suit all contexts at all times. We instead offer principles and ideas that can be relevant anywhere and argue for concerted, broad-based and continuous dialogue with business leaders, governments and civil society to achieve dynamic digital ecosystems that can offer billions of potential users a positive, productive and fulfilling digital life.



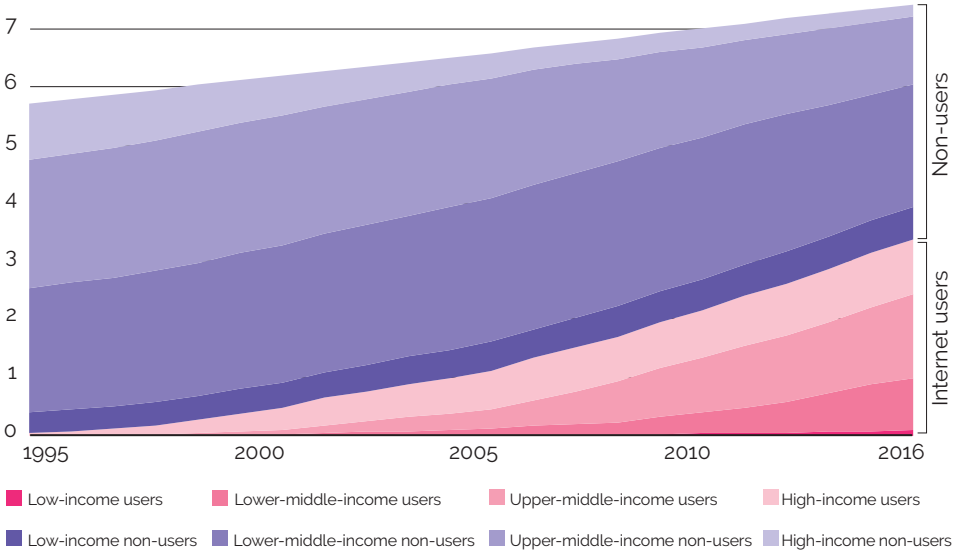
Angela “Ela” Nawaningsi Mustano tries to get phone reception in Tanini Village, Nusa Tenggara Tengah, Eastern Indonesia. Photograph: Santirta Martendano A, Pathways Commission 2018

CHAPTER 2
Digital access as the first step towards effective digital lives

Access to digital services has been increasing globally. Whether looking at network coverage or subscriber numbers, high-income or low-income countries, Europe or South Asia, the trend is the same – steady progress towards complete access. Even in low-income countries across South Asia and sub-Saharan Africa, access to digital services – measured through mobile coverage – is steadily catching up. Mobile network penetration was 80% across low-income countries in 2016. New technologies in mobile and digital communication are now adopted at an even quicker pace. While technological advancement is being driven by high-income countries, the rate at which they reach developing countries has been accelerating: basic cellular coverage reached 75% of people in lower-middle-income countries nine years after reaching 75% of people in high-income countries; for 3G networks, this time lag was only six years.

Figure 1. **Internet users and non-users by their country's income class**

Population in billions of people



Source: ITU (2018) ICT Indicators Database, Pathways Commission analysis.

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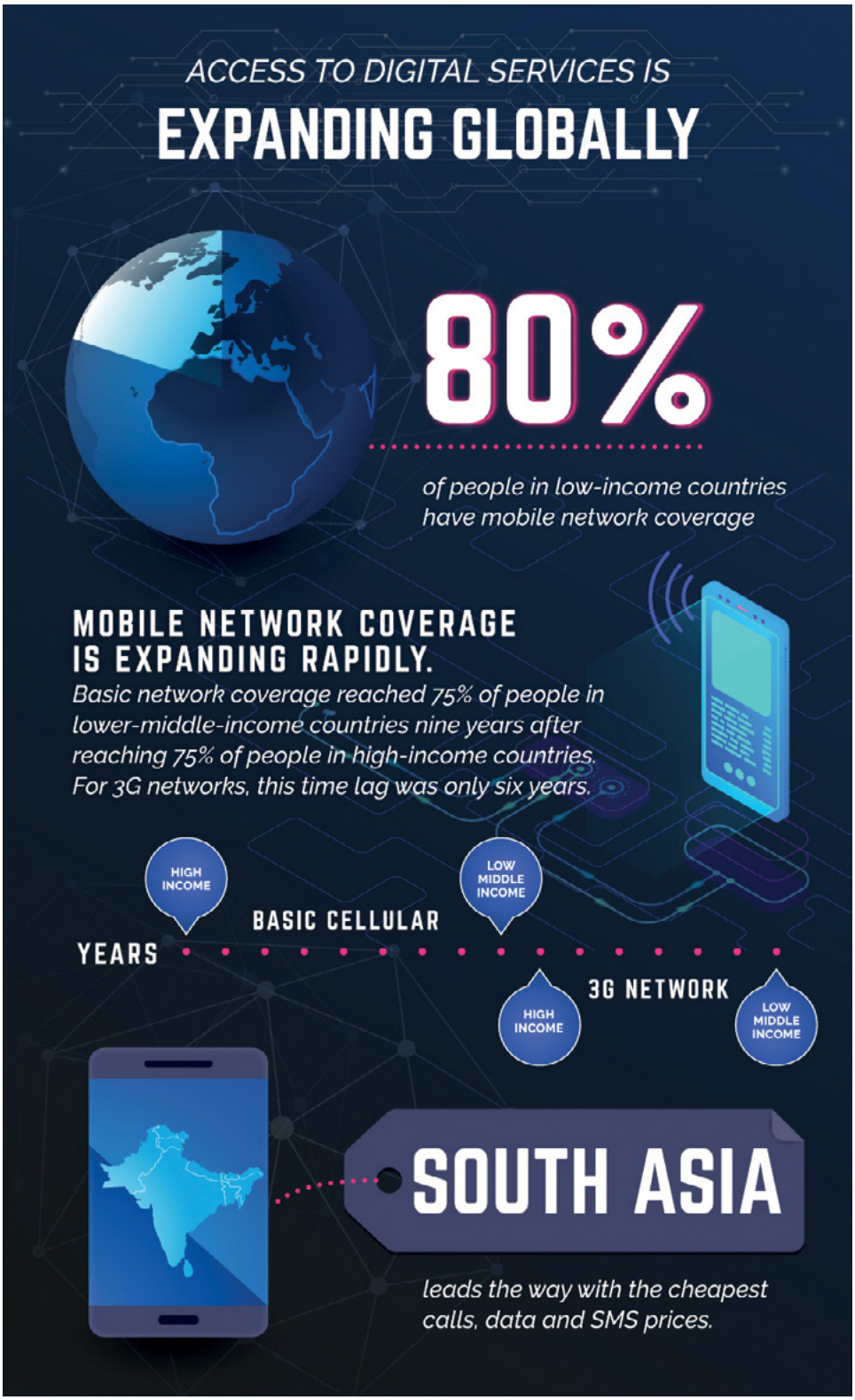
ACCESS TO DIGITAL SERVICES IS
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Basic network coverage reached 75% of people in lower-middle-income countries nine years after reaching 75% of people in high-income countries. For 3G networks, this time lag was only six years.
HIGH INCOME
LOW MIDDLE INCOME
BASIC CELLULAR
YEARS
3G NETWORK
HIGH INCOME
LOW MIDDLE INCOME
SOUTH ASIA
leads the way with the cheapest calls, data and SMS prices.

Internet access as a specific form of digital connectivity has also been rising globally. Over the last decade, people have been coming online at a rate of 620,000 people per day (see Figure 1 above). As with cellular network coverage, high-income countries have been the first to see high internet usage penetration rates. Growth in low- and middle-income countries started strong in the 2000s but there is still a long way to go, especially for low-income countries. At current growth rates, progress would still leave about three billion potential users unconnected by 2023, mainly in low- and lower-middle-income countries.[13]

Yet barriers to mobile phone and internet access remain considerable. Despite the expansion of cellular network coverage and internet usage, many people still do not have access to digital services, especially the internet. Only 14% of the population living in low-income countries are internet users. These gaps exist because of infrastructure deficits, economic costs and socio-cultural barriers. Overcoming these barriers is a crucial first step towards unlocking the transformative benefits of digital technology.

People without access to network infrastructure are excluded from the outset – and, despite promising growth in coverage, the current crop of technology (and business models) may be reaching the end of the line in terms of closing this gap. People in rural or remote areas are some of the most likely to miss out on the benefits of a digital life: across seven countries in Africa and South Asia, a third fewer people in rural areas had used the internet ever, compared to urban areas.[14] In recent years we have seen significant gains: fibre-optic cables – which are a cheaper and faster way of providing 'backhaul' connectivity to cell towers than alternatives such as satellites – have reduced the cost of connecting new peri-urban communities to networks,[15] making it more viable for network operators to serve poorer communities. Other new technologies, such as balloons and drones, might help expand geographic coverage further,[16] and these are starting to bridge the divide in availability between urban, peri-urban and remote communities. Whilst not yet reaching very remote communities, or those in mountainous or island states, the technology is getting there. But, the real problem facing the unconnected is as much to do with industry business models as it is the technology of delivery, as these remote users are also typically low-income. Internet and digital service providers often struggle to scale down their business models to reach these consumers while remaining profitable.

Education gaps hinder digital access. After controlling for gender, age, geography, and even extreme poverty, those without secondary education are still much less likely to own a phone or use the internet. For example, in seven countries in Africa and South Asia, those with secondary education are three times more likely to have used the internet than those with no formal education, while those with tertiary education are almost six times more likely.[17] The majority of digital functions require basic literacy skills and often foreign language skills on top of that (more than 50% of websites are in English).[18] Being able to read and write is the first step towards being able to

use a digital device and its functions. This turns into a self-fulfilling prophecy: digital access presents relatively little value if features beyond simple calling remain unexplored.

Gender also plays a significant role in digital access, where social norms that restrict the role of women in society also serve to hinder their digital access. Norms can act as a barrier to digital services if a society shares the belief that digital access is inappropriate for certain groups – either because it will affect an individual's perception of how useful or appropriate digital services are, or because it will cause others in society to block their access. A study of ten countries across Africa, Asia and South America found that women are between 30–50% less likely than men to use the internet to participate in public life.[19] These factors are independently influential in determining one's digital empowerment: for instance, women are not excluded because they also happen to be uneducated, but rather we see that women are almost 40% less likely to have used the internet than men, irrespective of their age, education, wealth and where they live – suggesting that structural social inequities are driving digital ones.[20] The access gap for women is especially large in South Asia. In Pakistan, for instance, almost 80% of men own a mobile phone, while this number only amounts to 39% for women, with the largest gap for internet-enabled phones.[21] In India, traditional patriarchal norms can at least partly explain the lack of access to digital technology by many women (see Box 1 below).

