

White Paper

# Internet for All

## A Framework for Accelerating Internet Access and Adoption

Prepared in collaboration with The Boston Consulting Group

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# Foreword

Alan Marcus  
Head of ICT  
Agenda  
Member of  
the Executive  
Committee  
World Economic  
Forum USA

Alex Wong  
Head, Global  
Challenge  
Partnerships and  
Co-Head, Future  
of the Internet  
Initiative  
Member of  
the Executive  
Committee  
World Economic  
Forum

The internet has been a major contributor to the evolution of and growth in the global economy over the past decades. It continues to have the potential to propel societies, help business leaders develop innovative business models and assist governments in addressing critical policy concerns. Yet despite the clear importance of the internet as a key enabler of the Fourth Industrial Revolution, over 4 billion people remain unconnected to the web.

This document, part of the Access/Adoption pillar within the World Economic Forum's Global Challenge initiative on the Future of the Internet, provides a common framework for addressing the barriers related to achieving an internet for all. The document is also a foundation for our focus in 2016 and beyond to develop new scalable and replicable on-the-ground collaborative models, in cooperation with governments, that accelerate the achievement of the broader social and economic priorities of a country or region in the context of accelerating internet access and adoption. Initially, projects will be launched in up to three country/regional programmes, with the Northern Corridor in East Africa (Rwanda, Uganda, Kenya, South Sudan and Ethiopia) identified as the first country programme with the full endorsement of the corridor's governments. Additional country programme opportunities in Latin America and Asia will be also scoped during 2016.

We are extremely grateful for the valuable inputs and overall stewardship that the members of the Future of the Internet initiative's Global Steering Committee and the Global Agenda Council on the Future of Digital Communications provided throughout the White Paper's development. We also thank The Boston Consulting Group (BCG) for their invaluable support as our project knowledge partner. And finally, we thank our colleague Rodrigo Arias as well as Michael Garabet (on secondment from BCG) as the project managers on this effort.

# Executive Summary

The internet has become a pervasive and fundamental part of daily life. Its impact on both economic development and solving problems in areas such as health, education, basic financial services and agriculture is well documented. Still, some 4 billion people – more than 55% of the world's population – do not use the internet. Many do not have access because they live in hard-to-reach areas or do not have access to digital or other basic infrastructure. Some do not see the benefits of being connected, often because of limited relevant digital content. Still others are illiterate, and many are poor. Inequality – in terms of gender, income or other factors – compounds the problem.

Governments, companies, local and international organizations, and members of civil society are working to extend internet access and use. Significant progress has been made since the “digital divide” first became apparent with respect to the internet over 20 years ago. The problem is big, complex and multidimensional. As a global multistakeholder platform that bridges policy, economics, business and civil society considerations, the World Economic Forum is in a unique position to bring together parties that can undertake a comprehensive analysis of the issue of internet access and use for all, and recommend solutions.

The barriers to greater internet use fall into four categories: infrastructure; affordability; skills, awareness and cultural acceptance; and local adoption and use, which is often an issue of the lack of local content. Segmenting the barriers that countries need to overcome can help identify which hurdles are highest in each region or market, and pinpoint solutions that have been successful (or made progress) in the context of common economic, geographic and other conditions.

**Infrastructure is a big hurdle for many countries, especially those that are poor or with large rural or remote populations. Many developing markets require massive investment to move up to more advanced mobile technologies.**

- Governments can facilitate and encourage infrastructure investment when they have a clear long-term plan for the economy, a transparent regulatory framework and a tax system that incentivizes investment. Many have successfully employed both digital strategies and national broadband plans.
- Regulatory policy and decisions have a large impact on infrastructure investment, with respect to both scarce mobile spectrum and fixed-line networks.
- Given the substantial investment required for some projects, multiparty cooperation among countries and between the **public sector, private sector and civil society** is important to realizing global connectivity, especially for the most fundamental infrastructure.
- Innovation in technology and business models, among other areas, has repeatedly demonstrated to be a powerful barrier breaker. When it comes to investing

in infrastructure for more remote areas, a more flexible and experimental approach for both service offerings and regulating services may be needed. This would help unlock the financial incentives required by the private sector, when no clear business case exists for investment based solely on voice and data charges. Scalable solutions and economies of scale are also important. Mobile 3rd Generation Partnership Project (3GPP) technologies, global standards or harmonized spectrum are driving economies of scale and hence affordability. These factors also constitute supply-side ingredients to success.

**Affordability remains a major constraint for the almost 13% of people worldwide who live below the international poverty line, and for those who find devices and access too expensive or do not perceive sufficient value for money from internet use.**

- While smartphone prices have fallen significantly, they are still out of reach for many. Low-income earners in emerging markets may face high costs for fixed-line or mobile access, often well above the affordability threshold of 5% of average income set by the United Nations. Affordability disproportionately affects certain segments of the population, such as women and rural residents.
- Government policy in a number of areas, notably in taxation, can have a direct impact on cost.
- Device manufacturers, **operators** and operating system companies, including some new players, are making progress. The downward trend in smartphone prices, particularly in emerging markets, is a welcome development and set to continue.
- Some organizations are using new business models to extend affordable access. Applying other revenue pools to cross-subsidize services, as well as bundling different services, can inspire new ideas.

**Research shows that a lack of skills and awareness is one of the greatest barriers to internet adoption and use. Cultural acceptance can also be an impediment. In many countries, basic literacy is a problem, but even in more developed countries, the lack of awareness of the internet's value among non-users remains a huge hurdle.**

- Spreading awareness of the internet's value, encouraging its cultural acceptance and helping people acquire the skills to go online are top priorities. These efforts need to be based on an understanding of local conditions and customs, especially of how families and communities influence learning and exposure to new ideas.
- Governments, private-sector players, civil society and local and international organizations can all combine to promote basic skills building.

- For widespread digital use to take hold and digital economies to grow, governments need to address literacy and educational enrolment issues, as well as the use of information and communications technology (ICT) tools in education. Advanced ICT skills are essential to putting the internet to work in businesses and developing digital economies.
- Connected facilities in remote or hard-to-reach regions can provide centralized venues for communities to be exposed to the benefits of internet access.
- Individuals and communities that become connected and are encouraged to engage online soon recognize the internet's value. They find a world of information and assistance; the latter often comes from international communities, organizations or institutions of civil society committed to using the internet to expand ICT skills.

**Digital ecosystems that produce local content and apps are vital for building digital literacy, attracting local users and serving local needs. Digital services can also address local problems and boost competition in an increasingly international digital services market. In addition, using the internet can have a significant impact on local businesses, especially small and medium-sized enterprises (SMEs).**

- **The public sector, private sector and civil society** can encourage adoption and use of digital services by facilitating local content development and using policies that make it easier for businesses, especially SMEs, to benefit from digital technology.
- One of the most powerful steps that governments can take is to digitize their interactions with citizens and the provision of government services to the greatest degree possible. Governments are also playing a direct role in promoting content development by others. Some are encouraging private-sector ICT development by including local businesses in government procurement and e-services programmes.
- The private sector can contribute to content development and profit directly from its efforts. As economies expand and incomes rise, the experience of countries such as India and Brazil shows that the internet, and particularly the mobile internet, are powerful vehicles for consumer commerce in places where physical retail infrastructure remains underdeveloped.
- Far-sighted companies and organizations are facilitating content development by others by helping to “incubate” new ideas and provide the necessary support services (e.g. financial, advisory) to would-be content creators.
- SMEs drive internet use and boost their countries' economies (as well as their own businesses) when they add websites and mobile apps and, as a result, increase revenues and growth.

These four issues are interdependent and need to be addressed in a comprehensive manner, because no “one-size-fits-all” solution exists for any of them. Each country or region will need to identify its own set of problems and develop an orchestrated approach that addresses the relevant issues, based in part on learning from what has worked elsewhere.

The barriers are real, and the costs are high. But policy-makers and others may want to ask themselves: what are the costs of inaction – of not extending access and use? These costs are potentially much higher in terms of fewer jobs and less economic development, a bigger digital divide, poor education, expanded inequality and worse healthcare, among many other factors. Innovative and fact-based approaches that lead to tangible social and economic outcomes are required to mobilize the necessary political and financial resources to bring the internet to all.

# Introduction

For many people, the internet has become such a pervasive, fundamental part of daily life and business that it is hard to fathom that over 4 billion people – more than 55% of the world's population – are still not online (Figure 1). Many of those simply do not have access: they live in hard-to-reach rural areas or do not have digital or other basic infrastructure. Some simply do not see the benefits of being connected, often because of limited relevant digital content. Others are illiterate; many are poor.

Inequality compounds the problem. Good, fast connectivity (broadband, or 3G or better mobile connections) reaches almost 70% of the world's population, but less than 30% in rural areas.<sup>2</sup> According to the World Wide Web Foundation (WWWF), women are much less likely to access the internet than men in the same communities; the WWWF reported that just 37% of women surveyed used the internet, compared to 59% of men. Once online, women are 30-50% less likely than men to use the internet to increase their income or participate in public life.<sup>3</sup>

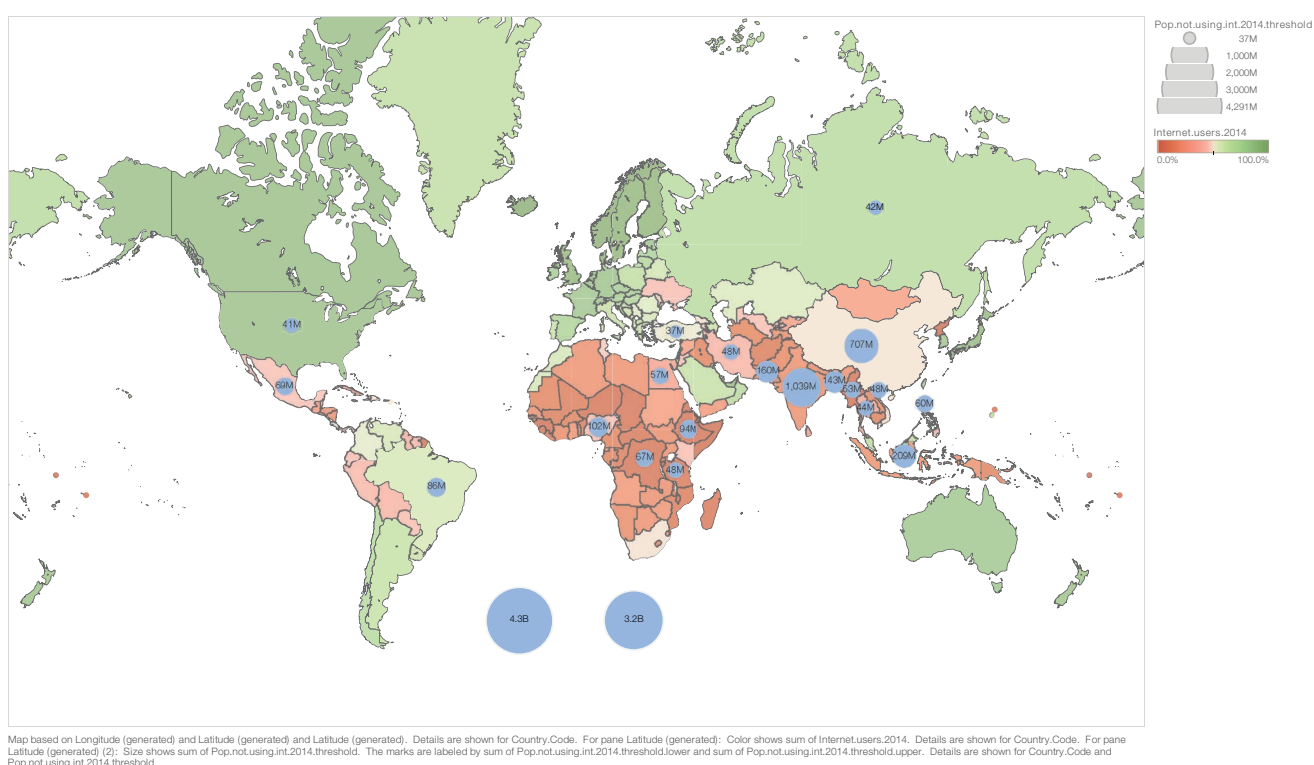
Governments, companies, local and international organizations, and members of civil society are working to extend internet access and use. Plenty of progress has been made since people first started talking about a “digital divide” with respect to the internet over 20 years ago. Establishing the Broadband Commission for Digital Development (now called the Broadband Commission for Sustainable Development) has helped to further

broadband's presence on policy agendas and build support for increasing countries' access to it (text box). But the problem is big, complex and multidimensional. It's hard to get one's head around the full nature and extent of the need. From its position as a global, multistakeholder organization that bridges policy, economics, business and civil society considerations, the World Economic Forum is in a unique position to bring together parties that can undertake a comprehensive analysis of internet access and use for all, and recommend solutions. Those should meet several essential criteria, which are:

- Address the local underlying environment and barriers of each case
- Serve as coordinated efforts and interventions across multiple dimensions
- Draw on successful examples of collaboration among stakeholders
- Represent proven examples of further expanding the internet and its use

This White Paper is a first step in the Forum's multiyear Future of the Internet initiative, which includes several related projects. It seeks to affect change through country programmes with multistakeholder partnerships.