Box 1. Digital lives of women

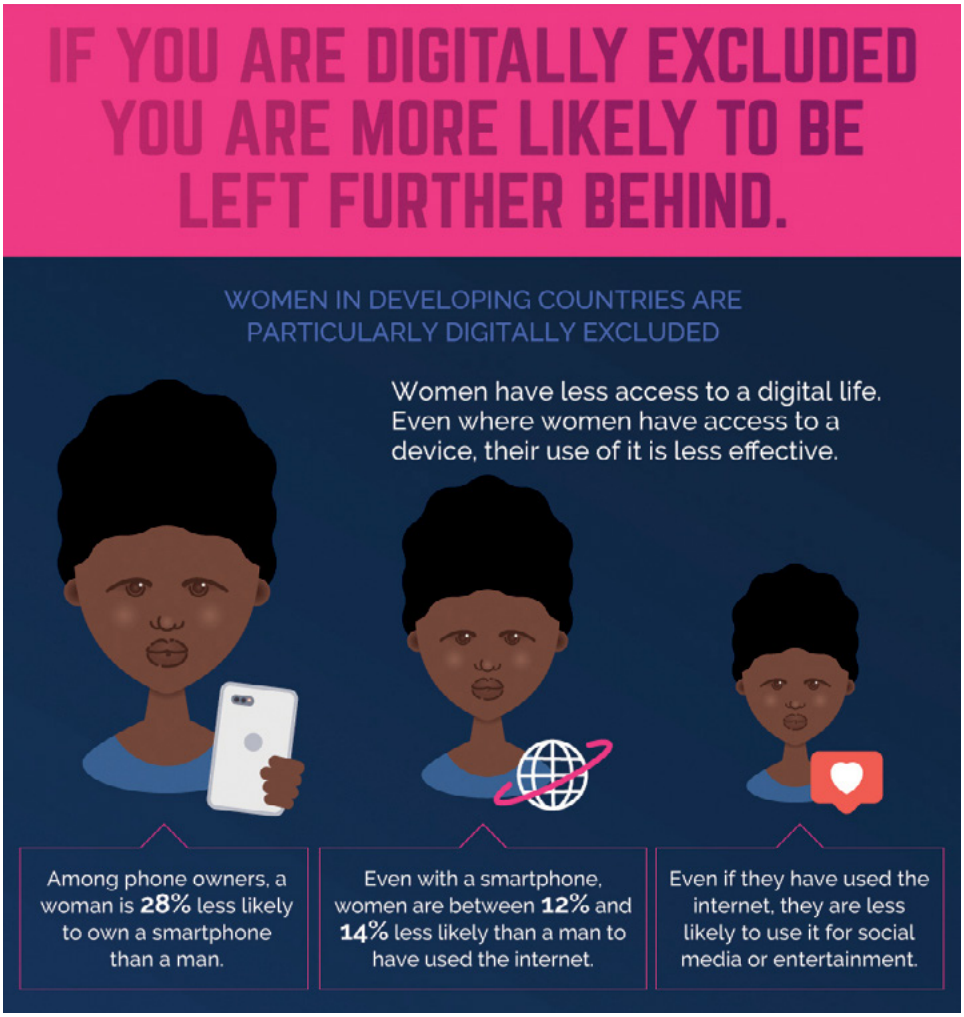
Few women own mobile phones in many developing countries. But, it can be transformative for those who do. Women on West Nusa Tenggara (a remote Indonesian island), who were interviewed for our research, explained how accessing a phone provided an invaluable and versatile tool in their lives. Women here use phones to communicate with neighbouring villages, search for information, keep in touch with relatives who moved to find work, and mobiles help them fulfil leadership roles in the village. For instance, one woman used the internet on her $30 phone to check whether a pig seller was telling the truth about the quality of his animals. Another woman has never used the internet, but she uses her phone to organise local women, reminding them when a village meeting is coming up. A teacher in another village walks 3 to 5 kilometres to get a good internet signal so she can get information from Google, a huge improvement on the village's stock of textbooks. Many women reported that they were introduced to mobile phones by their sisters who had left home – a clear illustration of the importance of networks as a determinant of usage and impact.

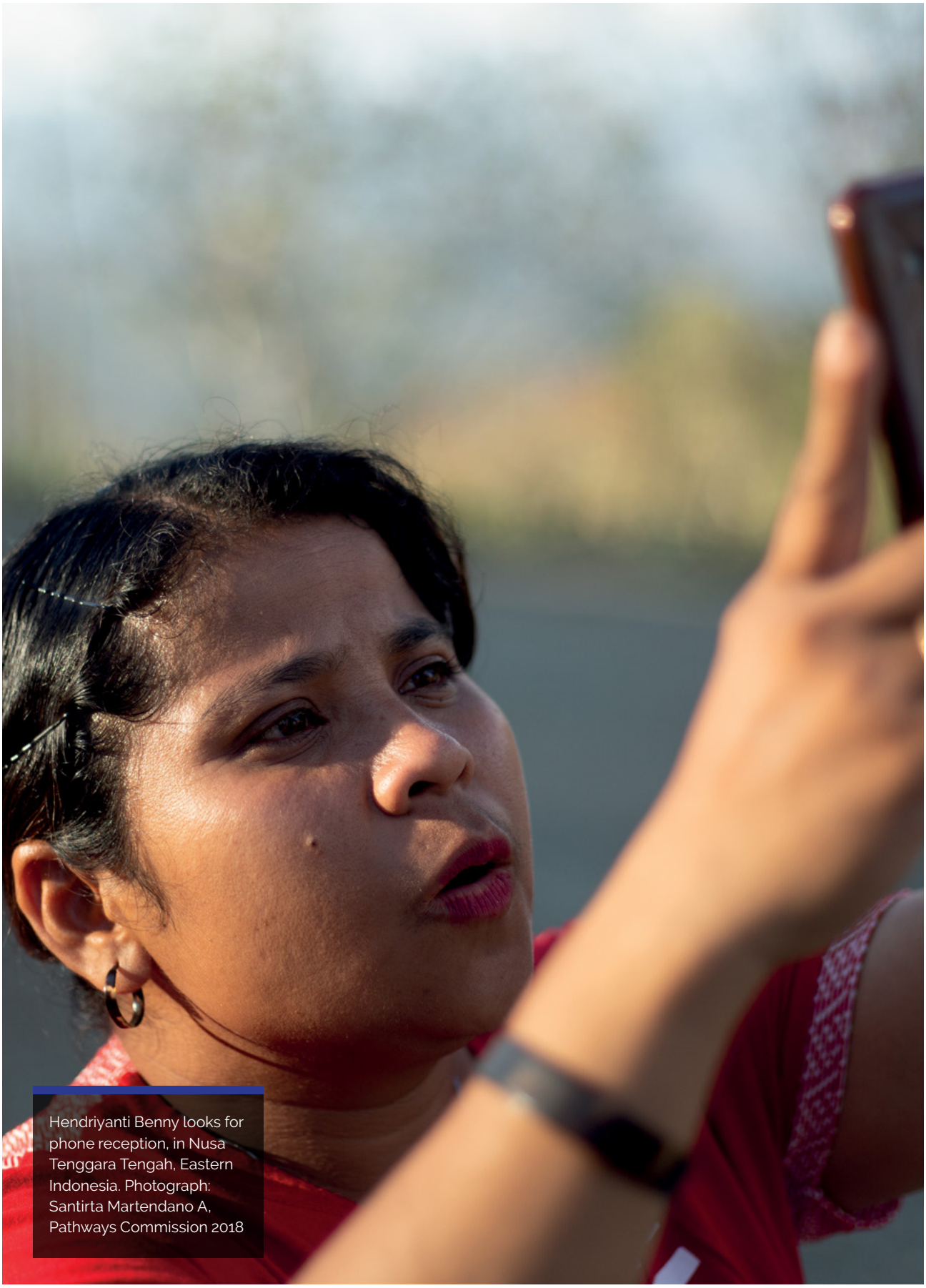
Cost remains a major barrier for many women, particularly when they may already have a "household" phone owned by their husband. Social norms also play a role, with interviewees describing a stigma around phone usage being perceived to lead to social promiscuity. Interviewees said that some men will prevent their wife from owning a phone.

Woman on phone, Nusa Tenggara Tengah, Eastern Indonesia. Photograph: Penti Aprianti. Pathways for Prosperity Commission, 2018

Researchers identified four key norms that limit women's access and use of digital technologies in India:[22] maintaining purity for marriage; patriarchal exogamy (women go to live with their husband's family upon marriage); subservience; and prioritisation of caregiving (women are expected to prioritise the care for their husband and household over their individual needs and aspirations). Before girls get married, mobile phones are viewed as a risk to their reputation in the form of promiscuity and digital harassment. For married women, phone use and ownership are more acceptable, especially as a means to stay in touch with their natal home. However, studies suggest that women (much more so than men) often self-restrict access to phones in an effort to save the household money. This could come in the form of a preference for basic rather than smartphones, a rationale for sharing a household phone rather than purchasing a separate phone for the woman, and self-limited use of airtime and data credits.

The cost of a digital life – buying a device and network access – remain substantial, and business-as-usual approaches are unlikely to solve this. Device and network access costs have been falling in recent years but remain too high for the poor end of the income distribution, barring their access to digital services. For instance, the cost of a smartphone has fallen by up to 50% since 2012 and the cost of a one-minute call in sub-Saharan Africa fell by more than 70% in the decade to 2016. That said, for people living in extreme poverty in India or Tanzania for instance, smartphones remain out of reach, costing at least two months' income for those living below the poverty line. This helps to explain why, in Tanzania, those in poverty are 27 percentage points less likely to own a phone.[23] Overall, only about two-thirds of Tanzanians own an internet-enabled mobile phone, but for those living in extreme poverty, this is again a third lower.[24] Furthermore, across sub-Saharan Africa, the cost of 500MB data varies by more than two-hundred times, from $0.35 in Madagascar to $81 in Guinea-Bissau.[25] Cost is a particularly salient barrier for youth, with almost two-thirds of Ghanaian adolescents citing handset and data costs as the principle impediment to internet access.[26] The fundamental problem, described above and returned to in Section 4, is that existing business models (where prices are set to recover the cost of infrastructure assets) will always exclude the poorest people who cannot afford these fees.





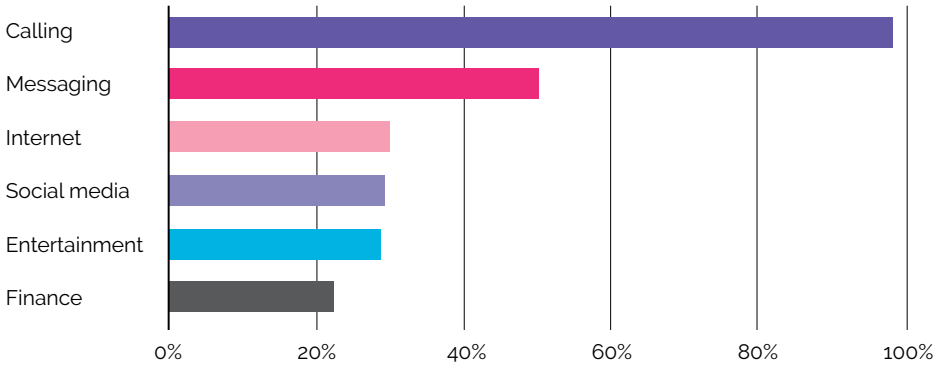
Hendriyanti Benny looks for phone reception, in Nusa Tenggara Tengah, Eastern Indonesia. Photograph: Santirta Martendano A, Pathways Commission 2018

CHAPTER 3
Towards effective digital usage

While digital access for the poor is important, in itself it will not achieve positive development outcomes, unless usage is effective. Basic access – making mobile phone calls – is now enjoyed by the majority of people around the world, including in low-income countries and among the poor (see Figure 2 below), but it is not in itself a guarantee for impact. The next frontier is the usage divide that separates those who enjoy a productive and happy digital life, and those who do not. This gulf consists of which features of digital technology people use and how. For instance, despite broad access to mobile money in many countries around the world (there are 690 million mobile money accounts), less than a quarter of accounts are "active".[27] By understanding the factors that shape how people use the technology available to them, we can begin to understand how to ensure that digital access leads to prosperity.

Figure 2. **People do not take advantage of all the available functions**

Percentage of people in developing countries who have ever used specific digital functions



Source: Financial Inclusion Insights (2017), Pathways Commission analysis.

Note: These are average numbers from a dataset covering Kenya, Tanzania, Uganda, Nigeria, Bangladesh, Pakistan and India.

More and more mobile devices in developing countries are now internet-enabled,[28] but Figure 2 shows that many people have never done anything more complex than make a phone call. The rise of feature phones, which are relatively cheap and can run simple internet apps, has meant that more people than ever can potentially enjoy rich digital lives. However, less than a third of people across seven developing countries in Africa and South Asia have

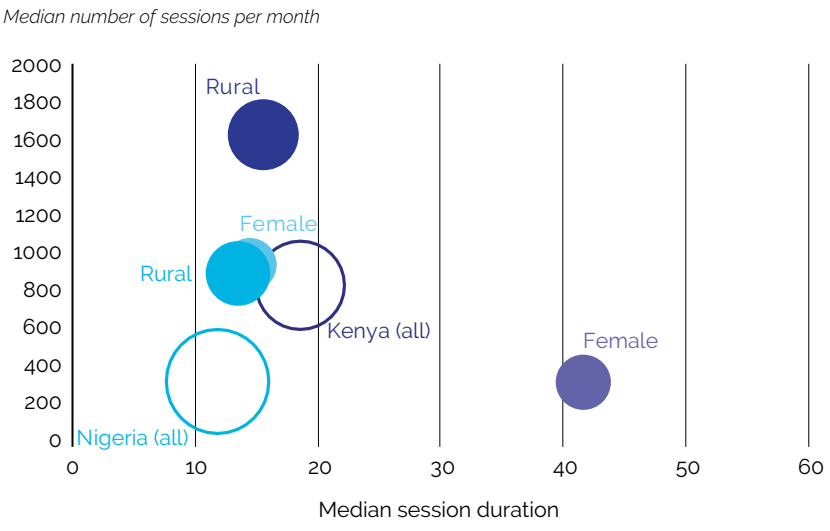
ever actually used the internet (see Figure 2 above). And only 23% have used digital financial services. Using more complex functions may not directly mean someone has a more fulfilling or effective digital life, but it is one of the proxies for which we have data.