**Figure 1:** Twenty countries are home to three-quarters of the 4.3 billion internet non-users worldwide



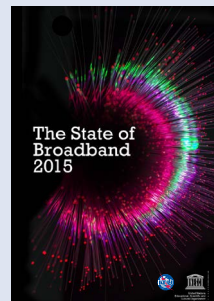


## Broadband Commission for Sustainable Development

ITU and UNESCO set up the *Broadband Commission for Digital Development* in response to UN Secretary-General Ban Ki-Moon's call to step-up UN efforts to meet the Millennium Development Goals (MDGs). The Commission was established in May 2010 with the aim of boosting the importance of broadband on the international policy agenda, and expanding broadband access in every country as key to accelerating progress towards national and international development targets. It defines practical ways in which countries — at all stages of development — can achieve this, in cooperation with the private sector.<sup>1</sup>

### Joining efforts for global connectivity

Broadband Commissioners and invited guests convened for a special session during the 2016 Annual Meeting of the World Economic Forum in Davos, Switzerland, to discuss collaboration opportunities and initiatives to connect the unconnected. As part of this collaboration, this report also references to several publications of the Broadband Commission including “The State of the Broadband 2015” and *Planning for Progress: Why National Broadband Plans Matter*<sup>2</sup>



1 Extracted from “About” section of Broadband Commission’s website: <http://www.broadbandcommission.org/about/Pages/default.aspx>

2 Extracted from the “Events” section of Broadband Commission’s website (Broadband Commission Special Session at the World Economic Forum): <http://www.broadbandcommission.org/events/Pages/WEF-davos-2016.aspx>

## Connectivity's Benefits

While causality and correlation shouldn't be confused, little doubt exists about the broad economic and social benefits of internet access and use. Most studies have verified the positive impact of greater broadband penetration on the growth in gross domestic product (GDP). One of the first, by the World Bank, concluded that every 10-percentage-point improvement in broadband penetration increases GDP by 1.3%. A 2012 International Telecommunication Union (ITU) study, which included a review of previous research, showed that for every 10% increase in penetration, the contribution to GDP growth ranged from 0.25% to 1.38%. A 2012 study, using similar methodology to the earlier World Bank study but including five years of additional data through 2011, found that a 10% increase in penetration was correlated with a 1.35% and 1.19% increase in GDP for developing and developed countries, respectively.<sup>4</sup>

Multiple studies by The Boston Consulting Group (BCG) have detailed the internet's macroeconomic benefits to GDP, the broad economic and job impact of the digital economy's rapid growth, and the big impact of information and communications technology (ICT) on small-business revenue growth and job creation. Recent studies have also detailed the internet's growing impact on consumer behaviour in emerging markets such as India and Brazil, and the increasing importance of mobile money in Africa.<sup>5</sup>

Research also highlights a positive relationship between the application of digital technologies and the quality of life. The internet helps solve many problems in such areas as health, education, basic financial services and agriculture. New services, such as mobile finance, are spread particularly by mobile technology and smartphones, and are more immediately available to more people. Government services are increasingly delivered online and via mobile technology, especially in developing countries. Mobile technology is

having a major effect on agriculture, improving productivity in emerging economies.<sup>6</sup> As the Forum explored last year, the future impact of the Internet of Things offers significant potential in developing countries to solve pressing problems such as those related to traffic, water hygiene and disaster prevention.<sup>7</sup>

Connectivity's benefits also include increasing access to information and knowledge, widening participation in public debate and civil society, and extending fundamental human rights. Expanding internet adoption and use is consistent with and, in multiple instances, supportive of many of the United Nations' (UN) global goals for sustainable development – not least those related to education, gender equality, jobs and economic growth, innovation and infrastructure, and sustainable cities and communities (Figure 2).<sup>8</sup>

Studies have shown, however, that until internet penetration in a particular market reaches a minimum threshold of about 20-25%, access to digital technology tends to exacerbate the divide between the “haves” and “have-nots”. Slow or uneven adoption can actually increase inequalities between, for example, urban and rural, wealthy and poor, or educated and uneducated segments of the population.<sup>9</sup> A World Bank report in 2016 found that “[i]n many instances digital technologies have boosted growth, expanded opportunities, and improved service delivery. Yet their aggregate impact has fallen short and is unevenly distributed”.<sup>10</sup>

Ubiquitous access and adoption also carries risks that need to be managed. The internet has a dark side – threats to consumer privacy and trust, data security, piracy, fraud, cyberhacking and cybercrime are all risks that need to be managed. Advancing good cyberpractice and cyberhygiene are important to furthering digital skills and awareness. In addition, digital's influence on individual and group behaviour in social settings is receiving greater scrutiny in developed



**Figure 2: ICT and the Sustainable Development Goals**



The United Nations' 17 Sustainable Development Goals and related 169 targets agreed in September 2015 seek to complete the objectives initiated under the Millennium Development Goals. "They are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental. The Goals and targets will stimulate action over the next fifteen years in areas of critical importance for humanity and the planet: people, planet, prosperity, peace and partnership."<sup>1</sup>

"ICTs can be an engine for achieving the Sustainable Development Goals. They can power this global undertaking."<sup>2</sup>

UN Secretary-General Ban Ki-moon, December 2015

<sup>1</sup> United Nations, 2015a; <sup>2</sup> United Nations, 2015b  
Source: UN; World Economic Forum

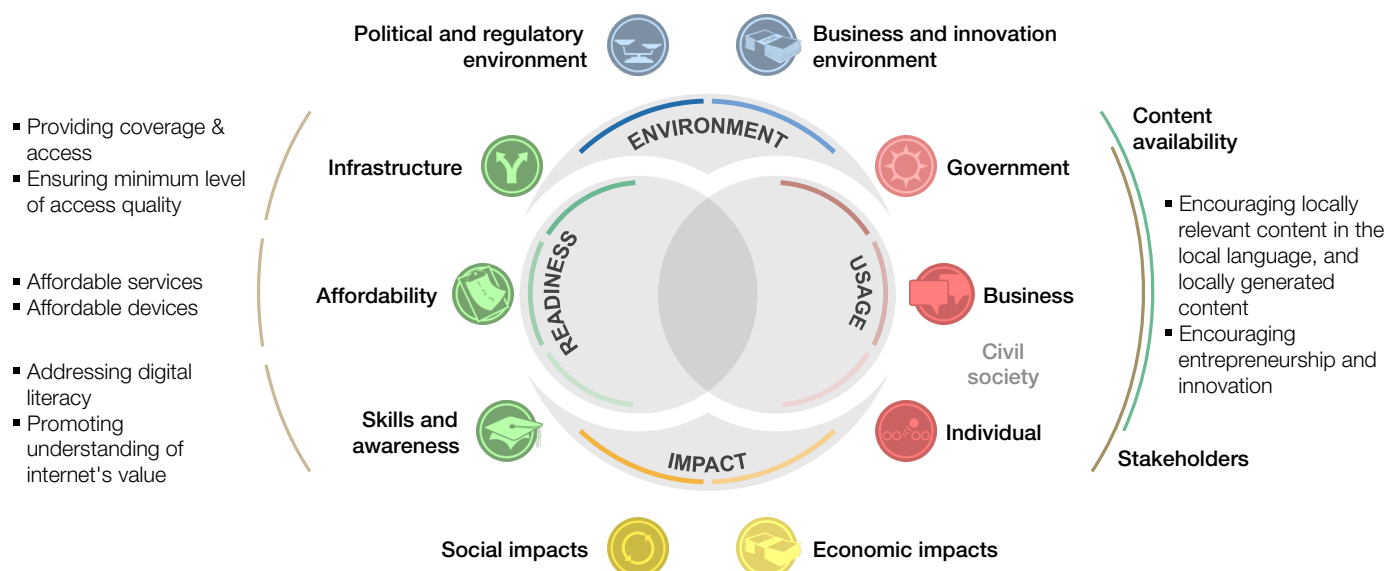
and emerging markets. Within the Global Challenge initiative on the Future of the Internet, the Forum is addressing these problems in other pillars, including initiatives on cybercrime and security, internet governance and the human implications of digital media.<sup>11</sup>

### The Barriers to Global Adoption and Use

After years of rapid increases, the growth in the number of internet users is slowing. The UN Broadband Commission noted recently that "growth in global mobile cellular subscriptions and growth in internet usage have slowed sharply. We have reached a transition point in the growth of the internet."<sup>12</sup> The expected milestone of 4 billion internet users worldwide is unlikely to be reached before 2020, and internet user penetration in the developing world will probably not achieve the 50% target before 2020.

The barriers to greater internet use fall into four categories: infrastructure; affordability; skills, awareness and cultural acceptance; and local adoption and use, which is often due to a lack of local content. (Research shows that in some large markets, such as India and Brazil, skills, awareness, cultural acceptance and availability of local content are actually the greatest barriers to more widespread usage after lack of infrastructure. However, since infrastructure and affordability are closely connected, they are discussed here first.) To facilitate the dialogue, this White Paper draws on a framework from the Forum's annual Networked Readiness Index (Figure 3). This framework serves as a comprehensive overview of the topics and issues that need to be considered and addressed when discussing internet access and adoption. It covers the underlying political and business environment that can help or hinder initiatives to encourage adoption and use, and considers other social and economic factors. This White Paper's structure is, at its core, a dialogue on infrastructure, affordability, skills and digital content.

**Figure 3: Framework based on the Forum's Networked Readiness Index**



Segmenting the barriers based on what countries need to overcome can identify the highest hurdles by region and country. It can also determine the successful solutions (or those that have made progress) in the context of common economic, geographic and other conditions.

**Infrastructure:** Infrastructure is a big hurdle for many countries, especially those that are poor or with large rural or remote populations. Mobile online coverage is the main means of internet connectivity for most people; 95% of the world's population is covered by at least a 2G network, and 69% is covered by 3G connectivity or better, although the extent of 3G or better coverage drops to 29% in rural areas.<sup>13</sup> While infrastructure is a prerequisite, 3G or better coverage far outpaces the percentage of people actually online, thus underscoring the need to address the other barriers.

**Affordability:** Despite many efforts to reduce price, affordability remains a significant constraint (Figure 4). It affects not only the nearly 13% of people living under the international poverty line<sup>14</sup> (mostly in developing countries), but also those who simply find the cost of both devices and access too high or do not perceive sufficient value for money from using the internet.

**Skills, awareness and cultural acceptance:** The most recent United Nations Educational, Scientific and Cultural Organization (UNESCO) estimate (2013) puts the global illiteracy rate at 15% of adults – a large barrier for many countries to overcome.<sup>15</sup> However, even when people are literate and relevant content is available, surveys in several countries have shown that many do not see any personal benefit from using the internet. In addition, not all cultures promote widespread or equal access for all elements of society.

**Local adoption and use:** Encouraging usage by both individuals and small businesses needs to complement and be as strenuous as efforts to build skills and awareness. This is largely, but not exclusively, a matter of stimulating the development of relevant and useful content. Such content is often developed in, or translated into, the local language and deals with matters of local interest. It also involves convincing local companies of the myriad and far-reaching business benefits of using the internet.

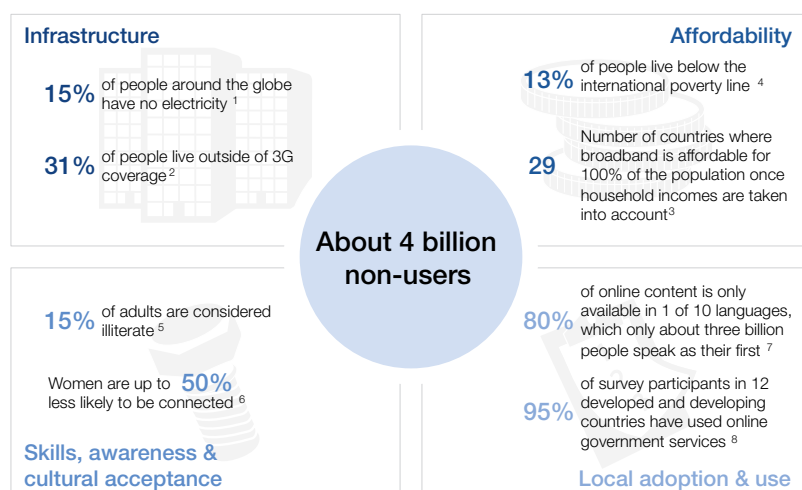
These issues are somewhat interdependent and need to be addressed in a comprehensive manner; no “one-size-fits-all” solution exists for any of them. Each country or region must identify its own set of problems and develop an orchestrated approach that addresses the relevant issues, based in part on learning from what has worked elsewhere. All participants, however, can take certain steps (which many are already doing). The public sector can set policy, adjust regulations and mount actual initiatives to address all four barriers. Numerous examples exist of private-sector efforts to promote adoption and use, and plenty room is available for cooperative ventures involving the public and private sectors, members of civil society, non-governmental organizations (NGOs) and other organizations at both international and local levels. Governments in particular need to appreciate that connectivity is not exclusively an ICT issue. Multiple departments and ministries, from health to education to labour to treasury, can benefit from applying digital technologies – if citizens are online. Indeed, it will likely take a combination of efforts from all players to bring internet access to all, especially in the most challenged areas.

The following chapters examine these four major barriers to internet access and use, and how the various stakeholders can help make progress in overcoming them, including examples of efforts that have worked (and some that have not) in countries around the world. The barriers are real, and the costs are significant. But all participants may want to ask themselves: what are the costs of inaction, of not extending access and use? These costs are high as well, and potentially much higher in terms of fewer jobs and less economic development, a bigger digital divide, poor education and worse healthcare, among many other factors.

The White Paper concludes with a checklist that all stakeholders can use to assess where they and their countries stand, and what needs to be done to bring more people online.

The Forum's ambition is that this work will inspire continued efforts on “Internet for All” in future years. Starting in 2016, in partnership with governments, international organizations, the private sector and civil society, the Forum will launch country programmes to develop and build to scale new public-private collaboration models that accelerate internet access and use for all.

**Figure 4: Approaching the problem through careful segmentation**



Most recently available figures used: 1. World Bank, 2012; 2. ITU, 2015 estimate; 3. Broadband Commission for Digital Development, ITU, UNESCO, 2015; 4. World Bank, 2015 (2012 data); 5. UNESCO, *Adult and Youth Literacy*, 2015; 6. Controlling for education level and household income, World Wide Web Foundation, 2015; 7. World Bank, 2014; 8. BCG, 2014a

# Extending Infrastructure to Enable Ubiquitous Access

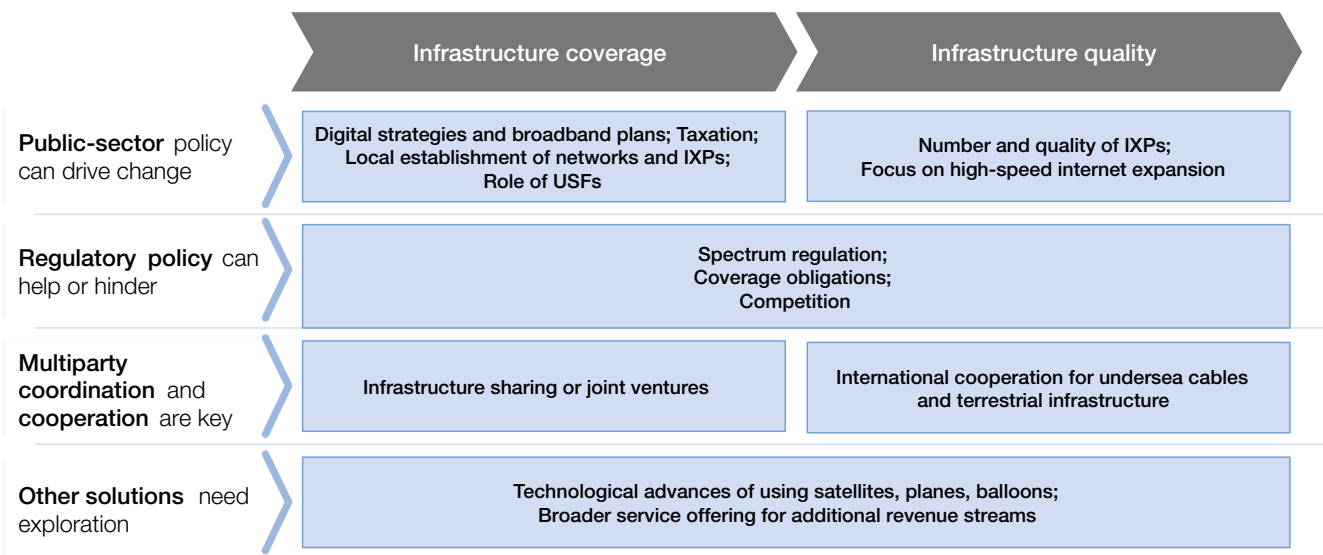
The availability, quality, reliability and affordability of internet access are all affected by infrastructure (Figure 5). Many barriers impede infrastructure construction and installation, including lack of electricity, limited mobile network coverage, underdeveloped core networks and the availability of high-capacity backhaul. These challenges are especially prevalent in remote areas because of long distances, difficult terrain, large capital expenditures, high operating costs and low average revenues per user. Many urban areas present their own infrastructure challenges, notwithstanding that almost 60% of the world’s population is projected to live in cities by 2030.<sup>16</sup>

Lack of electricity is most severe in Sub-Saharan Africa, where almost two-thirds of the population, or about 600 million people, do not have regular access to electrical power. Another 370 million people, or almost a quarter of the population of South Asia, are in similar circumstances.<sup>17</sup> Even where electrical infrastructure is in place, the cost for many to access it, such as for recharging devices, is a problem.

While the economics of fixed-line infrastructure are prohibitive in many countries, mobile network coverage is already nearly omnipresent in some developing nations. As noted in the Introduction, 95% of the world’s population is covered by basic cellular networks, and 3G or better coverage reaches 69% (but only 29% of populations in rural areas). A recent report by Ericsson projects 3G coverage to rise to more than 90% of the global population, and 4G coverage to reach about 75%, by 2021.<sup>18</sup>

Next-generation access, also known as 5G, is expected in the future. While the mobile coverage figures are impressive, the type of mobile network actually dictates the quality of service available, and the capabilities of the consumer’s device affects the experience as well. People living in areas with 2G coverage and without fixed-line infrastructure, or those using older-generation feature phones, receive only limited online connectivity. Their network connections are not sufficiently fast or reliable, and their devices lack the capability, to handle many more advanced functions or uses. Moreover, many developing markets require massive investment to move up to more advanced mobile technologies. Latin America needs about \$400 billion in investment through 2020, or the equivalent of \$700 per inhabitant, to close the digital divide.<sup>19</sup> Alternative approaches (e.g. using satellites) could help to alleviate these challenges, especially in remote areas. Ericsson is introducing Intelligent Antenna Sharing that allows for reuse of the 2G site equipment and introduction of new 3G equipment, resulting in potential savings of over 60% compared to a new conventional 3G site. In addition to these significant cost savings, this approach of upgrading incrementally offers fast time-to-market of 3G mobile broadband and reuse of existing support infrastructure.<sup>20</sup>

**Figure 5:** Extending infrastructure to enable ubiquitous access



## Public-Sector Policy Can Drive Change

Governments have played a big role in extending connectivity and coverage through policy setting and infrastructure initiatives in many developed and developing markets. A large number of governments have successfully employed both digital strategies and national broadband plans. Hong Kong SAR, for example, has steered development over many years through its Digital 21 Strategy. South Korea saw the potential of ICTs, many of which were nascent during the South-East Asian economic crisis of the late 1990s, and used a digital strategy to turn itself into an economic powerhouse. In 2010, Colombia launched its Plan Vive Digital “to give the country a technological leap through wide dissemination of the internet and the development of its national digital ecosystem.” The country’s former ICT minister has described the plan as “the most ambitious public policy strategy ever implemented by the Colombian government for the ICT sector”.<sup>21</sup>

National broadband plans have a large impact as well. Research by the Broadband Commission for Digital Development, the ITU and Cisco shows that such plans lead to 7.4% higher mobile internet penetration, on average. History also shows that competitive markets accelerate both broadband and mobile penetration. The Broadband Commission/ITU/Cisco study found that countries with competitive markets have mobile penetration rates that are 26.5% higher than average.<sup>22</sup>

The Government of Senegal has long regarded telecommunications as a priority sector to encourage economic growth and reduce poverty. As a result, the country has benefitted from international access through multiple analogue and, more recently, fibre-optic undersea cables. Senegal is a communications hub in West Africa and delivers international connectivity to neighbouring countries such as Mali, The Gambia, Guinea-Bissau and Mauritania. As of 2011, Senegal had the highest broadband penetration rate in West Africa.<sup>23</sup>

In many countries, increasing backhaul capacity is an important component of national strategies and plans. Government initiatives can include active promotion of E- and V-bands for wireless backhaul, support for point-to-multipoint backhaul applications, incentives for backhaul alternatives, and more.<sup>24</sup>

In general, governments can ease and encourage infrastructure investment when they have a clear long-term plan for the economy, a transparent regulatory framework and a tax system that provides incentives for investment. Facilitating widespread internet access and generating tax revenue are separate goals, and policy-makers should resist the temptation to use infrastructure investment as a source of tax revenue, as it can be a significant disincentive for investment. The GSMA’s most recent annual study on taxation and the mobile industry found that “total tax payments and fees are estimated to represent more than a third of market revenues for 11 of the 26 countries surveyed. Total mobile tax payments from taxation on both consumers and operators are estimated to range from 10.6% as a proportion of market revenues in Nigeria to 58.3% in Turkey.”<sup>25</sup>

Not all government programmes perform as expected, even when they have good intentions. Some governments have created universal service funds (USFs), often financed by levies on network operators, to provide funding for infrastructure initiatives. Bureaucracy and inefficiency, among other factors, are major hurdles. The GSMA has identified about \$11 billion of undisbursed funds in 64 USFs that it reviewed. For example, India charges operators a levy of 5% on revenue for funding infrastructure buildout (among other purposes). The plan is for the government to provide the basic infrastructure (towers and electricity, for example), and mobile network operators (MNOs) to operate their equipment on top. The programme has been limited in its effectiveness because the fund is not committed to specific projects upfront, and projects are often blocked for other reasons. About 60% of funds go unused.

This doesn’t mean that all USFs are performing poorly. Colombia’s USF has been structured to be financially autonomous, while fund projects are awarded through a highly transparent public bidding process open to all interested parties. Funds in Chile and Paraguay have achieved their targets, and any unused funds are rolled back into the treasury. The GSMA concludes, however, that “increased availability of telecommunications services has generally been accomplished through alternate solutions, such as the imposition of license conditions on operators, the establishment of new plans or funds that are separate from the existing USF, or private/public partnerships”.<sup>26</sup>

## Regulatory Policy Can Help or Hinder

Regulatory policy and decisions have a large impact on infrastructure investment with regard to both scarce mobile spectrum and fixed-line networks. Two previous World Economic Forum reports examined at length the impacts of regulation in both developed and developing markets. A recent BCG report explored the effects in Europe of policy-making and regulatory rulings on market structure, industry consolidation and wholesale regulation on competitive dynamics and, by extension, on the incentives for investment in next-generation infrastructure.

The principles explored in these reports are broadly applicable.<sup>27</sup> On the one hand, removing entry barriers and facilitating competition puts downward pressure on prices. Colombia, for example, lowered barriers for new broadband market entrants in 2009. Today, five network operators and six virtual network operators compete against each other. Prices decreased for entry-level broadband plans from 5.8% of per capita average income in 2013 to just 3.3% in 2014.<sup>28</sup> In West Africa, Yoomee Africa, a start-up provider of 4G/LTE high-speed wireless internet access, has established itself in two countries, is the market leader in Cameroon and plans to expand to others. In a number of countries, the Alliance for Affordable Internet (A4AI) has found that the shift to a unified licensing regime, which facilitates the move from vertical (technology-based) to horizontal (services-based) licences, can help reduce the administrative and formal requirements for new competitors to enter the market.<sup>29</sup> On the other hand, consolidation in a market with too many weak competitors can create stronger, healthier companies, and the synergies realized in mobile-operator mergers can



lead to much-needed investment. Regulators need to make comprehensive and balanced assessments that include investment, technical progress, innovation, efficiency and quality of service. They also need to adopt a comprehensive and technology-agnostic approach that recognizes current market realities for advancing both current and next-generation access.

Some countries are using spectrum policy to advance connectivity. For example, the Brazilian National Telecom Agency, Anatel, included specific coverage obligations to a spectrum auction in 2012, such as connecting 30% of Brazilian cities by June 2014, 60% by December 2014 and 100% by December 2015. The criteria for determining the buyer included bringing the lowest costs to consumers.<sup>30</sup>

As the Forum has previously argued, government policy on spectrum auctioning can have a major impact on operator investment levels and, therefore, infrastructure deployment and costs for end users. Too many governments consider spectrum as an asset whose full value to the seller should be realized immediately, rather than used as a powerful means of expanding coverage and use. Empirical evidence shows that high auction prices can result in successful bidders lacking the resources to make the capital investments required to put their newly acquired purchases to use, thus turning a scarce resource into a wasted one. The primary goal for policy-makers and regulators should be to maximize the use of spectrum rather than its short-term value.<sup>31</sup> Governments should also be clear on whether they are using spectrum policy to address coverage or capacity challenges, and establish their rules with this in mind. As a general rule, they will want to offer a mix of low-, medium- and high-frequency bands to address needs for coverage and capacity.

Releasing more licensed spectrum for mobile use is almost always the preferred route. However, a number of proven approaches exist of authorizing spectrum sharing to help combat shortages by allowing for secondary access to licensed spectrum. Since August 2015, for example, India has relaxed rules on spectrum sharing and now allows it when both licensees own rights to spectrum in the same band (leasing of spectrum is not permitted). Previously, network operators were only allowed to share passive infrastructure, such as mobile towers.<sup>32</sup>

## Multiparty Coordination and Cooperation Are Crucial

To achieve global connectivity, cooperation among multiple types of private- and public-sector players is crucial, especially given the substantial investments required for some projects. Private-sector companies, including content providers, are an increasingly important source of infrastructure investment. The public sector can encourage such investment by setting up a regulatory framework that ensures this capacity is used, and is available to consumers and businesses at affordable prices through open-access policies and competition.