Ownership inequalities are made even worse by differences in usage. Assessing usage across seven countries in Africa and South Asia, we found that women, those living in poverty or in rural areas, or those less well educated are less likely to use digital services than their counterparts; and this gap was even larger than the gap in access described above. Among those owning a phone, anyone with any of these characteristics is less likely to have ever used the phone to send a message. On top of that, even among those owning a smartphone, living in poverty or in rural areas, or being female or less educated, makes one less likely to have used the internet in general or for any of the functions in Figure 2 such as social media, finance or entertainment.[29] For example, among phone owners, a woman is 28% less likely to own a smartphone than a man. And, if she has one, she is between 12% and 14% less likely than a man to have used the internet, social media, or mobile finance.[30] This is also reflected in other data. For example, digital credit customers of the digital finance company TALA (in Kenya, Tanzania, Mexico and the Philippines) are more likely to have secondary or even tertiary education than the national average;[31] data from Kenya and Tanzania suggest that this usage bias is higher than the

overall smartphone ownership bias in favour of educated groups.[32] Going back to the more basic functions, illiterate women in India, for instance, merely knew how to use the green button to answer calls but had to ask family members for help when they wanted to make a call.[33]

Usage patterns are suggestive of demand for digital services, but also of ways to cope with barriers of access. Figure 3 shows that people in Kenya and Nigeria make voice calls many times per day, with an average of 845 uses per month in Kenya and 345 per month in Nigeria. Those in rural areas make many more calls than the national average, while Kenyan women make much longer (if fewer) calls than men, and Nigerian women make more (and somewhat longer) calls than Nigerian men. It therefore appears that people who usually have less access and therefore less diverse digital lives in terms of usage, may make up for this with greater consumption of the most basic digital product: voice calling. Messaging apps – such as SMS, WhatsApp, Telegram and others – are also used very intensively: around 65 times per month in Kenya and 115 times per month in Nigeria.[34] Apart from simply sending text messages, these apps are also a platform for sharing digital content (such as photos and videos), playing games, and even interacting with chatbots from businesses or service providers. Despite their core function (text messages) using negligible data, these apps account for more than 10% of all data traffic in Kenya. Messaging apps may well be a low-cost way to circumvent the "standard" routes to more complex digital usage. While using call and messaging functions more intensively is positive in itself, this does not quite compensate for digital inequalities, not least if many of the beneficial services from business or governments require more complex usage.

Figure 3. **Intensity of usage of voice calling**



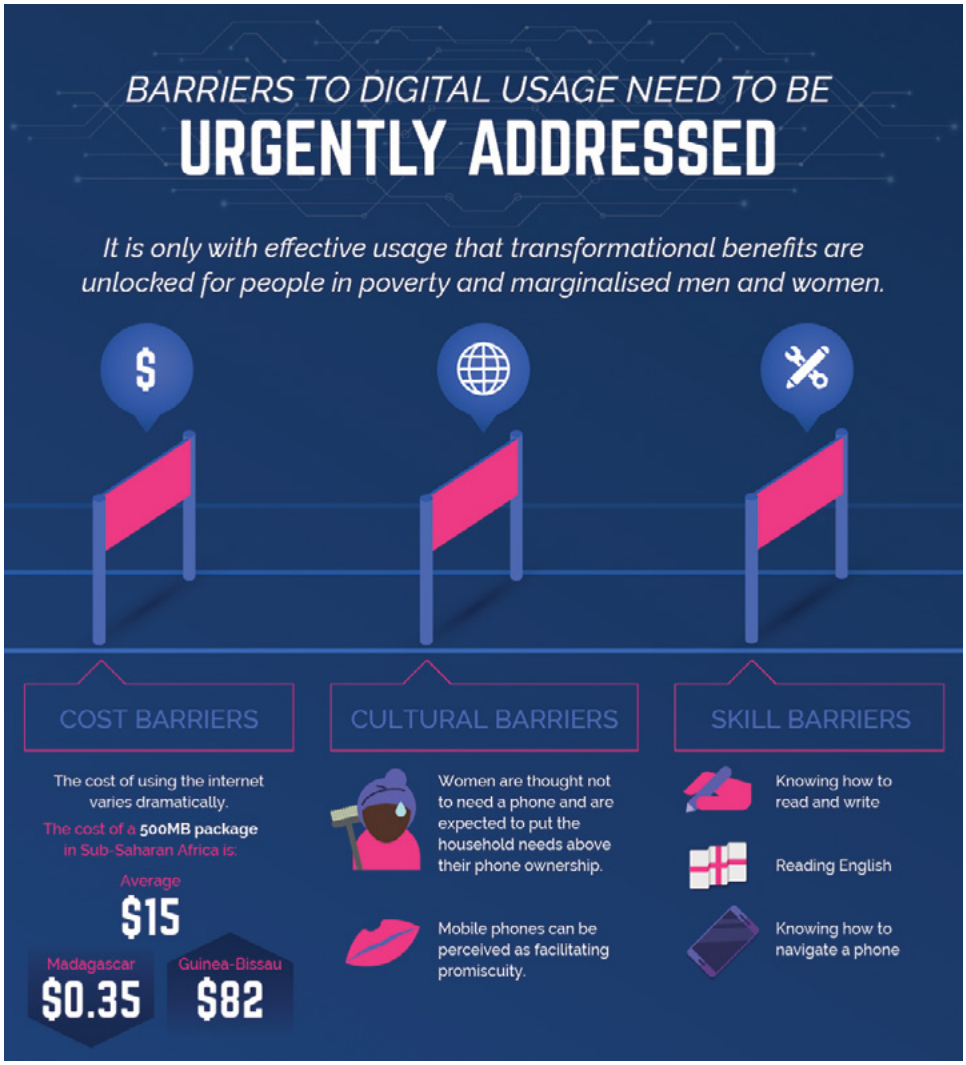
Source: Caribou Digital Data.

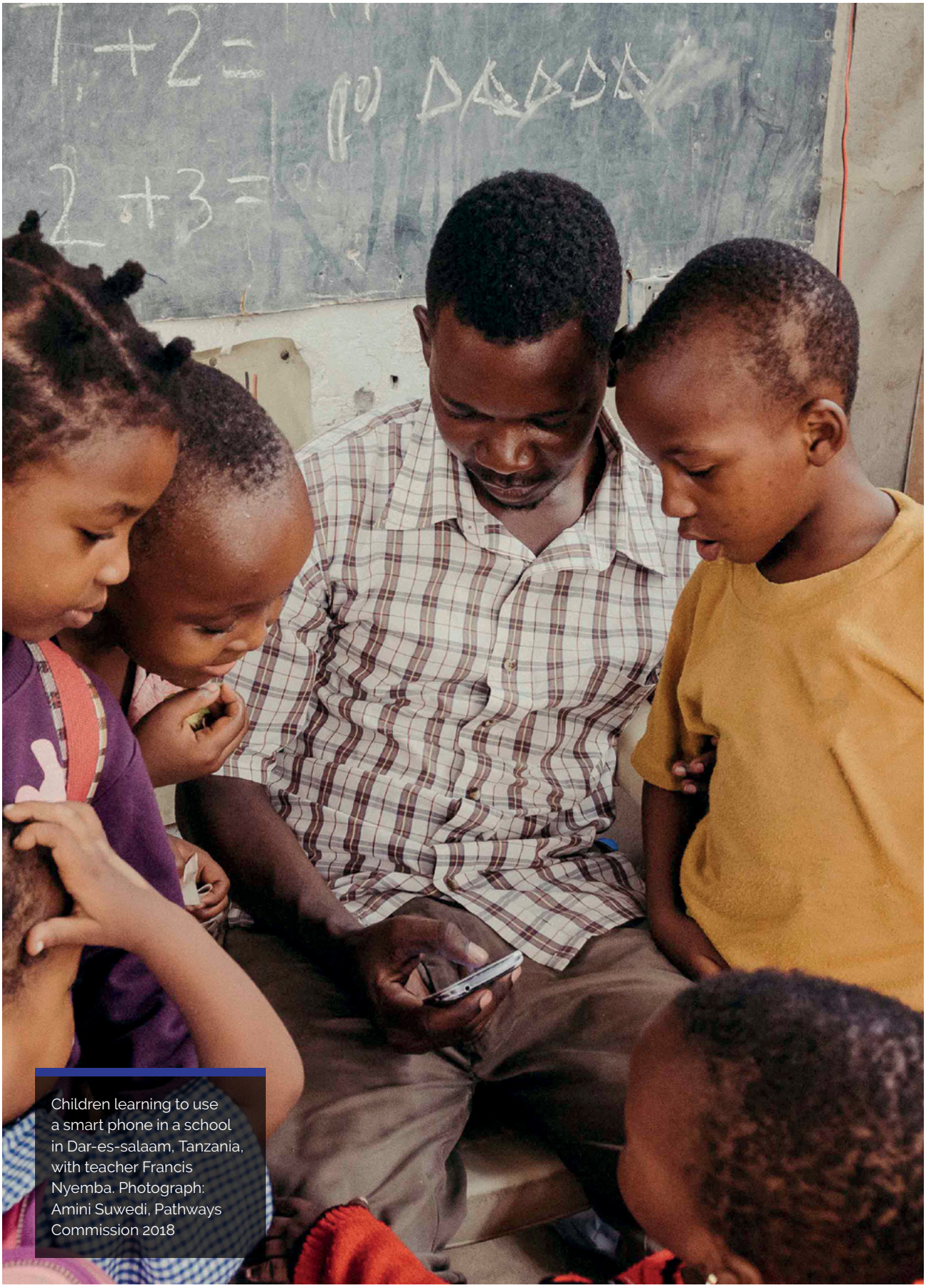
Note: This data is from a panel of 1,000 demographically representative Kenyan feature phone and smartphone users and 1,000 demographically representative Nigerian smartphone users.

Usage is changing dramatically with the younger generation, the 'digital natives', creating opportunities and some risks. Across the world, youth (ages 15–24) are the most connected age group – worldwide, 71% are online compared to 48% of the total population.[35] This age group are the first generation that would have had internet and widespread applications around them from the age of 15. In developing country contexts, Filipino youth use text more intensively than their older counterparts (whereas the opposite is true for voice calls) and over three-quarters of Ghanaian adolescents use the internet on a weekly basis.[36] Younger people also use their access differently: while 78% of under-25s in low- and lower-middle-income countries reported liking the internet because it helps them learn new things, separate data shows that youth are also almost twice as likely as other users to have accessed the internet for social media or for entertainment.[37] As elsewhere, young people are the most enthusiastic users of digital services; at the same time, as they are younger, they may also be more at risk of abuse or ineffective use.

Just as digital access does not automatically lead to impact, neither do high volumes of digital usage. More detailed information on how internet is used by young people or the population in general is hard to come by for developing countries. However, some evidence suggests that we need to be cautious in interpreting high usage as necessarily being impactful. For instance, many mobile money customers use the service to participate in gambling; so much so that it is one of the top ten reasons for upgrading to a smartphone in Kenya.[38] Additionally, research on poorer parts of the Colombian population found that internet access did not change total spending but shifted spending away from essential goods such as food to some more 'conspicuous' types of consumption.[39] This is not just a case of "more is better", but a complex question about what people are being connected to and how they use this access.

In summary, emerging evidence on usage confirms considerable inequalities and some risks; how digital services are offered may need to be rethought. Barriers in access are amplified in the way people can use digital services. Complex usage is, in general, still limited in some of the countries highlighted, particularly for people with limited education, for women, for those in rural areas or living in poverty. There are signs that they use simpler functions more intensively – for example, talking for longer on the phone – to cope with limited inclusion. But, this only partly compensates, not least as more services from governments and business are likely to be digitally delivered using more complex means. There is little sign or reason that these inequalities will just disappear, unless some of the structural issues are addressed. Demand-side issues, such as poverty, education and social norms, clearly matter. But, how services are offered is also crucial – and currently they do not seem to deliver sufficiently affordable and appropriate products for those living in poverty. Furthermore, the data also reveals that young people, even in poorer settings, are enthusiastic users of data, and more data use is not always the same as beneficial or effective use. The role government and business could proactively play to generate more digital inclusion in a safe way is discussed next.


BARRIERS TO DIGITAL USAGE NEED TO BE
URGENTLY ADDRESSED
It is only with effective usage that transformational benefits are unlocked for people in poverty and marginalised men and women.
COST BARRIERS
The cost of using the internet varies dramatically.
The cost of a 500MB package in Sub-Saharan Africa is:
Average
$15
Madagascar
$0.35
Guinea-Bissau
$82
CULTURAL BARRIERS
Women are thought not to need a phone and are expected to put the household needs above their phone ownership.
Mobile phones can be perceived as facilitating promiscuity.
SKILL BARRIERS
Knowing how to read and write
Reading English
Knowing how to navigate a phone



Children learning to use a smart phone in a school in Dar-es-salaam, Tanzania, with teacher Francis Nyemba. Photograph: Amini Suwedi, Pathways Commission 2018

CHAPTER 4
The architectures and business models of digital services and their consequences

The choices made by businesses and governments will shape digital access and usage. This section will consider the broader environment that influences how users get online, the tools that mediate their usage, and users' ultimate agency within their digital lives. These digital architectures – the choices made by businesses and government and the ecosystem that emerges – are the fundamental background forces that shape the types of digital lives available. In the sections above we saw that people are limited by their individual marginalisation (such as poverty or illiteracy); they can also be limited by the broader architectures around them. This section will look first at how the poorest people can be connected to digital services, and then at the business models and regulatory approaches that influence these digital services.

4.1 The choices of business and government can help connect the poor

Connecting people in poverty and achieving effective usage is predominantly a matter of pricing and fees. The empirical evidence explored in earlier sections showed that poverty is one of the biggest determinants of low access and usage; so, affordability (rather than simply geography) becomes one of the key factors in limiting access. It appears that, in many settings, it is simply not commercially viable for firms to serve the poorest people in poverty. This is not just a problem in developing countries: no country has reached 100% access; there are always some people that cost too much to reach. But, slight changes to this calculus can make services for the poorest more viable: the challenge is not about connecting 'the last mile' to infrastructure – we have the technology, and the poorest people often live near cell towers – rather, the challenge is about finding business models that make it profitable to connect to the lowest-income consumers.

Infrastructure may not be profitable to build, not least to reach underserved populations; public financing will continue to have a role to play. Countries such as Brazil and Indonesia are investing in major public-private partnerships to expand coverage to their population. In Brazil, the Banda Larga para Todos (broadband for all) project is launching a satellite to connect rural areas where conventional means of linking back to the main network (fibre-optic cables or transmission towers) are not viable. In Indonesia, the Palapa Ring project is running undersea lines to connect their islands. Some are trying, with success, to finance

these projects without direct government support. In Uganda and Ghana, Google has partnered with the International Finance Corporation to roll out a wholesale fibre network, called CSquared, in urban centres. These projects are succeeding in getting infrastructure on the ground. However, the networks still need to cover their costs, and this will continue to exclude the poorest people in society.

Various experiments with business models are underway to reach ever-more excluded people. Various business models are trying to provide data for free (such as Facebook's Free Basics) or for low prices (such as data-only Indian network Jio). In either case, these offers are predicated on cross-subsidisation. In Facebook's case it is revenue from the US and the EU cross-subsidising their loss-making operation in developing countries.[40] The same is true of Google's emerging market strategies, such as their free Wi-Fi provision in Indian train stations. In Jio's case, their parent company (India's second-largest public firm, Reliance Industries Limited) is able to cross-subsidise the operation from revenue in other sectors.[41] A third model is the "1800-Data" trend led by Qualcomm in Latin America, where an organisation or business could pay to have their website "zero rated" and delivered to their customers for free.[42] This is an innovative solution to the question of "who pays and how?", but it is only adopted by businesses who think they can acquire enough customers to offset the access charge. Around the world, these methods have been successful in temporarily boosting access along limited dimensions, but they are not easily sustainable in the long term.

The fact is that the low-hanging fruit is gone. Today's business models are unlikely to reach the next three billion – but much-needed new experiments are emerging. Getting to the next three billion may require trade-offs that fundamentally alter the nature of the digital services people are using; limiting users in terms of what they can do online, when they can do it, and how services reach them. Models of provision funded by data harvesting or advertising could work where the user base produces valuable data or is of interest to advertisers, but this will not always be the case for the poorest population. Free public space WiFi, such as Google's train station hotspots in India, provide a limited window of access; and while undoubtedly helpful for the users, it is unlikely that a philanthropic programme like this will scale up to cover billions of people. A cheaper, and even further limited, model of communal digital service provision is offline content distribution and edge-of-the-network caching like the SupaBRCK or RACHEL-Pi project. These projects load a library of content onto a cheap micro-server unit in a village centre. This gives anyone in the village free access to a cache of offline content – Wikipedia articles, educational videos, music, agricultural advice, news bulletins, first aid advice, podcasts and some social network and messaging functions. This is not full-speed live internet by a long stretch, and is no substitute for real-time digital connection, but it may be one of the only ways to get digital content into the hands of the poorest people, giving them some benefits (such as access to digital education and training).

4.2 Digital architectures determine use patterns; they also bring risks

The service providers' business model – how digital services are provided – matters in different ways from how phone connectivity is delivered. For more than 100 years, the landline telephone has served as a relatively straightforward switch between two places, transmitting information without manipulating or structuring it. Mobile telephony added more flexibility by allowing two people to connect to each other, no matter where they might be. Today, an increasingly large component of communication between individuals takes place across digital platforms. Unlike the telephone, these platforms are far from being a neutral switch: they can fundamentally shape content and usage. People can still pick up the phone and talk to each other, or message each other via SMS or WhatsApp. They can also participate in social media platforms, where the algorithms behind these platforms frequently influence who can see what, or if they see it at all. Social media algorithms reward and encourage sharing, this can lead to viral transmission of inspirational messages and cat videos, but also beget sensationalism and support rumour. And in this world, one's ability to get a job depends not only on merit, not only on how hard one searches, but also on whether a social media algorithm happens to help or hinder one's hustle for work in a Nairobi slum.[43]

The design of individual digital services, and not just the price of digital access, will influence user behaviour. Recent research shows that, in developing countries, Facebook is the entire 'internet' for many people. Across Africa and Asia, surveys are finding Facebook users who seem to have no idea they are connected to the internet.[44] (Despite this growing trend, the majority of users *do* seem to know the difference between Facebook and the rest of the internet.) Over 50% of all mobile traffic in Kenya is mediated through apps owned by Facebook and Google.[45] The algorithms that run these apps have incredible power to shape people's digital lives. Advertising-funded services create a multi-sided market for user attention.[46] Here, there is a clear incentive for digital designs that serve up increasingly more "engaging" content, which can lead to individual and group polarisation.[47] When designing these systems, firms make choices – either implicitly or explicitly – that end up shaping users' behaviour and preferences. This is mostly done in a reasonably benign way to attract customers, but there also is scope for misuse by third parties. Even the most developed societies are now grappling with the unintended consequences of some of these design decisions.

How digital services are provided matters for use in political debate and contestation, as well as its abuse. Social media has played a well-documented and, arguably, positive role in civil strife, from the Arab Spring to Venezuela's political contestation.[48] However, ethnic and religious violence in 2018 in Myanmar, Sri Lanka, and India were at least partly facilitated by the way incendiary messages and misinformation propagated through social media.[49] Governments are using digital technologies to influence or control citizens.[50] Recent research found evidence of political and governmental

manipulation of public opinion through social media in 48 countries. In a fifth of these – mostly developing countries – the medium of choice was "chat applications such as WhatsApp, Telegram and WeChat".[51] Indeed, in what was widely reported as a response to such incidents, WhatsApp moved in July 2018 to reduce users' abilities to forward messages.[52] Limiting message virality is probably a good move for civil stability, but a clear indicator of the app's power to influence society, and the firm's power to mediate communication on its platform: it is actively capping speed at which people can share information through the system.

There is no obvious perfect model for a commercially viable digital design, but citizens, governments and business all have responsibility to contribute to this architecture. In particular, it should be considered how digital architectures impact on usage, inclusion and livelihoods. Firms should be encouraged to develop business models that focus attention on those who are digitally excluded. Remember that access is not the endpoint, but rather it is usage that determines outcomes. Connection is not good in and of itself; so, the question to focus on becomes; "What are we connecting people to?"

4.3 Government regulation can shape digital architectures

The business models and digital designs described above are inherently influenced by government choices. In view of this, it may seem obvious, yet the topic of digital design and usage is almost entirely absent from discussions about development policymaking. Governments' potential regulatory levers mostly revolve around managing the telecommunications market, controlling the internet connection to the outside world and stewarding the ecosystem of domestic digital offerings. There have been very limited opportunities for the poor, or even civil society more broadly, to engage in a practical policy dialogue with governments about these important architectural discussions.

The business models discussed above are determined in no small part by government regulation. In section 4.1 we described how some new business models are based on using one part of a business to subsidise another part (which services poorer or more remote areas). This type of cross-subsidisation can be mandated or encouraged by regulation. Some countries (such as Chile, Taiwan, India, Australia) aim to achieve a "universal service obligation" by either requiring private companies to cover a certain percentage of the population or by establishing a public fund to subsidise such infrastructure. Other countries design their "spectrum" auctions (essentially the right for firms to build cell towers) with cost differentials for rural areas or built-in service obligations in a way to encourage broader coverage.[53] It is hard to argue that there is one best practice for each context, but there is considerable promise that countries can find models that fit their particular context.

Governments play an important role in regulating how providers deliver the internet to citizens, setting fundamental rules around what their business models can and cannot do. Different models abound: there is no obvious solution that fits all, with different models seemingly being designed to serve the state or citizens, corporations or consumers.[54] At one end of the spectrum is China's great firewall: a government blacklist of banned internet content. So onerous is this list, that Google chose to exit China in 2010 rather than comply with the firewall requirements.[55] At the other end of the spectrum, many countries require that internet providers do not filter or moderate content in any way. This principle of "net neutrality" says that all web traffic is equal; internet providers should not offer favoured treatment (this could lead to a form of extortion: "pay our fee or we won't let your users download your content at full speed"). Indeed, both India and Chile have outlawed free selective services on this basis.[56] Somewhere in the middle is the US system of near total de-regulation: rather than mandating a certain blacklist or mandating non-interference and equality in web-traffic, the US recently repealed its net neutrality laws to let private firms and therefore market forces figure it out for themselves.[57]

Governments also play a role in fostering the ecosystem of products and services available to users. Ideally, one may want to see a rich offering of digital services that give users agency and choice in living a fulfilled digital life. People will only use digital products that are relevant to their individual context. This requires local service providers, small and medium-sized enterprises (SMEs), governments, and businesses to create digital services. A major part of this is about having the "soft infrastructure" of integrated services that can work well with each other – for instance, a way for a local retailer to process payments online. In practice, it is not always easy. The Indian government-supported digital model deserves specific mention as it succeeds in offering a versatile suite of digital civic tools – such as citizen identification, payment processing, or digital document authentication – that developers can build on.[58] These tools are provided as application programming interfaces (APIs) – that can be plugged into any application, increasing its functionality and decreasing the cost of developing locally relevant digital products. Moving this logic into the private sector functions becomes less clear-cut. Having a diverse range of services and products is part of a healthy digital life, but many digital services exist as a form of natural monopoly. For instance, the best online marketplace for bananas will probably be the platform that has the most buyers and sellers. In other industries with network monopolies (energy networks, telecommunications, consumer banking) there are various regulatory frameworks governments can employ to ensure a dynamic market (such as setting interoperability standards and requirements). But, there are no best practice solutions yet to this sort of situation in digital services.

Governments, in theory, also have a role in protecting their citizens' interests when they are affected by digital design. This is an area where policy development is struggling to keep up with practice. The potential options here are broad – ranging from mandating explainable algorithms ("*On what basis* did the social network decide to show a user *this* video?") to requiring

total data portability ("Is a user locked in, or can they take their messages, photos, or account balance to a different provider?"). It does not appear that any country has yet codified these ideas in regulation. However, we have seen jurisdictions that are increasingly concerned with ensuring user privacy and sound data management.