Cooperation among countries can be critical for the most fundamental infrastructure. Many nations have only limited-capacity connections to the global internet. Undersea fibre cables that provide fundamental connections for entire nations are one part of the solution. For example, the 5,000 kilometre fibre-optic East African Marine System (Teams), which connects Kenya to the United Arab Emirates (UAE), has been operating since 2009. The undersea cable not only augments the fibre-optic Eastern Africa Submarine Cable System running from South Africa, but also connects the Kenyan national fibre backbone network to neighbouring Uganda, Rwanda, Burundi and Tanzania through cross-border connectivity arrangements. At a cost of \$130 million, Teams was constructed through a public-private partnership involving the Kenyan government, the UAE-based telecommunication provider Etisalat and other private operators. A joint venture between the Kenyan government and Kenyan operators owns 85% and Etisalat owns 15%. Kenyan authorities have announced plans for a fifth undersea fibre-optic cable to further boost the country's digital infrastructure.<sup>33</sup>

On the other side of the African continent, one submarine fibre cable had to handle all international data traffic in Ghana prior to 2010. Between 2010 and 2013, four additional submarine fibre cables (Main One, Glo-1, West Africa Cable System and African Coast to Europe) were added, with a massive boost in capacity. Competition among infrastructure providers increased and wholesale prices dropped. Mobile broadband penetration rose from less than 0.5% in 2009 to 33% in 2012. Mobile cellular telephone subscriptions doubled from 15 million in 2009 to more than 30 million in 2014. The Ghanaian government is now focused on developing nationwide terrestrial fibre-optic broadband infrastructure through a public-private partnership operated by the National Communications Backbone Company, a subsidiary of Vodafone Ghana.<sup>34</sup>

Since 2013, Huawei of China has worked with the Zambian Information and Communication Technology Authority and local carriers to implement Zambia's Universal Access Project, an initiative designed to deliver network coverage to remote areas. In 2014, Huawei installed 169 base stations in remote areas of Zambia's 10 provinces, connecting more than 500 villages for the first time.<sup>35</sup>

In some countries, multistakeholder groups have pushed for, invested in or facilitated an increase in the number of internet exchange points (IXPs), the physical infrastructure through which internet service providers and content delivery networks exchange traffic. Adding IXPs can help increase network speed and reduce costs. Brazil, for example, invested heavily between 2006 and 2010 to increase the number of IXPs from 4 to 19.<sup>36</sup> (By comparison, other Latin American countries typically host one or two IXPs). The additional IXPs helped to decrease network latency and bypass international traffic fees incurred when a country has to send domestic traffic for exchange at an IXP in another nation. Kenya was also able to reduce latency, enhance accessibility and lower costs by bypassing international traffic fees and improving the overall customer experience, cost and availability for its internet users.

The private sector can employ shared infrastructure as one initiative to reduce costs and advance infrastructure construction. The Burundi Backbone System, a partnership involving the Government of Burundi and four telecom operators (with initial financial support from the World Bank), is an independent infrastructure provider. It operates and maintains the fibre-optic communication network and leases fibre-optic connections to operators, companies and the government, and also ensures network connection to the landing stations of the submarine fibre-optic cables in Kenya.

In China, the objective of a joint venture among three major network operators is to build 1 million new cellular towers in the next two years, with a strong focus on rural coverage. The programme represents a significant increase over the current total of about 3.3 million existing base stations.<sup>37</sup>

In Myanmar, Ooredoo of Qatar is partnering with Norway's Telenor for network sharing in order to build Myanmar's mobile network. Sharing cellular towers realizes cost savings in building out infrastructure in one of the world's least developed telecom markets.

### Other Solutions Need Exploration

Innovation – in technology and business models, among other areas – has repeatedly proven to be a powerful barrier breaker; the idea of universal connectivity would still be a distant dream without advances in mobile technology, for example. Some companies are exploring the potential to solve coverage issues using satellites, balloons or stratospheric solar planes. Even if such solutions are speculative and for the long term, they deserve consideration and support from public authorities when necessary, such as accommodating airspace regulations and allocating suitable spectrum.

A more flexible and experimental approach to offering services and regulating them may be needed when investing in infrastructure for more remote areas. This would help to unlock the financial incentives required by the private sector when no clear business case exists that is based solely on voice and data charges. Allowing operators to freely bundle other services, such as financial services (e.g. M-Pesa in Kenya), could be one path making it worthwhile to reach out to currently unprofitable customers. In addition, allowing to experiment on fee structures, such as peak-use charges or two-sided business models under certain conditions (in which network operators receive fees from both consumers and content providers), may incentivize service providers to extend coverage to remote areas. To date, nearly all markets that have successfully scaled both wired and wireless services have done so under the internet's basic transit/peering model. Alternative practices may raise concerns about consumer protection, such as price discrimination and abuse of market power, and trade-offs can be considered if the alternative is no connectivity. One solution could be to relax rules for a specified period (e.g. 5-10 years) so that a review of future market conditions is automatically built in.

# Fixing Affordability

Affordability is a big barrier for many of the 4 billion people not using the internet – not least the almost 13% of the world's population living below the international poverty line, but also billions more with limited economic means.<sup>38</sup> According to Asociación Interamericana de Empresas de Telecomunicaciones, accessing ICT services in Latin America can take up 5% to 44% of a poor household's income.<sup>39</sup> Moreover, affordability is often intertwined with inequality; certain segments of the population, such as women, are frequently disproportionately disadvantaged. Having connectivity available at competitive prices is often not sufficient to ensure purchase: consumers need to believe they are receiving value for money, which is often partly an issue of awareness and the availability of local content (as discussed in the following two chapters), as well as price.

The main components of cost are devices and connectivity. Smartphone shipments are expected to grow from 1 billion units in 2014 to 1.6 billion in 2017, of which 780 million will be in emerging markets. As a result, the average penetration rate in the developing world will double to 46%. Moreover, the GSMA estimates that by 2020, 70% of mobile connections in the developing world will be via smartphones.<sup>40</sup>

Still, device cost is a major issue for billions of people. While prices have been falling, smartphones are still out of reach for many. A4AI found that the “cost of smartphones – the primary means of access for many in the developing world – has fallen significantly, with prices 30% below their 2008 levels in Asia, 25% lower in Latin America, and 20% lower in Africa”.<sup>41</sup>

The other principal cost factor is access. The cost of fixed-line access in emerging markets can be high relative to inhabitants' low incomes and well above the affordability threshold of 5% of average income as set by the UN.<sup>42</sup> The A4AI found that the cost of fixed broadband remains at about 40% of an average citizen's monthly income across 51 countries covered in its study, while the price for an entry-level mobile broadband package was slightly higher than 10% of average monthly income.

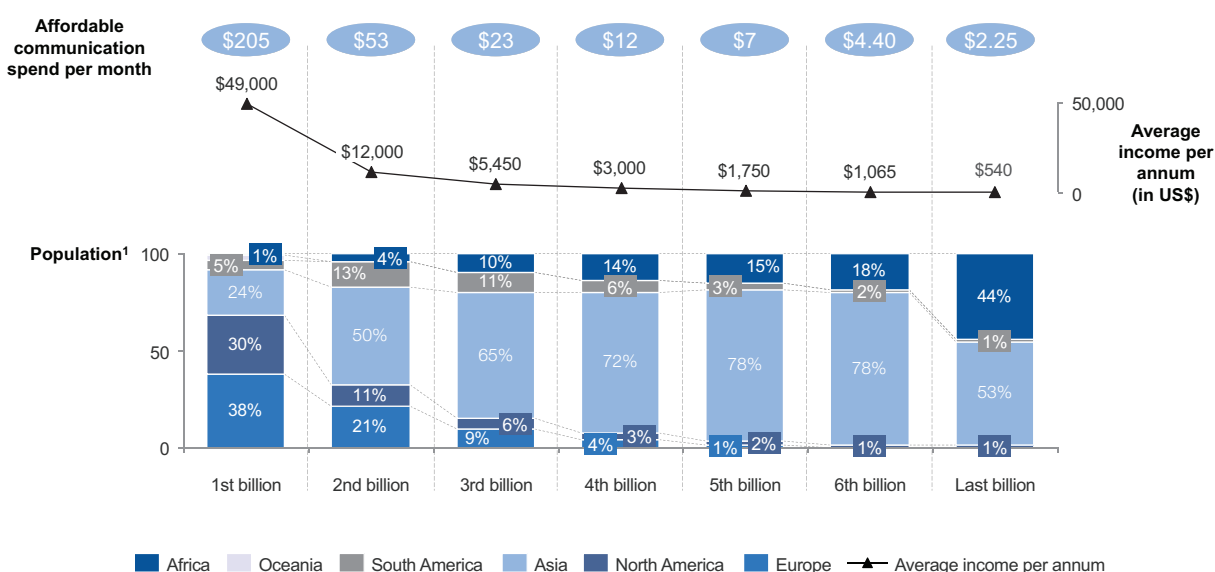
Recent research reveals how little the world's poor can afford to spend on communications services (Figure 6).

In addition, affordability strikes some segments of the population disproportionately. In its *Affordability Report 2014*, for example, A4AI noted: “Across the board, women are far less likely to be able to access the Internet affordably than men. Research has shown that women on average earn 30%-50% less than men. This income disparity diminishes the ability of women to afford to access, adopt, and benefit from a broadband connection.”

## Public-Sector Policy Can Have a Direct Impact on Cost

Government policy in a number of areas, including regulation and taxation, can have a direct impact on cost (Figure 7). As noted in the chapter on infrastructure, misguided regulatory policy on spectrum can lead to higher costs. Taxation can have a more direct effect. The GSMA estimates that in 2014, taxes applied directly on mobile consumers represented 20% of the total cost of mobile ownership (TCMO) across 110 countries surveyed, up from 18% in 2008 and 17% in 2007. In many countries, including many developing nations, taxes can represent 30% to 40% of TCMO.<sup>43</sup>

**Figure 6: Affordable spend on communications by income level**



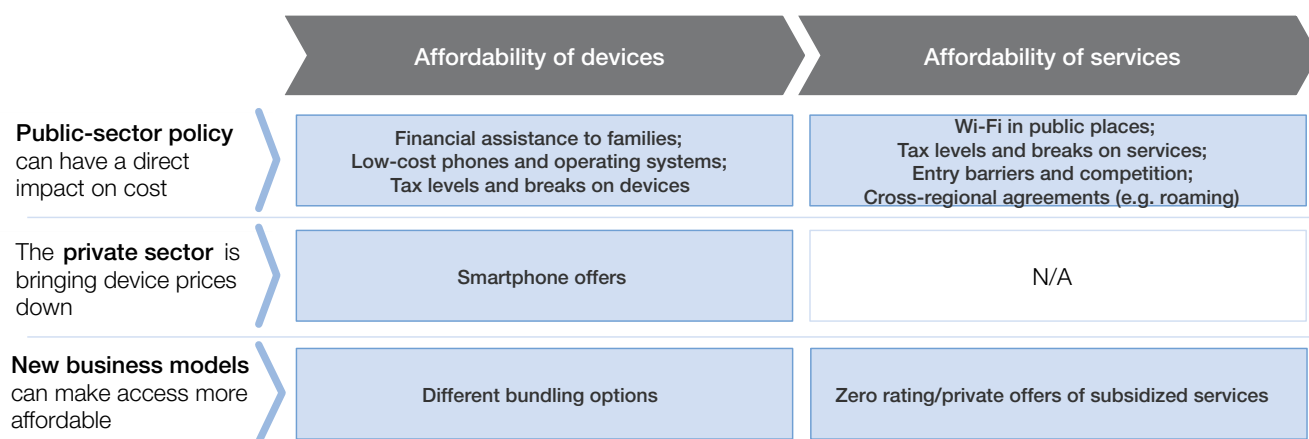
1. Normalized to 100% (equalling about 1 billion people)

Note: Methodology used by Richard Thanki: use of Gini index and GDP per capita (source: World Bank, CIA Factbook) for Lorenz curve, which was then used to slice the population of each country; affordable communication spend per month based on ITU data (5% of income)

Source: Thanki, 2015, *Measuring the local impact of TVWS broadband*; World Economic Forum; BCG analysis



**Figure 7: Fixing affordability**



Source: World Economic Forum; BCG analysis

Kenya provides a good example of how lowering or eliminating taxes can stimulate a market. Prior to 2009, the government charged value added tax (VAT) and other levies on mobile phones that aggregated to 21% of the total cost of mobile ownership, several percentage points higher than the global average. The government exempted mobile phones from VAT for two years beginning in June 2009, with the expectation that lower handset costs would lead to increased mobile penetration, thereby stimulating the mobile market with more subscribers and more revenues for mobile network operators. Handset sales doubled in the next two years and penetration jumped by 20 percentage points to 70%. A report by the GSMA noted: "Enhanced handset sales and mobile penetration allowed the mobile sector to grow, resulting in wider economic benefits across the mobile supply chain and generating economic benefits for users. Over the three years following the VAT removal, the contribution of mobile telephony to the Kenyan economy grew by almost 250%, while mobile-related employment increased by 67%." Moreover, tax payments by network operators actually increased. Operators paid KES 112 billion (Kenya Shilling) in taxes and fees during the 2009-2012 period, compared with KES 69 billion during 2006-2008.<sup>44</sup>

In April 2014, Brazil extended tax breaks to 2018 on computers and other digital devices set to expire at the end of the year. While the finance ministry estimated it would forego about 7.9 billion BRL (Brazilian real), or \$3.5 billion, in tax revenues in 2015, it believed that the cost of the tax break was "more than compensated by an increase in output, sales and employment in the sector".<sup>45</sup>

On the service side, some governments have intervened in the marketplace, stepping in either directly or through subsidies. The Government of the Philippines has announced plans to offer free Wi-Fi in nearly 1,000 towns and cities and in a wide variety of venues, including public schools, parks, libraries, national and local government offices, public hospitals, rural health units, transport stations, ports and terminals. The goal is to provide free Wi-Fi 24/7 in both urban areas and rural towns. The system will be able to serve 105,000 concurrent users at download speeds of 256 kilobits per second each.<sup>46</sup>

In addressing the affordability issue more generally, the Government of Colombia has offered subsidies and financial assistance since 2010 to families unable to afford ICT equipment or access to the internet. More than 2 million households have benefited from such subsidies. In East Africa, the Ugandan, Kenyan, Rwandan and South Sudanese governments are collaborating on the Northern Corridor's One Network Area to increase cross-border trade and exchanges. Implemented in 2014, it has substantially reduced the cost of calls among the four countries by eliminating roaming charges. According to Rwanda's *The New Times* newspaper, the average calling cost fell from \$0.28 to \$0.10 per minute. MTN Rwanda, the country's leading telecom company, told the newspaper that the volume of incoming calls increased by 450% and outgoing traffic rose by 300%, "while revenue has also been impacted positively". The initiative was expanded in 2015 to include SMS and data as well as voice communications.<sup>47</sup>

In general, however, governments should ensure that public-sector support or service provision does not crowd out private investment.