And when it comes to regulating international digital service providers, options are limited for many countries. Global tech companies receive negligible revenue from their operations in developing countries,[59] which means that, if faced by a high regulatory burden, they can realistically choose to exit a market rather than comply with regulation. This is reflected in different states' approaches to perceived problems with digital platforms. The US and the EU are the jurisdictions that drive profits, and so they have significant clout: global firms will comply with congressional hearings or complex legislation – such as the EU's General Data Protection Regulation (GDPR). Indeed, China may be moving back into this category of essential markets: after almost a decade of voluntarily not serving the Chinese market, Google is planning to launch a version of its search product that complies with the country's significant regulatory requirements.[60] In contrast, Uganda recently announced a tax on users of social media – however misguided it may seem to some – perhaps because they have comparatively less ability to directly regulate the firms themselves. At the extreme end of the spectrum, when Papua New Guinea and Sri Lanka had concerns with Facebook, they simply blocked it for their entire populations.[61]

Mamak Penina Behanifo shows phone to her daughter in Tanini Village, Nusa Tenggara Tengah, Eastern Indonesia. Photograph: Santirta Martendano A, Pathways Commission 2018

CHAPTER 5
Priorities for inclusive digital services design

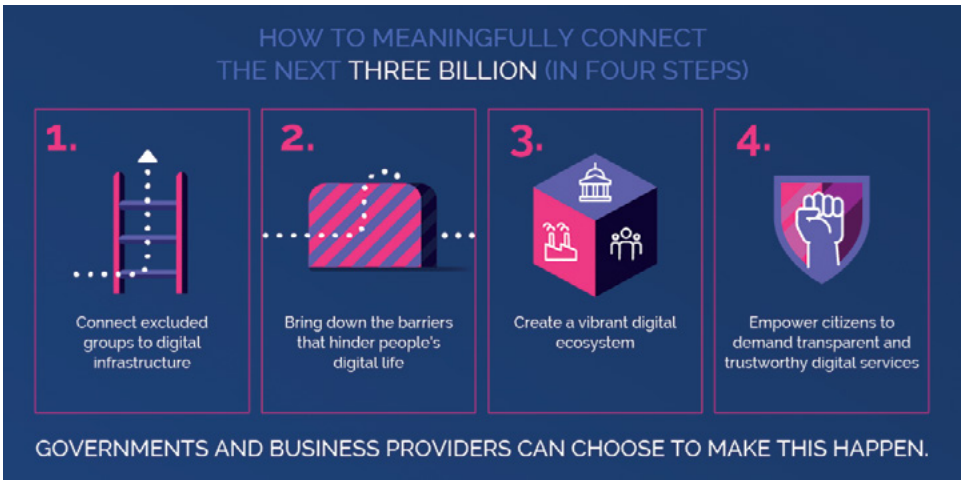
The challenge ahead is clear: connect the next three billion users to a positive, productive and fulfilling digital life. Just achieving greater access – building more cell towers and handing out mobile devices – is not enough. Governments and businesses need to focus on affordability and agency to ensure that citizens can make the most of their access. Policymakers must also consider the supply side of the market, as the impact of digital access depends entirely on what sort of digital life we are connecting someone to. The time to do this is now, as digital inequalities risk becoming entrenched just when governments and business are increasingly moving towards digital services to interact with consumers and citizens. To that end, there are four policy priorities that citizens can demand for more effective digital lives in any country, be it China or Uganda.

1. Drive access to the poorest and others who are facing exclusion. This may mean being smart about entering into government-backed financing deals or spectrum leases. These provide opportunities for the government to set coverage requirements, building a level of cross-subsidisation between urban and rural communities into the architecture of the market. Even with these sorts of initiatives, the price of access will still be based on the cost of supply, keeping it out of the poorest people's reach. This is where there is room for the private sector to think creatively about business models and pricing structures that allows them to cover costs, while still providing at least some access to the poorest consumers. Initiatives that provide communal access as a public good are an absolute priority for reaching the last part of the income distribution: those living in extreme poverty across the world. This may require compromises that fundamentally alter the nature of digital services (such as extremely limited bandwidth, or offline content distribution), but can be a profound tool for starting people's digital lives.

2. Address the fundamental barriers that prevent take-up and effective usage. Affordability is only one part of the solution; progress will stall unless people are actually using these services, and using them effectively. The analysis found that there are certain factors that systematically reduce the chances of people having an effective digital life, that are less linked to how digital services are provided. First, there are clear socio-cultural barriers that limit access by women to devices and use. Second, education also correlates with access and use. Digital skills are no doubt a further constraint. No country will be able to reach its digital potential without addressing poor literacy and restrictive gender norms. Resolving

these binding constraints is a core priority for all aspects of development, but specifically also for enabling effective digital lives. If not addressed, digital inequalities may end up persisting, even when digital provision improves.

3. Encourage a dynamic domestic ecosystem of digital services. Governments should try to ensure that their country has a broad stable of digital services to enhance users' lives. Otherwise, what is the point? Simple approaches to encourage interlinkages between services, and to encourage pro-competitive behaviour, are likely to be the best approach. Governments can regulate for interoperability – requiring competing services to at least be able to work together (for example, mobile money providers must be able to transfer funds to each other) to prevent artificial usage barriers. Governments and the private sector can work to co-design appropriate regulation, and set incubators jointly to test new models and their implications. Private firms can adopt an open and connected design philosophy: encouraging local developers to create local applications that link to their products (that is, by creating relevant APIs to let developers integrate some of their features into third-party apps). Even if these APIs have fees attached, they are still an important mechanism to foster local innovation and entrepreneurship. And governments should also contribute by developing "soft" infrastructure in the form of civic APIs (such as those in IndiaStack).



4. Push for transparent and trustworthy digital services. Digital lives are increasingly mediated through algorithms and servers, and the risk of abuse by those with power in business and politics is real. Digital designers and governments should do what they can to empower users to understand and control their digital life. This is an area where the private sector can clearly take the lead: tools, like the recent Ethical OS Toolkit, are being developed to help digital companies think through the implications of their product design.[62] Governments are also exploring a range of policy options. As this area is actively unfolding, it may be better to focus efforts on giving users a level of agency and control over data they have provided (or that is directly generated from their activity), rather than on defining business practices (for example, what sort of algorithms or revenue models can be used). There are a number of options or ideas worth exploring to give users different levels of understanding, participation and agency over how their data is used – from creating a trust or union to represent users, a legal fiduciary duty for data holders, or continuous disclosure requirements that mandate complete transparency around data usage. These practices may mean little to the most marginalised in society, who have little power to exercise their rights, but they will nudge the design of digital services in a pro-user direction, which should lead to richer digital lives for all.

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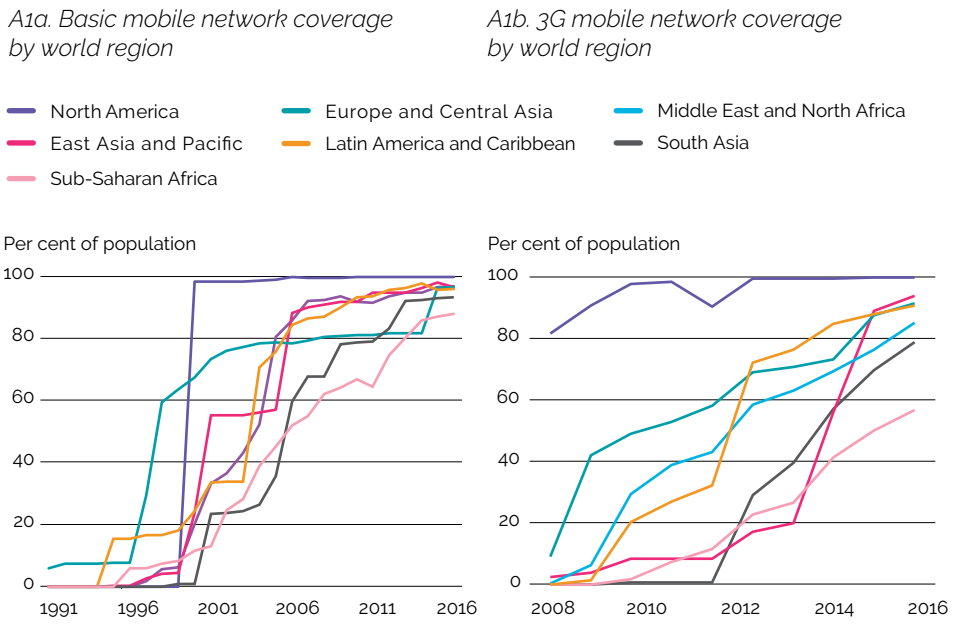
APPENDIX
Digital lives in data

Mobile network coverage

Cellular network coverage expanded quickest in high-income countries but recently other regions have caught up. In 2016, each region had at least 88% of their population covered with basic cellular network. For the faster internet speed network 3G, it is again North America leading the way, but the remaining world regions have taken less time to catch up.

Figure A1. **Mobile network coverage by country region and country income group**

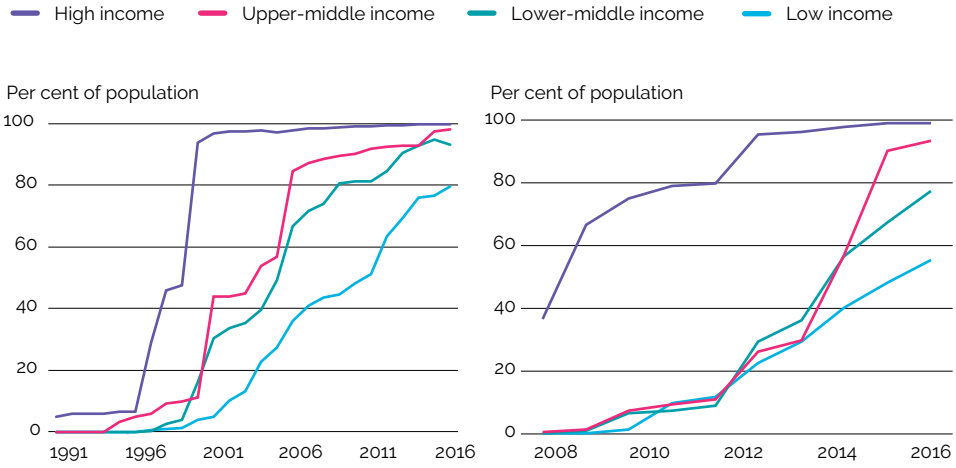


Source: ITU (2018) ICT Indicators Database, Pathways Commission analysis. Countries' income group determined based on 2016 figures.

Figure A1 CONTINUED. **Mobile network coverage by country region and country income group**

A1c. Basic mobile network coverage by countries' income class

A1d. 3G mobile network coverage by countries' income class



Source: ITU (2018) ICT Indicators Database, Pathways Commission analysis. Countries' income group determined based on 2016 figures.

Mobile phone ownership overall and by gender, rural/urban location, age, poverty and education

There is significant variation between countries in mobile phone penetration among people aged 15 years and older: between 6% in Nigeria and 42% in Uganda still do not own a handset, and many of the phones do not allow for internet access. Socio-economic and demographic characteristics are correlated with the type of mobile phone owned in nuanced ways: for instance, people living in extreme poverty are generally less likely to own a handset but, for those who do own a handset, they are about as likely as the rest of the population to own an internet-enabled handset.

Figure A2. **Mobile phone ownership in seven low- and lower-middle income countries**

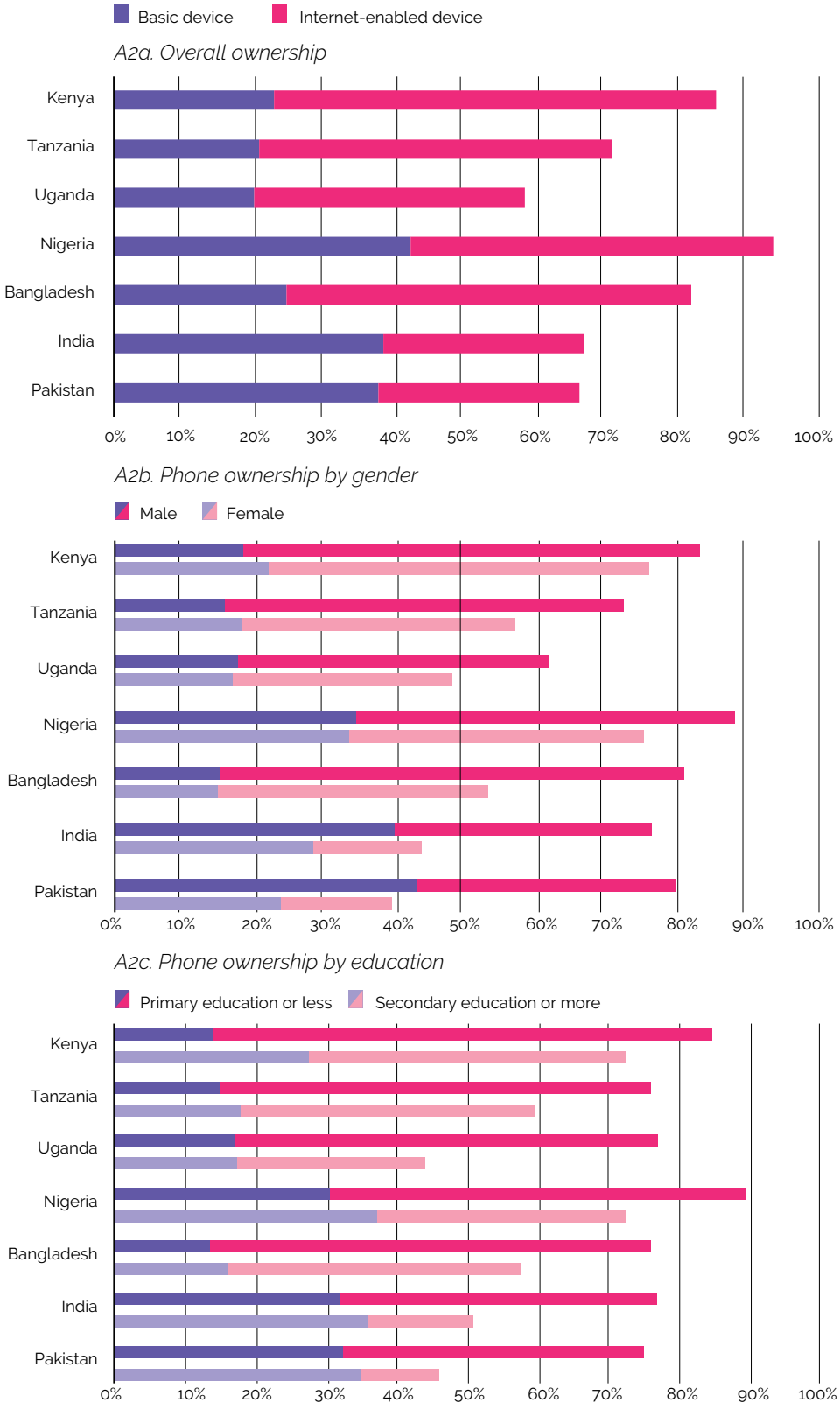
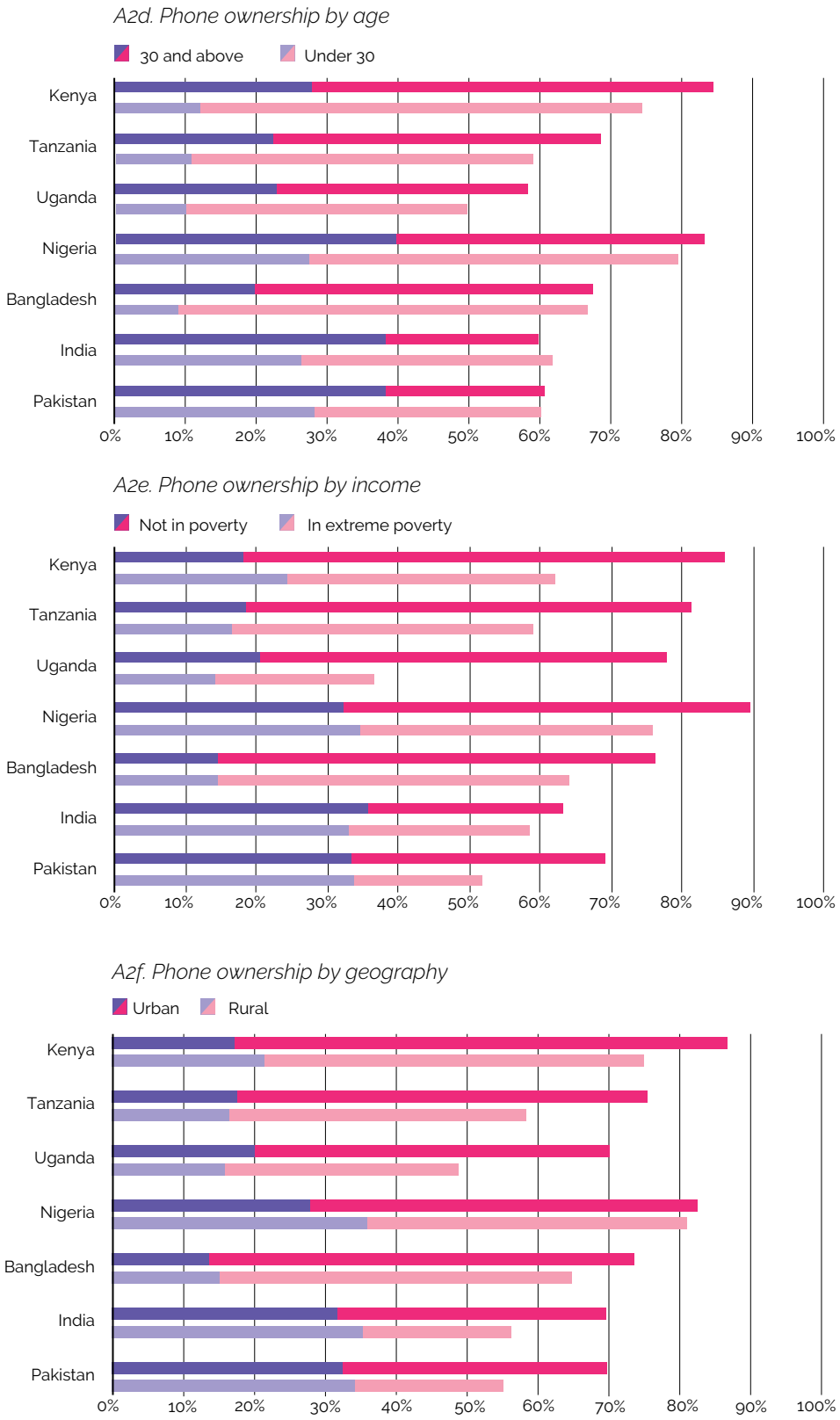


Figure A2 continued. **Mobile phone ownership in seven low- and lower-middle income countries**



Source: Pathways Commission analysis using data from Financial Inclusion Insights (2017).

Note: Internet-enabled devices includes both feature phones – and smartphones. Poverty is defined as living on less than 2011 $1.90 per person per day.

Usage of mobile phone functions by gender, geography, age, poverty and education

While virtually everyone in the dataset has made a call on a mobile phone before, and most people have sent a text message, all other functions are used less frequently. Only a minority of people have ever used the internet, entertainment and social media functions. The most pronounced usage gaps are among more- and less-educated as well as young (less than 30 years of age) and old respondents.

Each demographic and socio-economic characteristic (gender, rurality, age, poverty and education) is independently predictive of mobile phone functions' usage. The variance inflation factors (VIF) for a regression including these characteristics were between 1.08 and 1.89; well below the widely acknowledged thresholds of 5 or 10, which suggests a limited degree of covariance between them.

Figure A3. **Usage of mobile phone functions in seven low- and lower-middle-income countries**

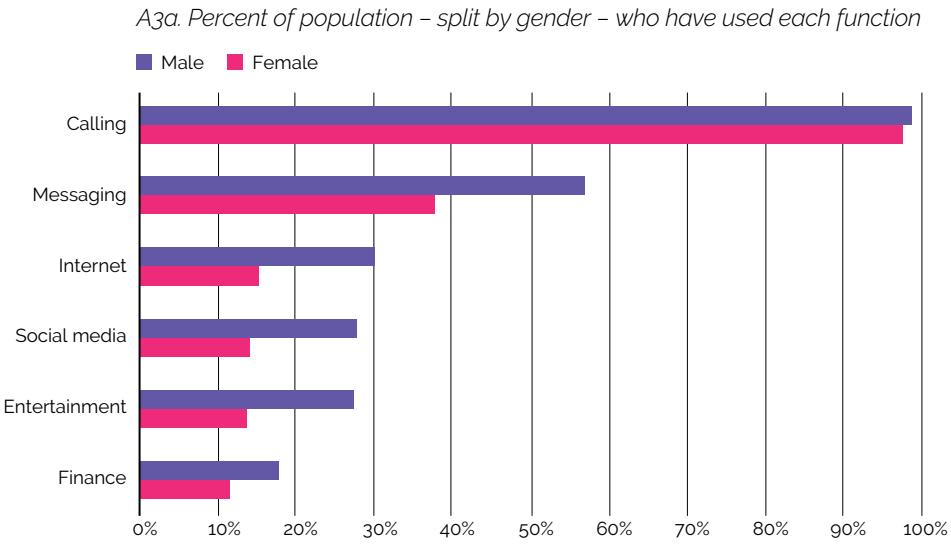
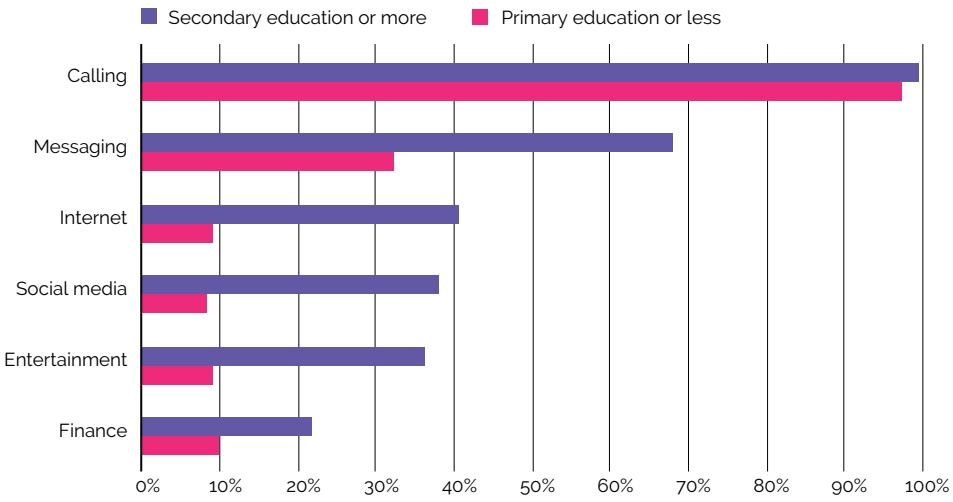


Figure A3 CONTINUED. **Usage of mobile phone functions in seven low- and lower-middle-income countries**