### The Private Sector Is Bringing Device Prices Down

The private sector – device manufacturers and operating system companies, including some new players such as Xiaomi and Mozilla – has been helping to drive down device prices. Phones priced below \$100 made up only about 20% of smartphone shipments in 2013, but since then a large and growing range of companies has been making affordable phones, including global manufacturers (Samsung, HTC), local players (Xiaomi, Micromax) and new entrants (Mozilla/Intex).

Some smartphones are now priced in the \$55-\$60 range in Indonesia and around \$40 in Myanmar. In India, a potentially massive market, Intex Technologies has launched a \$33 Firefox smartphone (the same price as a feature phone), and Google has introduced Android One, a set of high quality, affordable phones from different manufacturers, all priced at about \$100. Both companies plan to roll out these types

of low-priced phones across Asia. In 2015, Nokia, now owned by Microsoft, launched a \$29 feature phone with internet connectivity in Europe, the Middle East, Africa and Asia. The phone comes with 2G connectivity, a mini mobile browser and a limited array of pre-installed apps, including Twitter, Facebook, Messenger and Bing Search.<sup>48</sup> In China, Alibaba Group and China Telecom jointly released the customizable eSurfing Taobao mobile phone in April 2015, designed expressly for use by farmers in rural areas. These smartphones are preset with a Taobao mobile app and priced at only hundreds of yuan, with the cheapest costing only about \$48.<sup>49</sup> Huawei and Kenya's M-KOPA Solar are pioneering payment for smartphones (along with solar panels) on an instalment basis.

The downward trend in smartphone prices, especially in emerging markets, is a welcome development and set to continue.

### **New Business Models Can Make Access More Affordable**

In some countries, phones come bundled with free internet access for a certain period to help users get started online. A partnership between Mozilla and Orange brought a \$40 smartphone to 13 countries; the purchase included unlimited texts, unlimited calls and 500 megabytes (MB) of 3G data a month for the first six months. Bangladeshi telecommunications provider Grameenphone, part of the Scandinavian Telenor Group, has launched a locally manufactured Firefox OS smartphone that retails for just \$60. The GoFox F15 comes loaded with Telenor Digital's new WowBox service, which gives users 20 MB of free data per day (on top of their existing airtime plan).

Other organizations are also using new business models to extend affordable access. For example, the mCent app by Jana, a mobile start-up, provides free services in markets where people have difficulty affording online access. The app uses a sponsored data model, offering users free airtime in return for trying out its advertisers' apps or products. Jana partners with more than 300 mobile operators in 93 countries; mCent has some 40 million users. Having introduced the mCent app in 2014, Jana became profitable in 2015 with revenues of about \$50 million. As with many apps, potential privacy concerns exist: mCent collects data such as app-usage history and signed-up friends.<sup>50</sup>

Free Basics by Facebook is designed to demonstrate the value of connectivity to users and to provide an entry to the broader internet. Through partnerships with mobile operators, this programme provides users with free access to locally relevant basic services such as communications tools, health information, job sites and other educational information.<sup>51</sup>

By bringing mobile coverage as a service to rural areas, Managed Rural Coverage, a partnership between MTN Benin and Ericsson, addresses the business model challenges but still utilizes investments in 3GPP infrastructure to secure affordability.<sup>52</sup> In rural areas of China, China Telecom offers free 2G common data traffic to every user, and Taobao provides a "special shopping zone for e-surfing users". Such programmes have a double benefit: they help make access more affordable and teach users about the internet's benefits. Users get digitally "smarter", and the companies involved lay a solid foundation for their future smart products and services.<sup>53</sup> All kinds of companies can participate. In India, PepsiCo teamed up with mobile payments company Freecharge to offer consumers free internet access (with no restrictions) in return for purchasing soft drinks. Finally, a number of operators worldwide have started offering at least one "zero-rated" service to help build usage.<sup>54</sup>

Some have questioned zero-rated services on the belief that such services run counter to net neutrality.<sup>55</sup> Others point out that some access is better than no access at all, even if users cannot choose which apps and services are "free".

The notion of using other revenue pools to cross-subsidize services, as well as bundling services together, can inspire new ideas. With mCent, the advertising revenue pool is used to help fund free services. This can also apply to the public sector; imagine, for instance, people who get government financial assistance receiving free mobile devices with pre-installed m-finance applications. All future social grant payments could be channelled via the app, removing bureaucracy, potentially saving on administrative costs and thereby possibly financing the initiative in the first place. While such ideas need to be tested to see if they will work in practice, encouraging experimentation with flexible approaches and removing regulatory or other obstacles may be an effective way forward, in addition to revising tax policies and providing direct subsidies.

# Spreading Skills and Awareness

Lack of skills and being unaware of the internet's value are two key barriers to internet adoption and use, and are often bigger than the affordability hurdle. Cultural acceptance is another impediment.

In many countries, especially in Sub-Saharan Africa, South Asia, the Middle East and North Africa, basic literacy is a significant problem and one that often disproportionately affects certain segments of the population, such as women or rural residents. Basic ICT skills can also be sorely lacking. But even in more developed countries such as India and Brazil, lack of awareness among non-users remains a major obstacle. The absence of local content is part of the problem, which is addressed in the next chapter. But non-users' perceived lack of need or interest is all too prevalent in many places. For example, lack of need and lack of skills are the primary limiting factors for 70% of non-users in Brazil (Figure 8). In India, lack of need is the main reason that 53% of non-users do not go online.<sup>56</sup> Even in the US, 34% of non-users think the internet is just not relevant to them.<sup>57</sup>

The top priorities are to help people acquire the skills to go online and to spread awareness of the internet's value (Figure 9), which also may involve addressing issues of cultural acceptance. A sharp understanding of local conditions and customs needs to underpin these efforts, especially on how families and communities influence teaching and exposure to new ideas. Thus, these influencers can be leveraged to ease communication, circumvent cultural barriers and encourage a good understanding of what it means to be web-literate. Mozilla, for example, distinguishes different digital skills by dividing them into three categories: read (how to explore the web through search and navigation), write (how to build the web through design, composition and code) and participate (how to connect,

share and collaborate on the web).<sup>58</sup> Initiatives such as Free Basics, discussed in the chapter on affordability, help to address awareness by providing easily accessible services that demonstrate the internet's value and benefits to users.

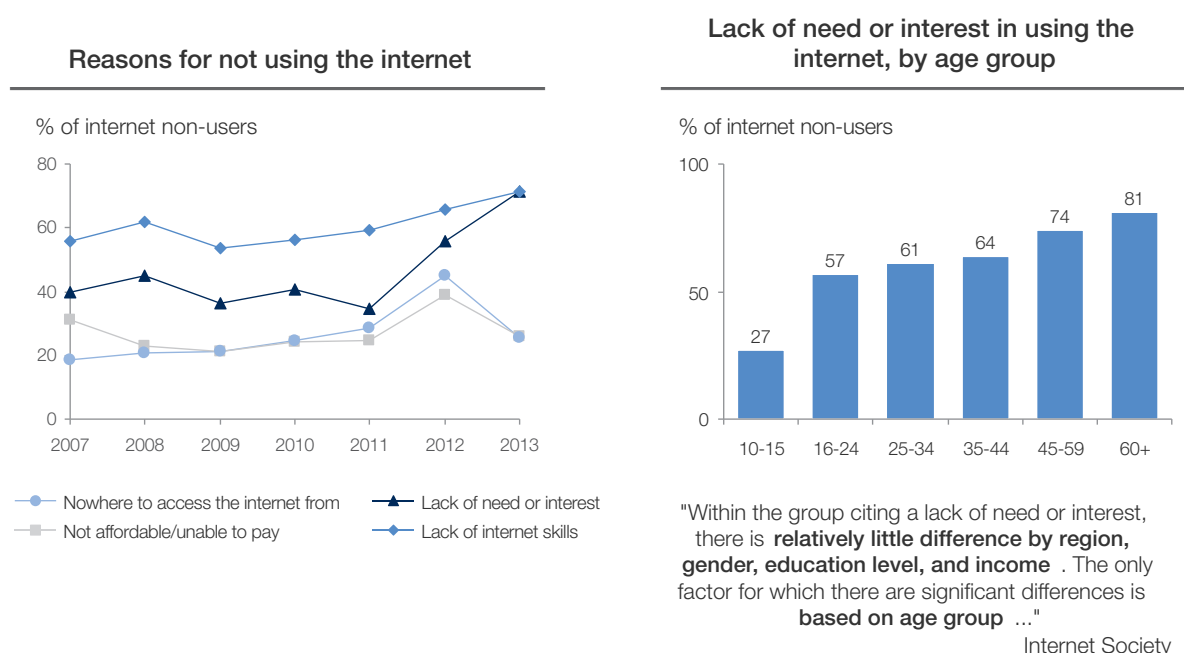
Unnecessary complexity is another hindrance at several basic steps of the adoption process, including signing-up for services, first-time set-ups, using the phone system and connecting other devices. At a more advanced but no less important level at which countries can fully benefit from the digital economy, they need the means to develop ICT skills such as web design and programming. This will require adapting current structures and capabilities; for example, teachers, government officials and others must acquire new skills to be effective at facilitating digital learning or helping constituents online. At the same time, solutions addressing widespread adoption should include education on practising good "internet hygiene" and the risks that come with technological advances, such as privacy concerns, security and fraud, among other issues.

## Embedding ICT in National Education Curricula

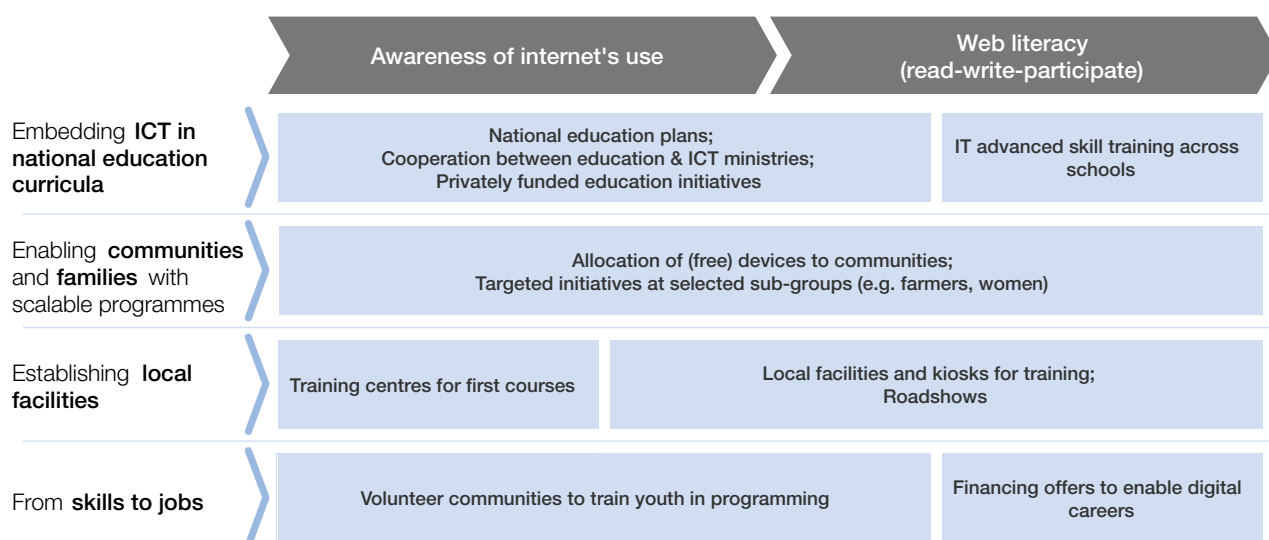
Governments, private-sector players, civil society, and local and international organizations can combine efforts to promote basic skills.