A3b. Percent of population – split by education – who have used the function



A3c. Percent of population – split by geography – who have used each function

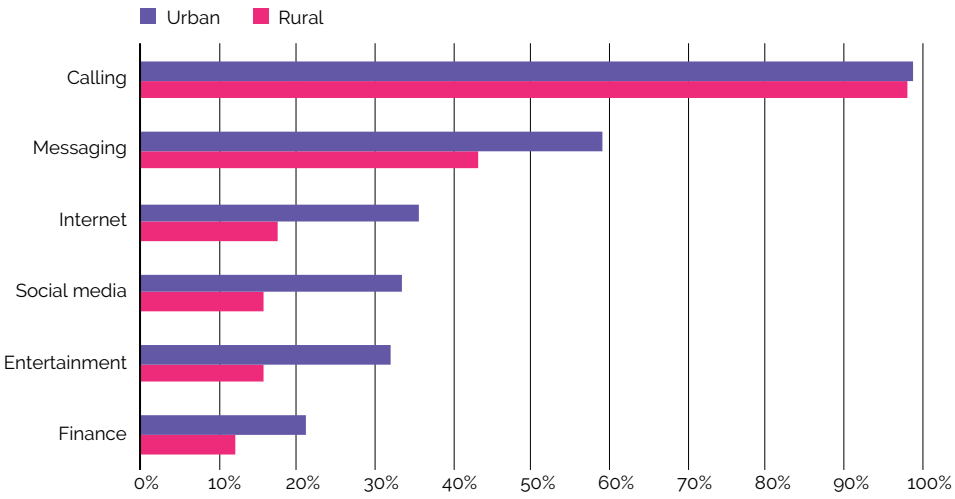
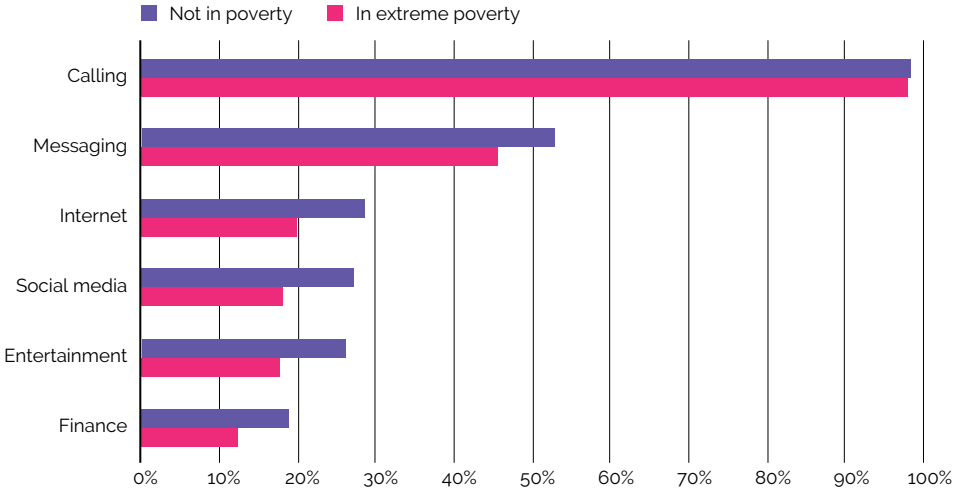
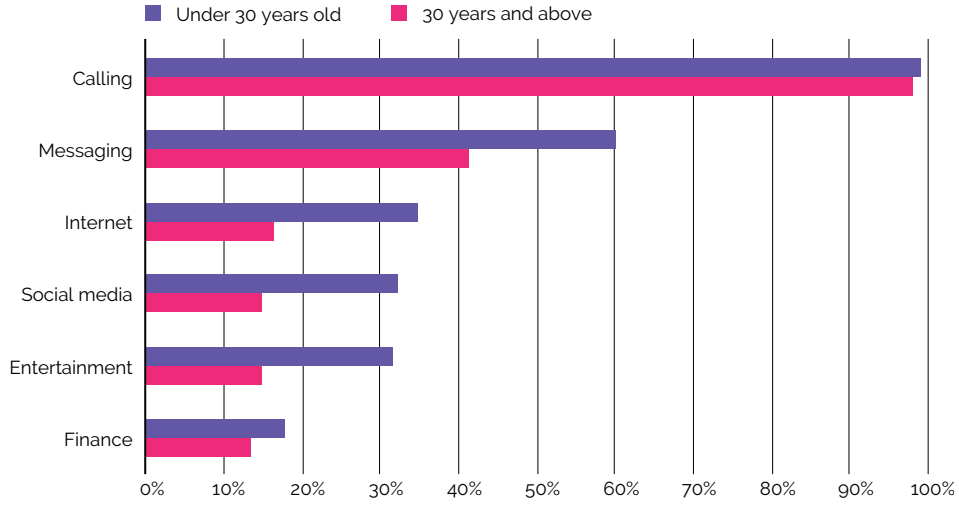


Figure A3 CONTINUED. **Usage of mobile phone functions in seven low- and lower-middle-income countries**

A3d. Percent of population – split by income – who have used the function



A3e. Percent of population – split by age – who have used each function



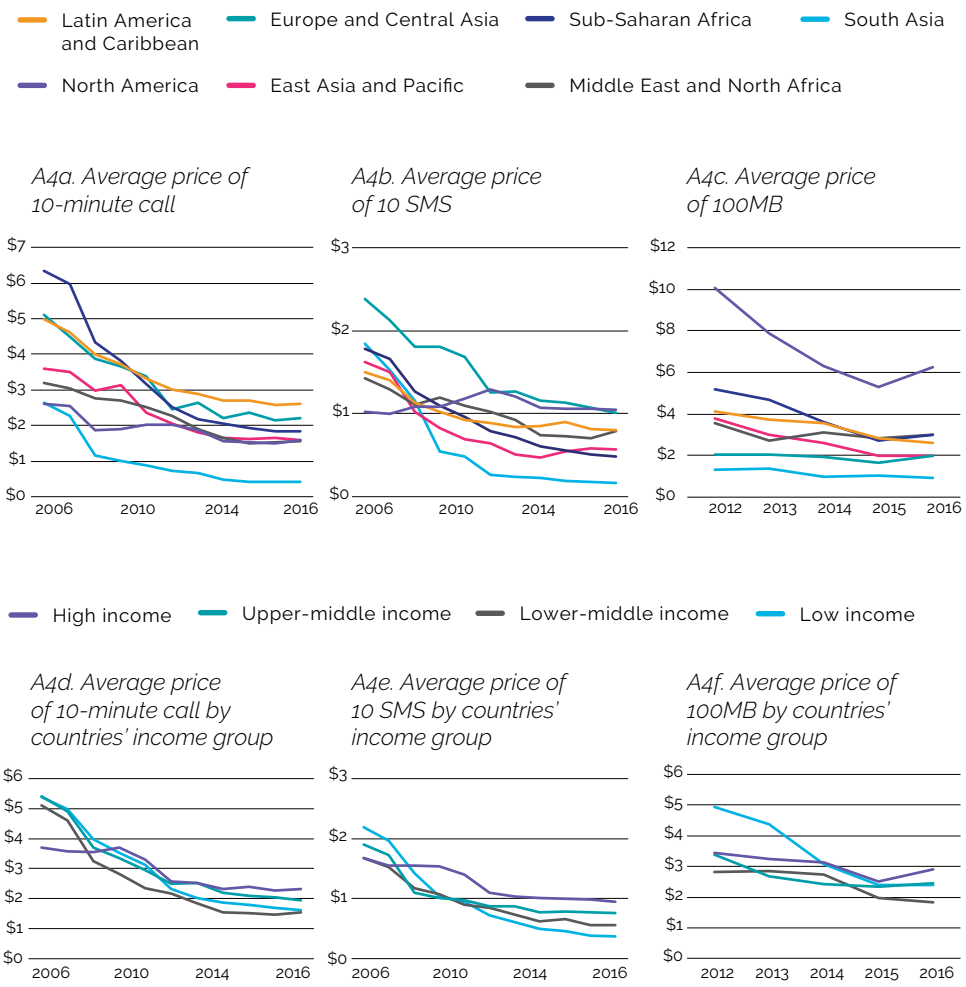
Source: Pathways Commission analysis using data from Financial Inclusion Insights (2017).

Note: Poverty is defined as living on less than $1.90 per person per day.

Prices for calls, text messages and mobile data

Prices for phone calls as well as text messages have decreased globally by 60% each over the course of just ten years from 2006 to 2016. Remarkably, it is low-income countries, especially the South Asia region, that are leading the way by having the lowest average prices for calls, messages and 500MB data packages.

Figure A4. **Price developments by income groups and world regions**

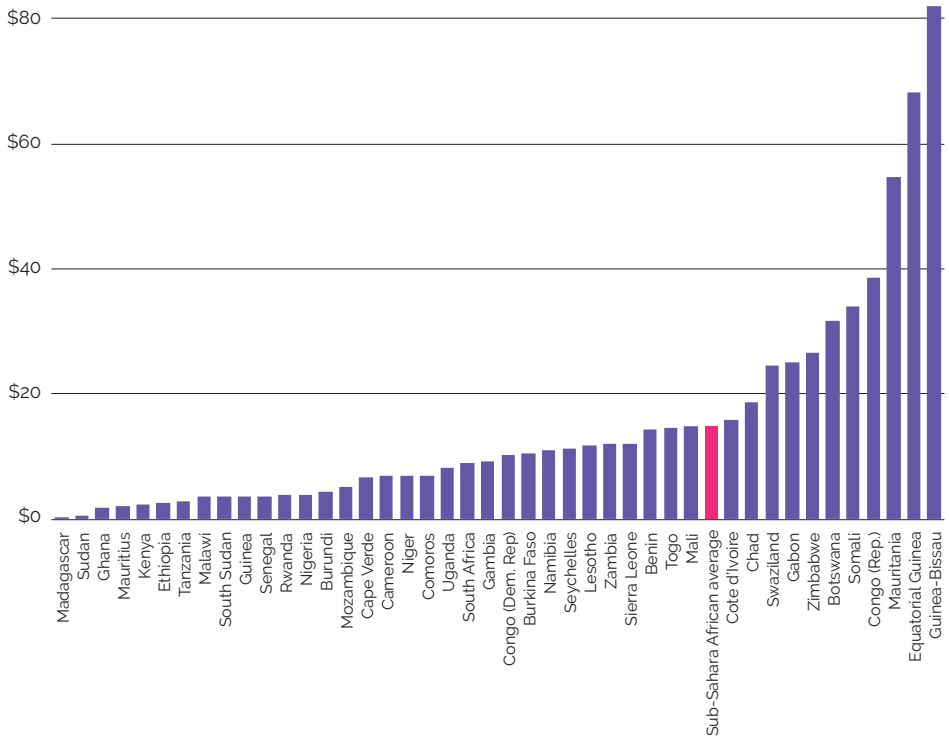


Source: Pathways Commission analysis using data from ITU (2018) ICT Indicators Database. Prices are in PPP-adjusted 2011 int-$.

Variance in prices for mobile data in sub-Saharan African countries

Even though prices for mobile data packages have decreased by more than 40% in sub-Saharan Africa from 2012 to 2016, the average values conceal the great dispersion in prices across the world region. Prices for a 500MB data package in 2016 ranged from $0.35 in Madagascar to $81 in Guinea-Bissau.

Figure A5. **The cost for 500MB data packages in sub-Saharan Africa (in 2011 int-$)**

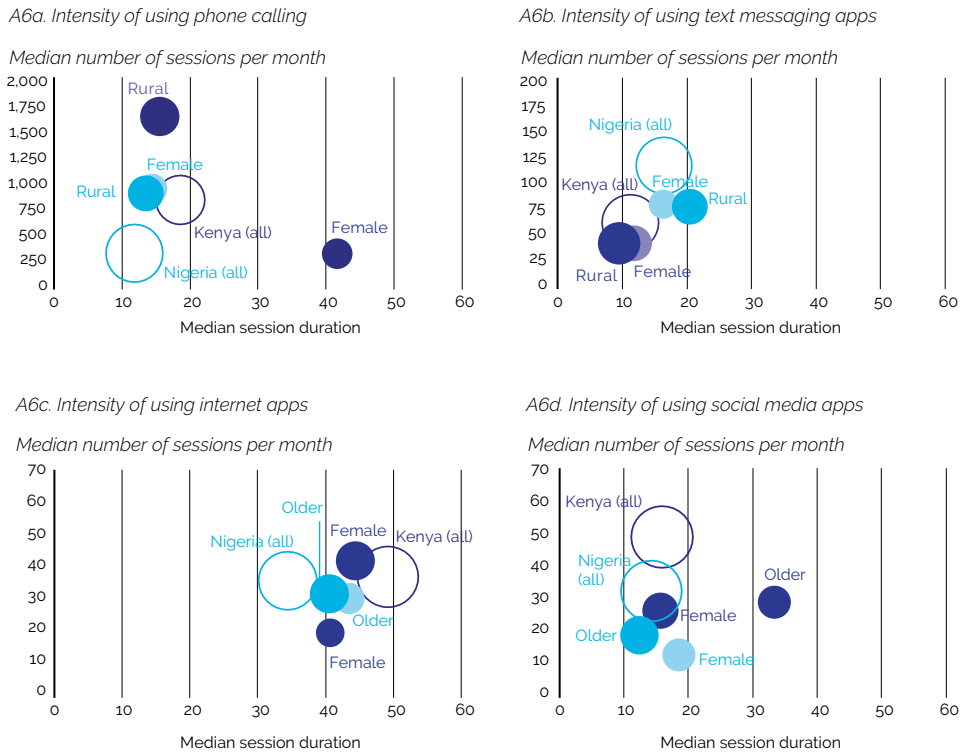


Source: ITU (2018) ICT Indicators Database. Pathways for Prosperity Commission analysis to adjust for inflation and PPP.

Mobile phone usage in Kenya and Nigeria

In both Kenya and Nigeria, female and rural owners of internet-enabled devices use the voice call function more intensely than the respective national average. For the other functions displayed below (text messaging, internet browsing and social media), however, their usage is less frequent. In many cases, they seem to partly offset this difference with, on average, slightly longer session durations.

Figure A6. **Usage intensity (frequency and duration) for four mobile phone functions**



Source: Caribou Digital Data.

Note: The y-axes display the median number of sessions per month. The size of each bubble represents the number of users who use these functions. Data is from a panel of 1,000 demographically representative Kenyan feature phone and smartphone users and 1,000 demographically representative Nigerian smartphone users. 'Older' people are those aged 30 years and above.

Mobile phone usage in the Philippines

Young people in the Philippines, especially those of 18 to 31 years of age, tend to use text messaging more heavily for communication than their older counterparts of 32–45 years of age that are the heaviest users of voice calling.

Figure A7. **Age distribution of voice calling and text messaging in the Philippines**

Source: TALA.

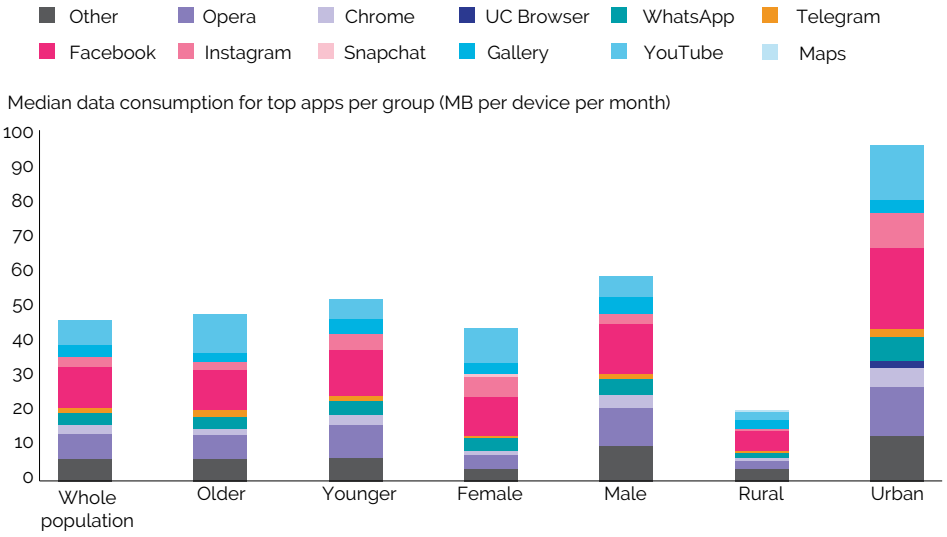
Note: These data are not representative of the Filipino population at large but are a subset of mobile credit clients of the company TALA.

Data consumption in Kenya and Nigeria

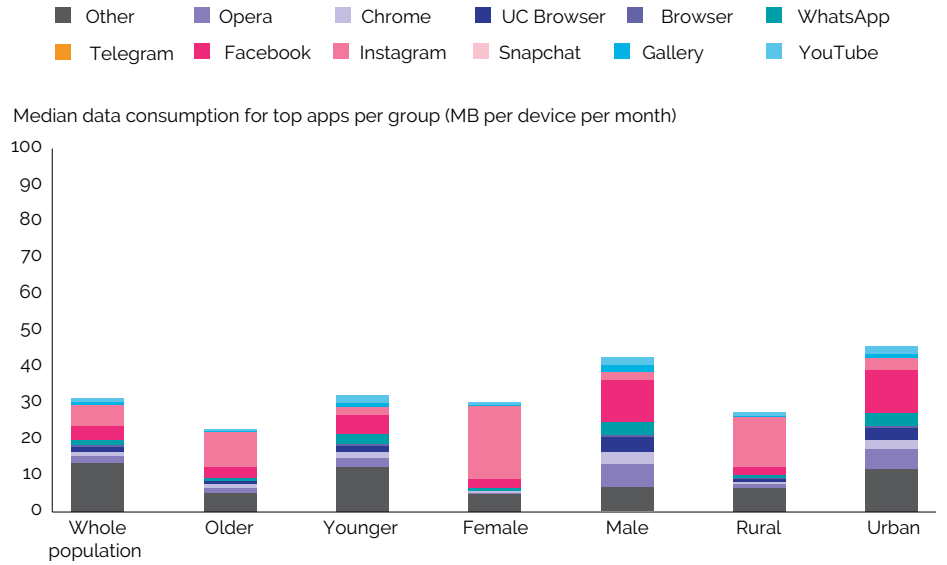
The disaggregation of mobile data use by app reveals clear gaps between older, female and rural user groups and their respective counterparts. For instance, younger and urban subscribers use much more mobile data than older and rural users. The apps using up the most data overall are Youtube, Facebook and various internet browsers such as Opera or Chrome.

Figure A8. **Data consumption between demographic groups**

A8a. Data consumption between demographic groups in Kenya



A8b. Data consumption between demographic groups in Nigeria



Source: Caribou Digital Data.

Note: The y-axis displays the median data consumption (MB per user per month). Data is from a panel of 1,000 demographically representative Kenyan feature phone - and smartphone users. 'Older' people are those aged 30 years and above.

ENDNOTES

1 Mayer and Fontelo (2017).

2 Pathways Commission analysis using data from random samples of the population (15 years of age and older) from Financial Inclusion Insights (2017). See endnote 14 for more details.

3 These 'edge-of-the-network' products load content onto a micro-server to create a locally stored cache that people can access. This is a way to deliver digital information and services (e.g., news, videos, educational material) to locations that do not have good enough networks to support live online use, or where people cannot afford live online use.

4 Data from Caribou Digital Data. See also Figure A8 in the appendix for more details.

5 See endnote 61 for more information about Ethical OS.

6 Jack and Suri (2016).

7 Mayer and Fontelo (2017).

8 Two companies are competing in Indonesia for the market, Grab and GO-JEK.

9 For a review of bribe reporting platforms, see Kutustschka (2016). For a recent review of Aadhaar, the Indian biometric identification system, see Abraham et al (2018).

10 Paton and Muinga (2018).

11 World Bank Group (2016).

12 Wong (2017).

13 This is based on population projections (from UN World Population Prospects) and Pathways Commission projections of recent trends in growth rates of internet usage from the International Telecommunications Union (ITU, 2017). This analysis suggests internet access rates by 2023 of 39% in low-income countries, 52% in lower-middle-income countries, 72% in upper-middle-income countries, and 100% in high-income countries.

14 Pathways for Prosperity Commission analysis using data from random samples of the population (15 years of age and older) from Financial Inclusion Insights (2017). The countries sampled are Kenya, Tanzania, Uganda, Nigeria, Bangladesh, Pakistan and India. Each country's sample has been weighted to make it nationally representative and all cross-country analysis pertains to population-weighted samples. All subsequent Pathways for Prosperity Commission analysis of data from Financial Inclusion Insights also concerns the same dataset. The results of differential internet usage are based on the marginal effects from the difference between rural and urban areas within regression analysis controlling for demographic dimensions such as age, gender, location, poverty and education. These effects are similar across countries.

15 World Economic Forum (2017).

16 USAID (2017).

17 Pathways Commission analysis using data from Financial Inclusion Insights (2017). See endnote 14 for more details.

18 W3 Tech Surveys (2018).

19 World Wide Web Foundation (2015). The report studied Cameroon, Columbia, India, Indonesia, Kenya, Mozambique, Nigeria, Philippines, Uganda and Egypt.

20 Pathways Commission analysis using data from Financial Inclusion Insights (2017). See endnote 14 for more details.

21 Data for India reveal a similar pattern.

22 EPoD (2018)

23 GSMA (2017) and Pathways Commission analysis using data from Financial Inclusion Insights (2017). See endnote 14 for more details of Financial Inclusion Insights data. GSMA (2017) reports that the cheapest handset in Tanzania costs about $36, or 5% of annual income for someone earning $2 a day, and about $70 in India. In both countries, the cheapest smartphone costs 16% of annual income for such a person, or about $115.

24 Pathways Commission analysis using data from Financial Inclusion Insights (2017). See endnote 14 for more details.

25 Pathways Commission analysis using data from ITU (2018). Costs are in international dollars (correcting for purchasing power parity [PPP] and inflation).

26 UNICEF Innocenti (2018).

27 Greenacre (2018).

28 Across seven countries in East Africa, South Asia and Nigeria, internet-enabled devices (feature phones and smartphones) made up 43% to 73% of all mobile phones owned. Pathways Commission analysis using data from Financial Inclusion Insights (2017). See endnote 14 for more details.

29 Pathways Commission analysis using data from Financial Inclusion Insights (2017). See endnote 14 for more details.

30 As before, this is after controlling for education, poverty and location.

31 In particular, 95% and 84% of TALA customers have secondary education in Tanzania and Kenya respectively, and this is higher than the percentages of smartphone owners with secondary education (respectively 83% and 62%). Whether this is due to the complexity of applying or other supply-side factors, or due to digital literacy or social norms biasing against lower-educated groups, or simply because of true lower credit worthiness cannot be assessed from these data.

32 Pathways Commission analysis using data from Financial Inclusion Insights (2017). See endnote 14 for more details.

33 EPoD (2018).

34 See Figure A6 in the appendix for more detail.

35 UNICEF (2017).

36 Data on the Philippines from TALA, see Figure A7 in the Appendix for more detail. Data on Ghana from UNICEF Innocenti (2018).

37 Preference data from UNICEF U-Report and usage analysis by Pathways Commission using data from Financial Inclusion Insights (2017). See endnote 14 for more details.

38 de Reynal and Richter (2016). While this had some negative effects (e.g., some users have a cavalier attitude to using loans for gambling) 75% of the people who gamble said it improved their phone skills as they learnt how to use search engines or online networks.

39 Sayer (2018). The paper shows that Colombians with increased access to the internet increased their consumption of goods and services such as jewellery, eating out, vacations and entertainment. The study explicitly looks at those in the poorest echelons of Colombian society and, as their overall consumption did not change, it suggests that this increase in 'conspicuous' consumption will have been offset by decreases in other, perhaps more critical, goods and services.

40 Caribou Digital (2017).

41 Godiwala (2018).

42 Frost & Sullivan (2015).

43 Wyche, Forte and Schoenebeck (2013).

44 Mirani (2015).

45 Data from Caribou Digital. See also Figure A8 in the appendix for more details.

46 A multi-sided market is a meeting place for two or more groups of agents who interact via an intermediary or a platform. Typically, in digital markets, consumers and advertisers meet on the digital platform, with rules set by the platform provider.

47 Bessi et al. (2016) and Quattrociocchi, Scala and Sunstein (2016).

48 On Venezuela, see Forelle et al. (2018). On the Arab Spring, see Howard et al. (2011).

49 Roose and Mozur (2018), Taub and Fisher (2018) and Ryan (2018).

50 For instance, Chen and Cheung (2017) discusses China's creation of a "social credit" system to monitor and score citizens, while Chege (2018) discusses the Kenyan government's use of data-mining firms to create targeted messaging for an election.

51 Bradshaw and Howard (2018).

52 WhatsApp (2018).

53 For instance, a Danish auction required bidders to serve at least two out of three identified low-coverage regions (Siong, 2012).

54 McGowan, Vora, Homer and Dolan (2018).

55 Lee, Liu and Li (2013).

56 Sambuli (2016) and Greenstein, Peitz and Valletti (2016) provide general discussions on net neutrality, including India and Chile's banning of "zero rated" services.

57 Collins (2018).

58 IndiaStack (2018).

59 Caribou Digital (2017).

60 Conger and Wakabayashi (2018).

61 Price (2018) and Morris (2018).

62 Ethical OS is an initiative headed by Institute for the Future (a Silicon Valley think tank) and the Omidyar Network (a philanthropy and impact investment firm). The core product is a toolkit to help developers of digital products think through the ethical ramifications of the digital architectures they are creating. It identifies eight risk areas (including economic inequality, surveillance state, criminal actors, and tech addiction) that should generally be avoided. By providing discussion guides, hypothetical scenarios, and mitigation options, Ethical OS offers a framework for decision-makers in digital firms to consider whether their design choices are moving towards or away from these digital risks.

Pathways for Prosperity Commission

Technology & Inclusive Development

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