In the United States, the Schools and Libraries Program, administered under the Federal Communications Commission, provides discounts to help schools and libraries obtain telecommunications equipment and internet access. The Uruguayan government's Plan Ceibal (Basic Informatic Educative Connectivity for Online Learning) introduced ICT learning as part of primary and secondary public education. Students and teachers in more than 2,300 schools have received about 450,000 laptops since 2009, and 1,900 of those schools are connected to the internet.

**Figure 8: Non-users in Brazil increasingly cite lack of need and lack of skills**



**Figure 9: Spreading skills and awareness**



Source: World Economic Forum; BCG analysis

The UAE's Ministry of Education trains young children in the internet's benefits, with a specially designed ICT curriculum for students in grades 1 to 3. Uganda's national library has introduced an ICT training programme designed for female farmers, with information on weather forecasts, crop prices and other subjects provided in local languages. The Northern Regional Library in Tamale, Ghana, provides technology training, and a library in Bogota, Colombia, offers young girls access not only to books and literacy programmes, but also to computers, the internet and technology training.<sup>59</sup>

In October 2013, China's Ministry of Education launched the Project for Improving Information Technology Application Capability of National Primary and Middle School Teachers. It seeks to establish a standard system for the "information technology application ability" of over 10 million primary- and middle-school teachers. By June 2015, millions of teachers had received training through the six-component programme.<sup>60</sup>

In a public-private partnership between the UK government (Department for International Development), Ericsson and Myanmar's Ministry of Education and Ministry of Communications and Information Technology, Ericsson is providing educational solutions to schools as well as teacher training. Over two years, the Connect to Learn programme has reached about 20,000 students, who will have internet access via mobile broadband. Also involved in the partnership are UNESCO, which provides teacher training, and Columbia University (USA), which supports with monitoring and evaluation.<sup>61</sup> ICT tools can also be used to spread and enhance learning in other subjects, such as language, mathematics and the sciences, thus advancing both general and ICT-specific education and skills building.

Advanced ICT skills are important for using the internet in businesses and developing digital economies. A critical shortage of engineers and computer scientists exists nearly everywhere. While such education and training can take place anywhere, including in the private sector, a new

national computing curriculum in England and Wales is one of the most ambitious efforts to develop ICT skills. The curriculum includes coding, a core component, and involves three stages: 5- to 6-year-olds learn how to create and debug their own simple programmes, developing logical reasoning skills and taking their first steps in using devices; 7- to 11-year-olds create and debug more complicated programmes with specific technical goals and come to grips with technical concepts, such as variables, sequences and selection; and 11- to 14-year-olds make use of two or more programming languages to create their own programmes.<sup>62</sup>

In June 2015, Alibaba launched Cultivating One Million E-commerce Talents at One Thousand Colleges and Universities in One Hundred Cities, a programme to promote China's foreign trade development. Working with government authorities, colleges, universities, businesses and training institutions, the Alibaba programme aims to train 1 million people in cross-border e-commerce capabilities within three years.

### Enabling Communities and Families with Scalable Programmes

For widespread digital usage to take hold and digital economies to grow, governments need to address literacy and educational enrolment issues in their countries. While this is largely a matter of policy and follow-through, digital technologies have helped, with some examples dating back more than a decade. Some programmes address the most fundamental issues. Many efforts have been limited in scope and targeted at a particular need or population segment, but the lessons can be applied more broadly.

For example, all children have the ability to learn, and even to teach themselves, given the right circumstances and tools. An Indian educational researcher showed in 1999 that simply providing children with digital equipment, without teachers' assistance, was sufficient to stimulate learning. More recently, a group of researchers in Ethiopia distributed



solar-powered tablets containing curated games, books, cartoons and movies to children in two villages. The children immediately identified how to open and switch on tablets, and used an average of 47 apps daily after the first week. In two weeks, they could practise the basic alphabet.<sup>64</sup>

The Rural Education Action Program, an impact evaluation organization, ran a controlled experiment in China to assess the impact of computers on teaching, involving two groups of 150 students each in 13 schools. Students in one group were given computers, as well as instruction on basic functions and the preloaded learning software. Both groups were tested before and after the project. The tests showed a standard deviation of 0.32 between the computer skills of the treatment and the control groups. Students without prior exposure to computers or the internet experienced the largest improvements, for example in their computer skills (by standard deviations of 0.78 and 0.41, respectively).<sup>65</sup>

A combination of factors often appear to limit such initiatives: their planning and implementation is not comprehensive enough; their financing and execution lacks continuity; and they lack dedicated or experienced supervision that can overcome setbacks or unforeseen roadblocks. This does not mean such initiatives are bound to fail, but it does point to the need for thorough planning, staffing and financing if they are to succeed – even on a local (much less a national) scale.

Other initiatives, often involving NGOs and the private sector, are designed to start programmes with outside help that can then grow and spread under local guidance. Sissili Vala Kori, a project established in 2003 by the Federation of Agricultural Producers of Sissili Province in Burkina Faso, focuses on providing information and communication capabilities for rural residents. Initially, a group of 20 farmers was trained in basic ICT skills and how to use them to create training materials for other farmers, including where and how to find information online about farming techniques. The ICT skills were not an end in themselves; rather, they facilitated the training of other skills. An impact study revealed that average agricultural production increased from 0.5 tons per hectare in 2003 to 4.5 tons in 2007.<sup>66</sup>

Uninor, the Telenor Group's subsidiary in India, launched Project Sampark in 2014 "to bridge the gender gap in rural India, drive commercial revenue, and create value for women". As part of this initiative, Uninor piloted a project that involved recruiting a network of local women retailers to market a product concept called the Bandhan SIM Plan – a pack of two paired SIMs (Subscriber Identity Module), one of which was to be used by a female and the other by a male member of a household. The goal was to overcome cultural barriers preventing women from owning a mobile connection and encouraging men to see the value of women in their household having mobile access. Five months after launch, sales from the Bandhan SIM Plan accounted for more than 30% of new Uninor subscribers in the pilot area. Average minutes of usage for plan users were higher than for other subscribers in the pilot area, and the project had crossed the commercial break-even point. Market research showed that Project Sampark not only helped Uninor reach an

untapped customer segment, but also attracted customers from the competition. Qualitative and quantitative interviews suggest that the project has been successful in breaking down the cultural barriers that have prevented women from owning a mobile connection.<sup>67</sup>

## Establishing Local Facilities

Connected facilities in remote or hard-to-reach regions can provide centralized venues for communities to gain internet access. These centres serve two purposes. First, they are basic infrastructure, providing shared access points for the local population; they provide the only access in some instances, and in others reduce the cost of access for users. Second, some centres also go beyond simple access to provide training and education that help users gain the skills needed to use the internet effectively. In Colombia, for example, local computing centres have been established since 2010 as part of a countrywide strategy called 900 "Vive Digital Points". Users access the Colombian state web portal and receive training to use different technologies. More than 100,000 people have received digital literacy training and gained specific competencies.<sup>68</sup>

In Kenya, Uganda and Tanzania, the Arid Lands Information Network (ALIN) has been establishing Maarifa Centres, often using shipping containers adapted for the purpose and providing ICT equipment in some of the world's most remote areas since 2007. The centres offer courses and training sessions on mobile phone and internet use, emphasizing their application to issues related to small-scale sustainable agriculture, climate-change adaptation and natural resources management. ALIN is increasing the number of Maarifa centres from 12 to 112.

The Kenyan government started a programme in 2010 that provides loans, in a competitive process, to entrepreneurs who run "digital villages" or "e-centres". These centres provide rural residents with internet access, e-government services and other e-services at the grass-roots level through public-private partnerships.<sup>69</sup> Pakistan's telecentres serve as internet and e-learning hubs, with mobile connectivity provided free of charge. The owner/manager of the telecentre is typically a teacher, who also teaches classes.<sup>70</sup>

## Moving from Skills to Jobs

Individuals and communities that become connected find a wealth of information – and assistance. The latter often comes from international communities or organizations, or institutions of civil society committed to using the internet to expand ICT skills. Located in numerous countries, CoderDojo, a grass-roots organization started in Ireland in 2011, oversees a global volunteer-led community of free programming clubs, or "Dojos", for young people aged 7-17. Although in disparate locations, they can explore and learn technology together and receive support from skilled mentors. Users create apps, websites and games. While the over 880 Dojos are mostly in urban centres of developed countries, some dojos are in developing countries (e.g. 10 in India, 4 in Madagascar).<sup>71</sup>

Microfinance can help local talent upgrade coding skills. CodersTrust, a Danish-based microfinance platform supported by Danish development fund DANIDA and the Grameen Bank, provides financing so students can earn more money on freelance portals. Students' microloans (up to \$2,000) cover living expenses and tuition fees. Working with mentors, they follow a 12-month personalized e-learning curriculum. Once they start earning money from freelance portals, they can begin to repay the microloan. A 20-student pilot was launched in 2014, with the first full "class" of 100 students starting their coursework in early 2015. Initial results show a significant increase in students' income.<sup>72</sup>

According to the World Bank, "The internet's ability to reduce transaction costs increases opportunities for people who face barriers in finding jobs or productive inputs. This promotes inclusion for women, for persons with disabilities, and for people in remote areas. Impact outsourcing brings internet-based jobs to the poor and vulnerable." The bank cites several programmes that help bring women and disadvantaged groups into the workforce. The Indian state of Kerala established the Kudumbashree project to outsource information technology services to cooperatives of women from poor families, 90% of whom had not previously worked outside the home. Other programmes, such as Samasource and RuralShores, link clients in the United States and the United Kingdom with workers in Ghana, Haiti, India, Kenya and Uganda. Moreover, almost 45% of global online workers on the Elance freelancing platform, part of Upwork, are women.<sup>73</sup>

These types of examples seem to hold great promise for future skills development. A centralized, government-led educational strategy is a necessary element, and any additional facilities or initiatives designed to teach ICT literacy and skills should be welcomed. Targeted initiatives designed for specific circumstances (for example, women teaching women, or farmers teaching farmers) are understandably among the more effective programmes to date, but these are difficult to scale up. The most promising and scalable path for the future may be demonstrating the abundance of information available for people to help themselves – from learning coding through CoderDojo to the growing number of offerings for online education, such as massive open online courses. A key step in building awareness of such useful online content is to ensure that enough of it is locally relevant – the focus of the next chapter.

# Encouraging Local Adoption and Use

As the World Economic Forum pointed out in the 2014 report, *Delivering Digital Infrastructure: Advancing the Internet Economy*, digital ecosystems that produce local content and apps are vital for building digital literacy, attracting local users and serving local needs. Digital services can be a big step towards addressing local problems and boosting competition in an increasingly international digital services market. In addition, using the internet can have a large impact on local businesses, especially small and medium-sized enterprises (SMEs).<sup>74</sup>

Internet awareness and relevant digital content obviously have a symbiotic relationship; an increase or improvement in one will help drive an increase or improvement in the other. In developed markets, where factors such as infrastructure and cost are minimal constraints, content and usage have become a double-barrelled growth engine. In North America, Europe and numerous Asian economies, e-commerce and m-commerce (rooted in online and mobile content that supports consumer sales) are major retail channels. In the UK, e-commerce is projected to make up almost 20% of the total retail market in 2018. Consumption of media – video, print, film, music and games – has moved online at a rapid rate, and consumers in many developed markets now reap more economic value from online media, net of the costs of devices and access, than from offline media.<sup>75</sup> Small businesses that are active online grow faster and create many more jobs than those that are not.

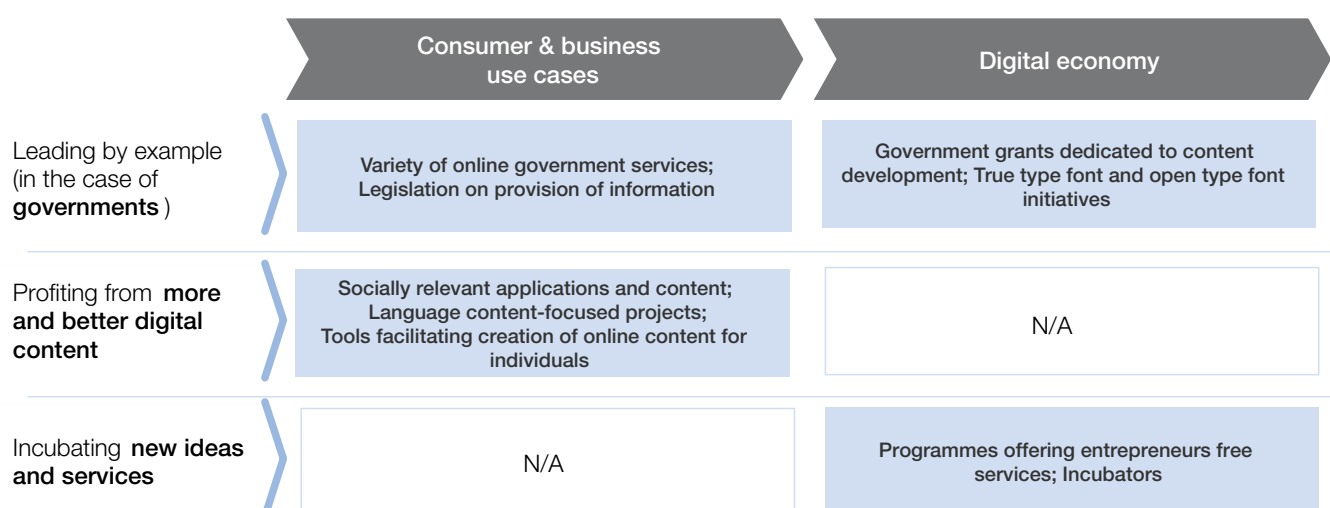
A similar picture is forming in rapidly developing economies. The online marketplaces run by Tencent and Alibaba are retail and social media colossuses in China. Brazil is Facebook's third-largest market by number of users, with more than 100 million. In India, the proportion of internet users is expected to reach roughly 16% of the population in

2018, or more than double in number from about 200 million in 2014 to at least 400 million – and, potentially, to as many as 550 million. Online media consumption in the country is increasing as vernacular content rises. Non-English content is expected to represent 60% of all Indian media content by 2018.<sup>76</sup> Data from eBay shows that in six of the Association of Southeast Asian Nations – Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam – exporters using eBay reach an average of 33 countries, compared to an average of three countries for other companies. Rural artisans in Morocco, some of them illiterate, sell globally through the platform Anou. Firms in India, Jamaica and the Philippines have captured a share of these global markets for services ranging from traditional back-office services to long-distance online tutoring.<sup>77</sup>

Lack of relevant content in local languages, however, can impede bringing people online. The World Bank estimates that 80% of online content is available in one of 10 languages: English, Chinese, Spanish, Japanese, Arabic, Portuguese, German, French, Russian and Korean.<sup>78</sup> Only about 3 billion people speak one of these languages as their first. More than half of all online content is written in English, which is understood by just 21% of the world's population, according to estimates by Mozilla and the GSMA.<sup>79</sup> To reach the goal of global connectivity, the problem of relevance as it relates to awareness and language must be addressed.

The public sector, private sector and civil society can encourage adoption and use by facilitating local content development (Figure 10) and putting policies in place that make it easier for businesses, especially SMEs, to benefit from digital technology.

**Figure 10:** Encouraging local adoption and use



Source: World Economic Forum; BCG analysis



## Governments Should Lead by Example

One of the most powerful steps that governments can take is to digitize to the fullest extent possible their interactions with citizens and the provision of government services (Figure 11). Among developed countries, for example, Denmark has mandated digital communications between the government and citizens or businesses. Australia, South Korea, Singapore and the United States, among other nations, are all experimenting with ways to streamline and simplify access to government websites. French users can access some 30 services with a single user name and password. About 2 million Australians have a myGov account, and Singapore's SingPass programme provides a single online authentication system for users to access 270 different services from 58 government agencies (the SingPass has a usage rate of over 90%). The United Kingdom has mounted a major initiative for the government to become "digital by default," defined as "digital services that are so straightforward and convenient that all those who can use them will choose to do so whilst those who can't are not excluded". The government services portal in Estonia reportedly provides access to some 3,000 services and private-sector players, including banks, utilities and telecom companies; even doctors use the system.<sup>80</sup>

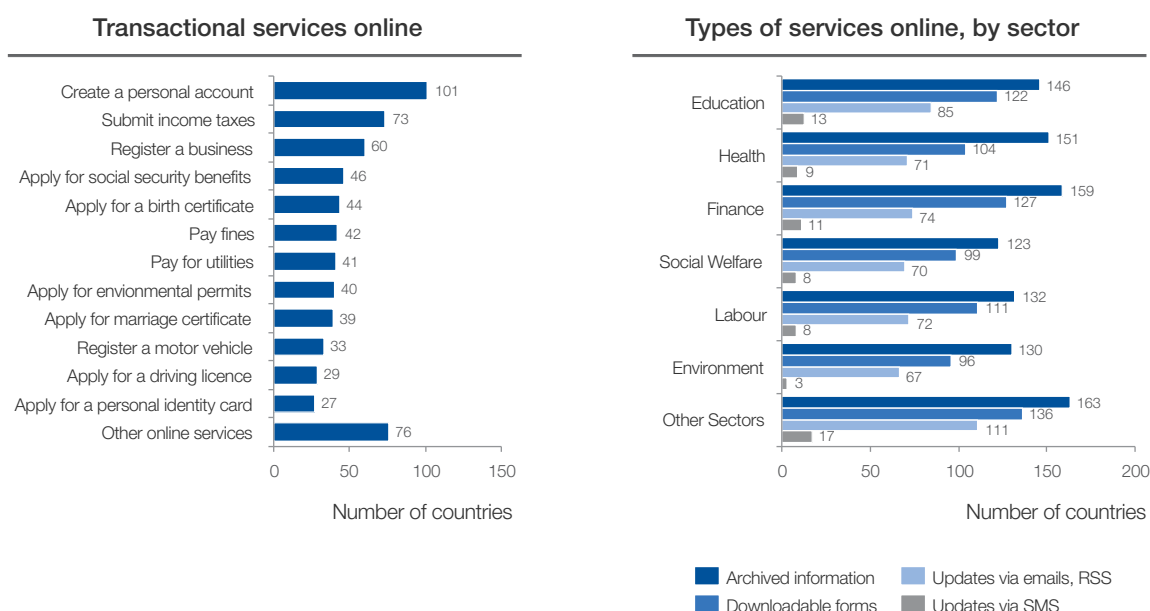
Governments of developing nations are also active. The Indian government passed the Right to Information law in 2005 that allows citizens to demand information from government and public authorities. These services and information are accessible to citizens via the internet from anywhere in the world. Kenya's e-government services include new-generation digital identity cards, iTax (online tax returns and registration), an e-procurement system and a mobile app that enables people to search for company and business names. The government intends to provide a platform for developers to create and customize applications that allow citizens to access services easily.

The e-government programme in Colombia, Gobierno en Línea, uses two initiatives to promote the use of the e-government strategy: (1) encouraging good government through the use of information technologies, and (2) giving citizens the power to interact with the state through information technologies. A 2014 UN e-government survey found that Colombia is the only middle- to low-income country to score more than 66.6% in all areas of the UN's e-participation index. Half of all Colombian citizens interacted with the government through electronic channels in 2012. The UN notes that Colombia's online public consultation site, known as "urna de cristal", makes "the Colombian transparency initiative a standout in the region".<sup>81</sup>

These kinds of programmes significantly drive usage. A 2014 BCG survey in 12 developed and developing countries found that almost 95% of respondents had used at least one online government service in the last two years, with an average of 32% using such services more than once a week. The survey also showed that users in developing countries access more services online and access them more frequently. People in developing countries are especially heavy users of services that have a significant impact on life and livelihood, such as those related to healthcare and education. They are embracing the web for much more than convenience: they are using it to improve their well-being and earning ability.<sup>82</sup>

Governments are also playing a direct role in promoting content developed by others. In 2010, the Kenyan government launched a \$4 million grant to promote the development of local digital content and software applications.<sup>83</sup> Grants go to those developing private-sector content and those who work on developing the government's portals and supported projects, ranging from agriculture to tourism to professional development. The Indian government's Centre for Development of Advanced Computing has developed many true type fonts (TTFs) and open type fonts (OTFs) to facilitate digital content development in vernacular languages.<sup>84</sup>

**Figure 10: Many countries offer a variety of government services online (status 2014)**



Some governments are encouraging local private-sector ICT development by including local businesses in government procurement and e-services programmes. A UN study found that “the government and public sector is often the largest buyer of IT services [and] the increasing deployment of e-government services and the associated demand for IT services from the public sector represent a key market for local IT firms.” In Sri Lanka, for example,

- ICTA (the agency responsible for large e-government programmes) has stimulated local IT SMEs development by establishing a framework of transparent and competitive tender procedures, and using a wide range of public procurement strategies and tools. For instance, by providing targeted preferential marks to local firms, it has encouraged joint ventures between local and international enterprises, and promoted technological capacity development among local firms.<sup>85</sup>

The World Bank has noted: “E-procurement helped India and Indonesia inject more competition into the process by increasing the probability that the winning bidder comes from outside the project’s region. This also improved the quality of infrastructure.”<sup>86</sup>

### Profiting from More and Better Digital Content

The private sector has the ability not only to contribute to content development, but also to profit directly from its efforts. The flourishing app economy in many western and Asian countries shows what is possible. Globally, app developers have made 2 million apps available. In 2013 alone, apps were downloaded 102 billion times (of which 9.2 billion downloads were of paid apps), a 60% increase over 2012. Downloads are forecast to rise to 269 billion (15 billion paid) by 2017.<sup>87</sup> Despite the astronomical growth in the app economy, many app developers still struggle to monetize their efforts.

Apps are harder to find and use in developing markets, of course, but both the appetite and the need are readily apparent. Brazil, India and Russia all ranked in the top five countries for app downloads from Google Play in the third quarter of 2014. China was the number-two-ranked country for downloads from Apple’s App Store.<sup>88</sup> A 2014 report by the Mobile Ecosystem Forum found that four of the top five countries for educational app downloads were India, South Africa, Kenya and Nigeria.<sup>89</sup> UNICEF is using mobile apps in its programmes in almost 200 countries and territories, including HIV testing and monitoring water sanitation and access to medication. In some developing countries, app developers are focused on building healthcare applications that connect rural patients to trained urban doctors, such as MeraDoctor in India and 1DOC3 in Colombia.

Developing countries potentially represent much different – and possibly much more developer-friendly – markets than more developed nations. This is especially true if digital technologies can be applied to longstanding real-world problems (such as lack of banking or other financial services, or providing market- or weather-related information to farmers in remote areas), and if solutions can be found for distribution and payment issues. The Chinese market has its

own unique dynamics, but Chinese users already spend far more time on apps developed locally than those from other countries. Brazilian users are also spending considerable time using locally developed apps. As India’s user base expands to include many more women and rural users, companies that provide local language content will have an opportunity to engage with fast-growing segments of online consumers.

As economies expand and incomes rise, the experience of countries such as India and Brazil show that the internet, and particularly the mobile internet, are powerful vehicles for consumer commerce in places where physical retail infrastructure remains underdeveloped. Apps can fuel this trend. According to App Annie, an analytics services company for app developers, retail app use is soaring in India, with 4.4 times as many retail apps downloaded in the 12 months ended 30 September 2015 than in the previous 12-month period. BCG has argued that as more consumers in India have become connected, the user base is both expanding and diversifying to include rural and lower-income consumers across all age groups. Companies that overlook this shift risk missing out on a rapidly growing channel for marketing, brand influence, engagement and, ultimately, commerce. In Brazil, BCG’s research in 2015 found that the internet influences more than half of all retail purchases. Nearly all connected consumers – some 106 million people, accounting for more than half the Brazilian population – use the internet at some point for some purchases.<sup>90</sup>

New, easy-to-use development tools have significant potential to increase content created in developing countries. User-generated content is one way to overcome issues of local relevance and, particularly, local language. However, 85% of the user-generated content indexed by Google comes from the United States, Canada and Europe, similar to the share of global scientific journals originating in these countries. Mozilla distributes Webmaker, a free and open-source tool intended to make mobile content creation accessible to anyone with a low-cost, entry-level Android smartphone. Webmaker’s goal is to create software that recreates the flexibility and low barriers to entry that characterized technologies such as HTML and “home pages” of the early web. It is designed to be accessible to all kinds of users, and to empower ordinary mobile users as creators and content producers. Among young people participating in Webmaker field tests in Cambodia and Rwanda, the number of participants who felt “very confident” about using the web increased from 27% to 65% in the course of one month.<sup>91</sup>

Focusing on device design and marketing for emerging markets could also help further adoption and use. In many markets, there is room to improve the product (user interface and user experience) as well as the sales experience to bring mobile devices closer to the end user. The ease of using products also stands to gain from a more consistent experience across platforms.

SMEs drive internet usage and boost their countries’ economies (as well as their own businesses) when they add websites and mobile apps. As a result, they increase revenues and growth. For a report in January 2014, BCG

surveyed approximately 3,500 SME decision-makers in the United States, Germany, South Korea, Brazil, China and India on their mobile adoption and usage, with eye-opening and informative results, especially for developing markets. Mobile technologies level the playing field, often allowing mobile leaders to grow faster than the overall economy. SMEs that are leaders in mobile usage report much greater benefits in increased revenue, efficiency gains and innovation than laggards do. Leaders have grown revenue up to two times faster than laggards and have added jobs up to eight times faster over the past three years. This is in part because mobile leaders can reach more customers and engage with them through additional channels, increasing opportunities for marketing and sales. Moreover, SMEs in emerging markets have a higher percentage of leaders overall than their counterparts in developed markets. In Brazil, China and India, 25-30% of SMEs surveyed are mobile leaders, as opposed to only 14% in Germany. Approximately 75% of emerging-market SMEs surveyed report that mobile has helped them grow revenue, become more efficient and be more innovative, compared with only 50% of SMEs in developed markets.<sup>12</sup>

Among consumers, one of the oldest and best examples of content stimulating use is the M-Pesa system in Kenya, where two-thirds of Kenyans use SMS-based mobile-money technology. Innovative applications, such as Eko India Financial Services and Bandhan Financial Services, are also bringing financial services to the unbanked in India.<sup>13</sup>

## Incubating New Ideas and Services

Far-sighted companies and organizations are easing content development by others by helping to “incubate” new ideas and providing the necessary support services (e.g. financial, advisory) to would-be content creators. The App Lab, led by the Grameen Foundation, is developing mobile phone applications and services, which allow people to access basic information about health, agriculture and education. For the last two years, network operator Orange has mounted the Developer Challenge, which is open to local businesses, entrepreneurs and French companies with a strong business interest in Africa and the Middle East. The 2015 challenge operated in 12 African nations. India’s Airtel operates a similar challenge programme for developers “to come up with apps that will help [Airtel] deliver the best smartphone experience for customers”.<sup>94</sup>

Singapore’s SingTel, a telecommunications provider, has a multifaceted and sophisticated programme to develop a local content ecosystem. It supports local content and app development, and funds digital initiatives with venture capital across Asia. The company offers its own content to users, including, for example, HungryGoWhere, a successful restaurant-review portal, and fashion portal Clozette. SingTel’s Accelerator Challenge gives developers access to application programme interface (API) for “anonymized” SingTel data, and handles such administrative functions as in-app payment. The company also makes venture capital investments, funding 16 firms in Asia so far through its Innov8 initiative. It also offers cloud-based services, such as software and platform as a service in partnership with other companies.<sup>95</sup>

Multiple other examples include internet provider Liquid Telecom Kenya, which is launching a two-year programme of support for entrepreneurs who publish local content online. Entrepreneurs will receive free internet connections, free website hosting and unlimited internet usage for two years. AfriLabs, founded in 2011, is a pan-African network of 40 technology innovation hubs in 20 countries; it seeks “to build a community around rapidly emerging tech hubs – spaces that serve as physical nexus points for developers, entrepreneurs and investors”. The iHub community in Kenya, part of the AfriLabs network, “includes individual developers, designers, creatives, researchers, scientists, engineers, technologists, as well non-tech people looking to launch start-ups”.<sup>96</sup>

Setting up incubators and providing financial as well as business support to entrepreneurs are promising paths for building capabilities in sustainable content development. Many of the services and applications developed address local problems. As the examples demonstrate, programmes set up by local operators have a win-win element, as these operators can benefit from being involved in developing innovative ideas. SMEs clearly benefit themselves from putting more content online. Governments can help in providing local content as well – and the many examples of useful and well-used e-government services provide plentiful input for others to emulate.

# A Checklist for Making Progress

How do governments, companies, organizations and others move ahead in the future? The following checklist of questions can help both public- and private-sector institutions and organizations, as well as NGOs, foundations, academic and research institutions, and members of civil society to assess where they and their countries stand. While the checklist is not intended to be comprehensive, it does point to the kinds of initiatives these groups need to consider with respect to each of the four issues of extending infrastructure, tackling affordability, building skills and awareness, and promoting local adoption and use.

The Forum intends to use this work and checklist for the country programmes planned for 2016. In a first step, a detailed analysis of the status quo in the countries should take place. The checklist can aid in identifying existing strengths as well as gaps and unevaluated ideas. In a next step, the resulting list of possible initiatives should be detailed and tailored to the local circumstances. Stakeholders, led by the local government and authorities, should collaborate to act on the ideas. Innovative and fact-based approaches that lead to tangible social and economic outcomes are required to mobilize the necessary political and financial resources to bring the internet to all. The Forum's ambition is to be the catalyst and coordinating stakeholder in this effort and help generate and sustain the momentum to make these initiatives a success.

## Overall

- What is the country's current strategy or plan for national internet, the digital economy or broadband development?
- What is the extent of involvement of various relevant government departments, ministries and agencies in the existing plan and initiatives?
- How are the private sector, industry bodies, national and international organizations, and civil society involved in developing and implementing the plan?
- What measurable goals and milestones have been set and what responsibilities allocated in the four key areas – infrastructure deployment; affordability; spreading skills, awareness and cultural acceptance; and promoting local content and usage – so that progress that can be monitored and adjustments made?

## Infrastructure

### Public-sector policy:

- How does the policy and regulatory environment encourage competition and balance targets to stimulate investment, innovation and consumer welfare?
- Has the government explored privatization of publicly owned telecommunications assets?
- Which viable solutions for solving complementary problems (such as electricity) are being explored?

- What are the tax levels that network operators face, and have they been reviewed in light of advancing connectivity (e.g. corporate tax, revenue-based contributions, annual regulatory fees, annual spectrum fees)? Are tax incentives in place to accelerate internet deployment (e.g. accelerated depreciation for connectivity infrastructure investments, tax credits for research and development to promote infrastructure innovation, or other tax credits)?

### Regulatory policy:

- What is the current status of spectrum availability, and what are the current allocation/reallocation/spectrum management plans? Do spectrum allocation plans include the possibility to allocate unlicensed spectrum? How does spectrum policy strike a balance between the goals of raising revenue and advancing access? How are spectrum auction winners evaluated (e.g. on bid price, speed of build out)? Is a spectrum-shortage evaluation conducted periodically?
- How do the relevant authorities ensure that the regulatory framework is perceived over time as credible and consistent enough to encourage private-sector commitment to investing in infrastructure projects?
- Is regulation technology neutral and flexible enough to allow for sharing models in infrastructure and spectrum use?

### Multiparty cooperation and coordination:

- Which non-ICT infrastructure projects (e.g. transportation, electricity) are under way, and do coordinating mechanisms among different initiatives exist to benefit from synergies in construction efforts?
- Which options have been explored for regional cooperation models with public or private organizations across countries?
- What collaboration mechanisms exist among ministries to fund and benefit from extending access (e.g. the positive impact of greater connectivity on law enforcement, education, healthcare and agriculture, among others)?

### Other solutions:

- What latest technological advances have been encouraged and explored in trials (e.g. allowing experiments with balloons and planes)? Are efficient regulatory frameworks in place to allow for such trials?
- Does public policy encourage a flexible and experimental approach to service offerings and regulating services, especially in areas where no clear business case exists for infrastructure investment based solely on voice and data charges?

## Affordability

### Public policy and regulation:

- What sustainable, targeted ways are being explored to offer subsidized devices and services (without disrupting market incentives)?
- What regional solutions have been considered (e.g. abolishing roaming charges)?
- What taxes (e.g. VAT, duties on handsets) affect consumer prices and to what extent? Do tax structures reflect the imperative of internet access as a necessity in today's world? Or, stated differently, are the goals and objectives of the ICT and finance ministries aligned?
- What targeted initiatives have been considered to address subsections of the population that may be underserved (e.g. women, farmers, youth, rural residents, handicapped people)?

### Involvement of the private sector and civil society:

- How does commerce take place and what does it imply for providing goods and services (elements of an exchange economy, role of communities and market places, access to other goods and services)?
- What barriers may need to be removed to encourage the private sector and civil society to explore new models (e.g. flexible-fee and zero-rating models, bundling options)?

## Skills and Awareness

### National education curricula:

- What current initiatives in the educational system promote and facilitate acquiring ICT skills and encouraging internet use? Does the educational system offer formal training in ICT skills? To what extent are ICT tools used in teaching other subjects, such as languages, math and sciences?
- What initiatives are planned or under way to prepare educators and public officials to facilitate acquiring ICT skills and using the internet?

### Enabling communities and families:

- What cultural conditions affect the use and adoption of new trends? Do specific target groups need to be addressed in a particular way?
- What typical information sources do people use, and how does news spread?

### Establishing local facilities:

- Are schools wired for ICT access all the way to the classroom?
- What population groups in which areas are particularly unaware of the internet's benefits and/or are unskilled? Are they being addressed with individualized initiatives?
- What local circumstances exist to facilitate, or be the vehicle for, teaching and learning? (e.g. availability of libraries, schools, community centres)?
- What localized initiatives are there, and does best-practice exchange exist among them?

### From Skills to jobs:

- What existing ways can be used to promote awareness of free, international resources for training? What barriers need to be removed for their widespread adoption?

## Encouraging Local Adoption and Use

### Government:

- Has the government charged all relevant ministries, departments and agencies (e.g. health, education, labour, treasury) with bringing services and programmes online?
- Is local private-sector ICT development encouraged by including local businesses in government procurement and e-services programmes?
- Is regulation and policy supportive of developing innovative digital solutions for basic services (e.g. mobile money, insurances)? Is the government at the forefront of using such innovative services (e.g. for public-sector employee salaries)?
- Does the legal framework promote content creation and dissemination by protecting freedom of expression, and using technology to promote openness and transparency?
- Is government striking a balance between concerns about net neutrality and business model innovation in providing content (e.g. sponsored data)?

### Private sector and civil society:

- What cultural conditions (familiarity with English language, variety of population groups and dialects) exist in different areas?
- What steps are required to start a new business? Can unnecessary hurdles be removed?
- What are the relevant "use cases" for the population – i.e. what kinds of local content have the greatest impact on improving individuals' livelihoods? What relevant use cases are most likely to constitute an entry to the internet and encourage first-time use? What relevant use cases are prone to expand the population's engagement and encourage more profound internet use, including content or business created by individuals?
- What are various stakeholders (public, private and civil society) doing to establish entrepreneurial clusters? What is the economic and legal environment for content creation and hosting, and for entrepreneurship in general (the ease of starting a business and access to credit, for example)? What kinds of programmes or incentives encourage wider entrepreneurial local app development?
- What kinds of programmes or incentives encourage SMEs to use the internet more widely?



# Contributors

## World Economic Forum Project Team

Alex Wong  
Head, Global Challenge Partnerships  
Co-Head, Future of the Internet Initiative

Rodrigo Arias  
Content Lead, Telecommunications Industry  
Global Leadership Fellow

Michael Garabet  
Project Manager, Future of Digital Communications

## The Boston Consulting Group (Adviser and Knowledge Partner)

Wolfgang Bock  
Senior Partner and Managing Director  
Hans Kuipers  
Partner and Managing Director  
Maikel Wilms  
Associate Director

## Internet for All Global Steering Committee

### Alliance for Affordable Internet

Omobola Johnson  
Sonia Jorge

### BT Group

Niall Dunne  
Anna Easton

### Cisco

Robert Pepper

### Cyberspace Administration of China

Zhang Wang  
Wang Jianchao

### Ericsson

Mats Nilsson  
Elaine Weidman Grunewald

### Facebook

Benjamin Bartlett  
Chris Weasler  
Pat Wu  
Sarah Wynn-Williams

### Federal Department of the Environment, Transport, Energy and Communications (DETEC)

Thomas Schneider

### Google

Fred Xue  
Hibah Hussain

## GSMA

Matthew Bloxham  
John Giusti  
Alix Jagueneau

## Huawei

Adam Lane

## Independent Consultant

David Dean

## Innovation, Science and Economic Development Canada

Corinne Charette

## Inter-American Development Bank

Antonio Garcia Zaballo

## International Telecommunication Union (ITU)

Preetam Maloor  
Vaggelis Igglesis

## Internet Corporation for Assigned Names and Numbers (ICANN)

Nora Abusitta  
Tarek Kamel  
Ergys Ramaj

## Internet Governance Forum (IGF)

Brian Gutterman  
Janis Karklins  
Chengetai Masango

## Internet Society

Constance Bommelaer  
Michael Kende

## Microsoft

Paul Garnett  
Paul Mitchell  
Carolyn Nguyen

## Ministry of Youth and Information Communication Technology of Rwanda

Didier Nkurikiyimfura  
Jean Philbert Nsengimana

## Mozilla Foundation

Mitchell Baker  
Ben Moskowitz  
Mark Surman

## NEPAD Planning and Coordinating Agency

Towela Nyirenda-Jere

## Palantir Technologies

Katherine Hsiao

**Qualcomm**

Ryan Gorostiza  
Anne-Lise Thieblemeont

**Royal Holloway, University of London**

Tim Unwin

**Rwanda Development Board (RDB)**

Francis Gatare  
Patrick Nyirishema

**Tata Consultancy Services**

Santosh Mohanty  
Ameet Nivsarkar

**Telefonica**

Christoph Steck

**Tsinghua University**

Niu Zhisheng

**US Department of State**

Manu Bhardwaj

**US Agency for International Development (USAID)**

Ann Mei Chang  
Jonathan Dolan  
Katharine Gage  
Sarah Glass  
Jessica Klein

**World Bank**

Mavis Ampah  
Pierre Guislain  
Boutheina Guermazi  
Deepak K. Mishra  
Arleen Cannata Seed  
Randeep Sudan

**World Wide Web Foundation**

Anne Jellema

**YooMee Africa**

Anat Bar-Gera

**Zain Group**

Emre Gurkan  
Jennifer Suleiman

## Global Agenda Council on the Future of Digital Communications

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Rodrigo Abreu, Chief Executive Officer

Tsinghua University

Niu Zhisheng, Deputy Dean, School of Information Science and Technology

VimpelCom

Romano Righetti, Group Chief Regulatory Officer; Deputy Chief Operating Officer, Wind

Vodafone Group

Matthew Kirk, Group Director, External Affairs and Member of the Executive Committee

YooMee Africa

Anat Bar-Gera, Chairperson

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World Economic Forum  
91–93 route de la Capite  
CH-1223 Cologny/Geneva  
Switzerland

Tel.: +41 (0) 22 869 1212  
Fax: +41 (0) 22 786 2744

[contact@weforum.org](mailto:contact@weforum.org)  
[www.weforum.org](http://www.weforum.org)